Putative contact ketoconazole shampoo-triggered pemphigus foliaceus in a dog

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Lessons learned from the evolution of terrestrial animal health surveillance in Canada and options for creating a new collaborative national structure — Second opinion

Dear Editor,

I read with fond interest the excellent piece on the evolution of disease surveillance in Canada by my good friend and colleague Dr. Wayne Lees (Can Vet J 2017;58:459–465). In my view, this clearly laid bare why we do not have an overarching “Animal Health Canada” type of system like the international examples Dr. Lees cites. After working in this area for over 35 years, I consider the reasons to be twofold.

First, all of the current and previous incarnations of Canadian animal health/surveillance systems that Dr. Lees lists have been assembled by dedicated, keen provincial and federal veterinary staff and stakeholders. However, these efforts lacked the most difficult and necessary element — expert public policy development in government — the people who know how to develop public policy and lead the work through to a cabinet decision. Among all the other priorities of government, when the time is right, real animal health policy development would lead to a cabinet decision on a partial funding model to hopefully sustain a new body such as “Animal Health Canada.”

Secondly, it may just be that our current vast network of well-trained veterinarians, world-class laboratories like the Animal Health Laboratory in Ontario, government veterinarians, and engaged stakeholders may already be providing a model that succeeds for a diverse Canada. And our current network is already pretty much sustainable on existing dollars. It works and it may be the most efficient expert system we can afford.

When one takes a broad risk-based view, the disease examples Dr. Lees cites are actually some of the disease mitigation success stories in Canada (e.g., West Nile virus, porcine epidemic diarrhea, avian influenza, bovine spongiform encephalopathy (BSE), etc.). The existing intelligent “net” created by hard working practitioners, the diagnosticians in our laboratories, government staff, and new stakeholder groups such as Swine Health Ontario or the diverse National Farmed Animal Health and Welfare Council — is truly coming of age as a robust network in my view. I am hard-pressed to envision a significant “fish” that would get through this current “net” undetected for very long. And we have a good track record of dealing with isolated outbreaks.

Sure there is always more preparedness, research and animal health work to do and a better understanding of animal health policy work would help. However, in the meantime let’s not beat ourselves up too much — our current networks are world-class and work to serve us well.

Sincerely,

David Alves DVM PhD, Elora, Ontario
Retired and still enjoying veterinary practice.
E-mail: Davidalves6020@gmail.com

Constructive and professional comments made in the spirit of intellectual debate are welcomed by the Editor. Writers are expected to be respectful of others and to ensure that letters are considerate and courteous. The Editor reserves the right to remove comments deemed to be inflammatory or disrespectful.

ERRATUM

Can Vet J 2017;58:690

The title International Council for Veterinary Agencies (ICVA) should be corrected to read: International Council for Veterinary Assessment (ICVA).
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As I sit down to write my first President’s Message I can’t help but reflect on what a wonderful profession is veterinary medicine. A girl from Sydney, Cape Breton, who never considered being anything other than a veterinarian from her earliest memories, is writing this message to her colleagues and is so humbled and proud to be a Canadian veterinarian and part of the Canadian Veterinary Medical Association (CVMA).

Veterinary medicine is a profession where you can do so many things. In my case, I have worked in a mixed practice, taught animal health students and registered veterinary technicians, worked for the Canadian Food Inspection Agency in meat hygiene, and have been, and continue to be, a small animal practitioner. When I stop to consider all of those professions within the profession it is truly amazing.

Of course the other half of my life as a veterinarian has been spent volunteering for my provincial veterinary medical association (VMA) and the CVMA. Volunteering is so worthwhile and rewarding. If you haven’t volunteered for your provincial VMA or the CVMA, I highly recommend it. It will give you an entirely different perspective on the profession, the successes, the challenges, and the work still to be done. I have met colleagues from across my province, my country, and the world. Even when on personal travel I have always made a point of dropping in to a local veterinary hospital or clinic, tell them where I am from, and I am always met with open arms. It’s a small world and a small profession, and for the most part, our problems and successes are just like those of a veterinarian/veterinary association in South Korea, or Ireland for example.

Regardless of the location, the face of veterinary medicine is changing. There needs to be more collaboration between veterinary and human health professionals. Veterinarians need to play a greater role in helping to confront global challenges such as animal welfare and sustainable agriculture. Veterinarians need to continue to work with, and influence, governments in making important policy and regulations with respect to such

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issues as antimicrobial resistance and prudent use, food safety, animal welfare; the list goes on.

We, as veterinary medical professionals, are seeing changes in technology and innovation and must learn to adapt and embrace innovation or we will be left behind. I was honored to put together the speakers and topics for the Summit in Charlottetown this past July, part of the CVMA Annual Convention. Veterinarians need to continue to raise the profile of the profession to the public, to veterinary students, and to prospective veterinary students; and to raise awareness of other veterinary positions in research, government, academia, industry, and public health. Also, everyone within the entire veterinary team is important and we are so thankful for the important collaboration we have with the Registered Veterinary Technicians/Technologists of Canada. As a colleague and close friend of mine once said “there is no ‘i’ in team.”

But there is a place and time for attention to the self; we are often so busy taking care of animals and clients, we neglect the need to stop and take care of ourselves and each other. Stop and reflect on what it was like having just graduated and going to your first job. For most of us, it was exciting and scary at the same time. Veterinary medicine is at the top of the list for suicide. Why is this? What can we do better? What can we change? How do we deal with the stressors? How do we deal with social media? How do we support ourselves and one another? We need to encourage and maintain open lines of communication with each other. There are many resources available. There is a wellness section on the CVMA website with links to programs in each province, familiarize yourself with it.

So, as I sit here and reflect on this profession and the people within it, I am very much looking forward to meeting more colleagues in the months ahead. We live in the best country in the world and we have, in my opinion, the best-trained veterinary professionals in the world. The opinion and voice of the Canadian Veterinary Medical Association is sought after by government, non-governmental organizations, and veterinary associations worldwide. We are leaders in national issues and animal welfare. How lucky are we, to live in a country where we can decide what we want to do for a living; where we are free to give opinions and influence government policies and regulations; where you can choose from an assortment of professions within the profession. How awesome is that!

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Ethical question of the month — September 2017

Groups defending current livestock production practices claim that videos showing abusive handling procedures in livestock facilities are the exception rather than the norm. If this is true, then animal activists have an unexpectedly high success rate videotaping farms with substandard animal husbandry practices. It can be argued that activists are more likely to be hired by large facilities due to staff turnover and therefore animal welfare problems are more likely to be documented on large facilities. Animal agriculture proponents argue that animal welfare problems are not related to farm size. Large facilities can dedicate staff to particular animal care responsibilities which is a luxury that smaller facilities cannot afford. Should veterinarians consider farm size as a significant risk factor for animal welfare problems?

Responses to the case presented are welcome. Please limit your reply to approximately 50 words and forward along with your name and address to: Ethical Choices, c/o Dr. Tim Blackwell, 6486 E. Garafraxa, Townline, Belwood, Ontario N0B 1J0; telephone: (519) 846-3413; fax: (519) 846-8178; e-mail: tim.e.blackwell@gmail.com

Suggested ethical questions of the month are also welcome! All ethical questions or scenarios in the ethics column are based on actual events, which are changed, including names, locations, species, etc., to protect the confidentiality of the parties involved.

Les réponses au cas présenté sont bienvenues. Veuillez limiter votre réponse à environ 50 mots et nous la faire parvenir par la poste avec vos nom et adresse à l’adresse suivante : Choix déontologiques, a/s du Dr Tim Blackwell, 6486, E. Garafraxa, Townline, Belwood (Ontario) N0B 1J0; téléphone : (519) 846-3413; télécopieur : (519) 846-8178; courriel : tim.e.blackwell@gmail.com

Les propositions de questions déontologiques sont toujours bienvenues! Toutes les questions et situations présentées dans cette chronique s’inspirent d’événements réels dont nous modifions certains éléments, comme les noms, les endroits ou les espèces, pour protéger l’anonymat des personnes en cause.

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Ethical question of the month — June 2017

Large numbers of rodents and other animals are used in psychology experiments as surrogates for investigating human emotional states such as anxiety, depression, phobias. Some studies use electric shock and forced swim tests in rats to study learned helplessness in people. Critics claim that complex human psychological characteristics cannot be effectively studied in rodents. They argue that the reactions of laboratory animals housed in cages do not reflect complex human emotional states. If the behavior of caged rodents can never be representative of human behavior, is such experimentation ever justified?

Question de déontologie du mois — Juin 2017

Un nombre important de rongeurs et d’autres animaux sont utilisés comme substituts lors d’expériences en psychologie afin de réaliser des enquêtes sur les états émotionnels humains comme l’anxiété, la dépression, les phobies, etc. Certaines études ont recours à des chocs électroniques et à un test de la nage forcée chez les rats afin d’étudier la résignation acquise chez les humains. Les critiques allèguent que des caractéristiques psychologiques humaines complexes ne peuvent pas être étudiées efficacement chez les rongeurs. Ils font valoir que les réactions d’animaux de laboratoire logés en cage ne reflètent pas des états émotionnels humains complexes. Si le comportement de rongeurs en cage ne peut jamais représenter un comportement humain, peut-on justifier une telle expérimentation?

An ethicist’s commentary on psychological research conducted on animals

I have entertained a significantly negative attitude towards psychological research on animals since my undergraduate days. This attitude was first expressed unequivocally in my first book on animal ethics, published in 1981, in which I depicted a good deal of such research as significantly abusive towards animals, and of no value for human health and welfare, or for advancing scientific knowledge. For example, I subsequently pointed out that although the cat has been very much used in behavioral research throughout the 20th century, there were no books available on normal cat behavior!

One obvious example of absurdity which characterizes not only psychological research, but also physiological and veterinary investigations into experientially negative states, needs to be noted. This absurdity can be characterized in the following story. On one occasion, I was lecturing at the University of London, simultaneously, there was a conference being held on animal pain. I was asked to comment on the keynote speech. For about an hour, the speaker argued that, since the electrochemical activity in the cerebral cortex of the dog was radically different from that of humans, the dog could not be said to feel pain in any way analogous to people. My critical comment was brief. I said “you are a very prominent pain researcher, correct?” He modestly acknowledged that this was the case. I continued, “if I am not mistaken, you do your research on dogs and extrapolate the results to people?” He acknowledged that this was the case. I concluded by saying “that is all I have to say. Either your speech today is false, or your life’s work is!” There is in fact an entire panoply of researchers who study pain in animals, yet deny that animals feel pain!

Another parallel absurdity implicit in psychological research is known as “the psychologist’s dilemma.” Either the psychological states being studied in animals are analogous to those of humans, or they are not. If they are, then what gives us the right to inflict such negative states on animals as pain, fear, loneliness, when we morally cavil at doing so on humans? And if they are not analogous, why study them?

All of this would be bitterly funny, if it were not the case that animals can suffer considerably in psychological research. (By the way, it is pretty much axiomatic in psychological and psychiatric research that animals are incapable of suffering — allegedly, only humans can suffer).

In closing this discussion, we can cite an outrageous example of rationalization that I came across in my service on our Institutional Animal Care and Use Committee. A standard paradigm for motivating animals to learn is to keep them at 85% of the body weight they would be if allowed to feed ad libitum. This is done by restricting their food so they are constantly hungry. (If I were a psychologist, I would say “hungry,” to distance myself from the dreaded, career-killing charge of anthropomorphism. This, despite the fact, that all of animal research conceptually rests upon some degree of anthropomorphism).

Our committee did not like keeping the animals constantly hungry, and called in the psychologists doing this sort of research to defend the practice. Amazingly enough, their response was that keeping people underweight reduces their chance of dying of disease and increases their lifespan! What they absurdly forgot is that these animals are never allowed to live out a normal lifespan!

For all of the reasons detailed above, I am highly skeptical of both the morality and scientific validity of psychological research performed upon animals. Thus, unless we are dealing with totally benign, noninvasive research, I can see no justification for using animals in invasive ways in the sorts of experiments this case details.

Bernard E. Rollin, PhD
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1. Which of the following is NOT true regarding valvular endocardiosis in dogs?
   A. It is an age-related condition.
   B. It most frequently involves the mitral valve.
   C. It is associated with a systolic murmur.
   D. It causes smooth, nodular thickening of affected valves.
   E. It is associated with bacterial infection.

2. The most common site of gastrointestinal obstruction in horses is which of the following?
   A. Gastric pylorus
   B. Ileum
   C. Right ventral colon
   D. Pelvic flexure
   E. Small colon

3. Cataracts develop in dogs with diabetes mellitus for which of the following reasons?
   A. The increased glucose within the aqueous humor dehydrates the lens.
   B. The increased glucose causes formation of sorbitol within the aqueous humor.
   C. The increased glucose within the lens draws in water, destroying the lens fibers.
   D. The increased glucose causes formation of sorbitol within the lens.

4. A 6-month-old Shetland sheepdog is presented for hair loss and scratching. Examination reveals a thin hair coat with large numbers of papules, crusts, pustules, and comedones. Skin scrapings reveal eight-legged adult mites with long tails and short legs as well as 6-legged larvae. Which of the following is the most appropriate therapy?
   A. Ivermectin orally or subcutaneously
   B. Amitraz dips
   C. Pyrethrin dips
   D. Selamectin topically
   E. Lufenuron orally

1. Lequel des énoncés suivants est faux à propos de l’endocardiose chez le chien?
   A. Elle est associée à l’âge.
   B. Elle implique plus fréquemment la valve mitrale.
   C. Elle est associée au souffle systolique.
   D. Elle cause un épaississement nodulaire lisse des valves atteintes.
   E. Elle est associée à la présence d’une infection bactérienne.

2. Lequel des sites suivants constitue l’endroit le plus commun pour une obstruction gastro-intestinale chez le cheval?
   A. pylore de l’estomac;
   B. iléon;
   C. côlon ventral droit;
   D. courbure pelvienne;
   E. petit côlon.

3. Pour laquelle des raisons suivantes les cataractes se développent-elles chez les chiens souffrant de diabète sucré?
   A. L’augmentation du glucose dans l’humeur aqueuse déhydrate le cristallin.
   B. L’augmentation du glucose permet la formation de sorbitol dans l’humeur aqueuse.
   C. L’augmentation du glucose dans le cristallin prélève l’eau, détruisant ainsi les fibres du cristallin.
   D. L’augmentation du glucose permet la formation de sorbitol à l’intérieur du cristallin.

4. Un chien Berger des Shetland âgé de 6 mois se gratte la peau et présente une perte de poils. L’examen révèle un pelage fin avec un grand nombre de papules, de croûtes, de pustules et de comédones. Le raclage de la peau révèle des acariens adultes à 8 pattes, avec de longues queues et de courtes pattes, ainsi que des larves à 6 pattes. Lequel des traitements suivants est le plus approprié?
   A. ivermectin par voie orale ou voie sous-cutanée;
   B. bains d’amitraze;
   C. bains de pyrétrine;
   D. sélamectine topique;
   E. lufénuron par voie orale.
5. Which of the following options LEAST warrants investigation in an outbreak of papillomatous digital dermatitis?

A. Foot bath size  
B. Alley scraping  
C. Concrete age  
D. Copper sulfate invoices  
E. Stock invoices

5. Laquelle des options suivantes justifie LE MOINS une investigation lors d’une flambée de dermatite digitale papillomateuse?

A. La grosseur des bains de pieds.  
B. Le grattage des allées.  
C. L’âge du béton.  
D. Le traitement au sulfate de cuivre.  
E. La qualité des animaux.

Questions and answers were derived from Review Questions and Answers for Veterinary Boards 2nd ed., a 5-volume series including Basic Sciences, Clinical Sciences, Small Animal Medicine and Surgery, Large Animal Medicine and Surgery, and Ancillary Topics, by kind permission of the publisher, Mosby–Year Book, Inc., St. Louis, Missouri.


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With the scenic city of Charlottetown as a backdrop, a record high of over 950 delegates attended the 69th Annual Canadian Veterinary Medical Association Convention in Prince Edward Island.

The week began with multiple wet labs held at the Atlantic Veterinary College, pre-convention meetings including the CVMA Executive and Council meetings, and the CVMA Summit, which focused on *The Future of Veterinary Medicine: Embracing Change & Innovation*. The CVMA Emerging Leaders Program, practice management sessions, and over 105 concurrent sessions rounded out the continuing education (CE). For the 2nd year, the CVMA National Issues Committee held a forum; this year to discuss *Is "Alternative Medicine" no Longer Alternative?*

With a great variety of CE sessions presented by top-notch speakers, delegates had the opportunity to learn about dentistry, soft tissue surgery, pain management, ruminant, equine, as well as animal welfare issues and much more.

The social evening was held at the Lobster on the Wharf Restaurant, an amazing waterfront property. The Kitchen Party themed event was a success and sold out prior to online registration closing. Veterinarians without Borders held a successful live auction. Guests were entertained by Courtney Hogan and the Fiddler’s Sons.

With the direction of the CVMA’s Professional Development Committee, the passion of the 2017 CVMA Convention local chair Dr. Kathleen MacMillan, and a team of volunteers and CVMA staff, this year’s convention was a resounding success! Plans are already underway for the next CVMA Convention in Vancouver, British Columbia and we look forward to welcoming you on July 5–8, 2018.

(by Sarah Cunningham, Acting Manager, Conventions, CVMA)
Sur la toile de fond de la panoramique ville de Charlottetown, un nombre record de plus de 950 délégués ont assisté au 60e congrès annuel de l’Association canadienne des médecins vétérinaires à l’Île-du-Prince-Édouard.

La semaine a commencé par divers laboratoires de travaux pratiques qui se sont déroulés à l’Atlantic Veterinary College ainsi que par des réunions préalables au congrès, dont les réunions de l’exécutif et du Conseil de l’ACMV, et le Sommet de l’ACMV, qui a porté sur L’avenir de la médecine vétérinaire : Adopter les changements et l’innovation. Le Programme des futurs leaders de l’ACMV, des ateliers sur la gestion d’une pratique et plus de 105 ateliers parallèles complétaient le programme de formation continue. Pour la deuxième année, le Comité sur les enjeux nationaux de l’ACMV a tenu un forum. Cette année, la discussion portait sur La « médecine parallèle » est-elle toujours parallèle?

Grâce à un vaste éventail d’ateliers de formation continue présentés par des conférenciers de haut calibre, les délégués ont eu l’occasion de se renseigner sur la dentisterie, la chirurgie des tissus mous, la gestion de la douleur, les ruminants, les équidés ainsi que sur les enjeux liés au bien-être animal et plus encore.

La soirée sociale s’est tenue au restaurant Lobster on the Wharf, un établissement exceptionnel au bord de la mer. La soirée, qui s’est déroulée sous le thème d’un party de cuisine, a remporté un vif succès et tous les billets ont été vendus avant la fermeture de l’inscription en ligne. Vétérinaires sans frontières a aussi tenu un encan en direct réussi et les invités ont été divertis par Courtney Hogan et le groupe Fiddler’s Sons.


(par Sarah Cunningham, gestionnaire par intérim, Congrès, ACMV)
Animal Welfare: Safeguarding the Five Animal Freedoms

Next month, we celebrate Animal Health Week from October 1 to 7, 2017. The Canadian Veterinary Medical Association (CVMA) is highlighting the importance of meeting the needs of all animals in our care through the campaign slogan, “Animal Welfare: Safeguarding the Five Animal Freedoms.”

We are promoting the fact that it is the responsibility of animal owners to provide the attention and accommodations required to meet the Five Animal Freedoms: adequate shelter, proper nutrition, appropriate veterinary care, proper socialization, and the ability to exhibit normal behaviors. We must ensure the animals in our care not only survive, but thrive. Guaranteeing every animal experiences each of the Five Animal Freedoms ensures their health and happiness.

Responsible animal ownership includes providing access to fresh water and a diet to maintain full health and vigor, allowing animals to socialize with and spend time away from members of their species as appropriate, providing an appropriate environment including shelter and a comfortable resting area, providing freedom from pain, injury or disease through the prevention or rapid diagnosis and treatment, and allowing animals to express normal behavior by providing sufficient space, proper facilities, and tools/accessories, and not punishing animals for carrying out undesired behaviors.

Visit our website (www.canadianveterinarians.net) in September to download fact sheets and information you can share with your clients to help their animals survive and thrive.

We invite you to share your celebrations on Facebook or tweet using the hashtag #AnimalHealthWeek.

Our generous supporters

Generous support of the 2017 Animal Health Week campaign is provided by Principal Plus Sponsor, Boehringer Ingelheim, Principal Sponsor, Petsecure, and Program Sponsors, Elanco and iFinance Canada (Petcard). This month, we invite you to learn more about our Program Sponsor, Petcard.

A message from Petcard

For Petcard, animal welfare is not just a concept, it’s our business. For over 20 years Petcard has assisted Canadians in ensuring their companion animal’s welfare by providing a financing option at their veterinarian’s office. In Canada, healthcare is something many people take for granted, but when an unexpected illness or accident strikes our furry and lovable family members, many are taken off guard by the costs associated with the best in veterinary care.

Protégez les cinq libertés afin d’assurer le bien-être animal

Le mois prochain, nous célébrerons la Semaine de la vie animale du 1er au 7 octobre 2017. L’Association canadienne des médecins vétérinaires (ACVM) souligne l’importance de satisfaire aux besoins des animaux confiés à nos soins sous le thème du slogan de la campagne «Protégez les cinq libertés afin d’assurer le bien-être animal».

Nous faisons la promotion du fait que c’est la responsabilité des propriétaires d’animaux de fournir l’attention et l’hébergement requis afin de satisfaire aux Cinq libertés animales : un hébergement adéquat, une alimentation appropriée, des soins vétérinaires appropriés, une socialisation appropriée et la capacité de manifester un comportement normal. Nous devons veiller à ce que les animaux confiés à nos soins puissent non seulement survivre, mais s’épanouir. En veillant à ce que tous les animaux puissent jouir des Cinq libertés animales, nous assurons leur santé et leur bonheur.

Une possession responsable des animaux comprend : fournir l’accès à de l’eau fraîche et à une alimentation qui préserve la pleine santé et la vigueur; laisser les animaux socialiser avec les membres de leurs espèces et leur permettre de se retirer au besoin; fournir un environnement approprié qui comprend un abri et une aire de repos confortable; assurer l’absence de douleur, de blessure ou de maladie par la prévention ou le diagnostic et le traitement rapides; et permettre aux animaux d’exprimer un comportement normal en leur fournissant suffisamment d’espace, des installations adéquates et des outils et accessoires et en ne punissant pas les animaux lorsqu’ils manifestent des comportements indésirables.

Visitez notre site Web (www.veterinaireasaucanada.net) en septembre pour télécharger les feuilllets d’information et des renseignements que vous pourrez partager avec vos clients afin d’aider leurs animaux à survivre et à s’épanouir.

Nous vous invitons à partager vos célébrations sur Facebook ou en gazouillant en utilisant le mot-clic #célèbroslaSVA.

Nos généreux commanditaires

La campagne 2017 de la Semaine de la vie animale est généreusement appuyée par le commanditaire principal plus, Boehringer Ingelheim, le commanditaire principal, Petsecure, et les commanditaires de programme, Elanco et iFinance Canada (Petcard). Ce mois-ci, nous vous invitons à en apprendre davantage à propos de notre commanditaire de programme, Petcard.
Petcard assists pet owners in safeguarding the Five Animal Freedoms in more ways than just ensuring their pets have access to veterinary care. Petcard provides financing for all sorts of animal-related products and services ranging from wellness plans and medication, to grooming services. We help pet owners provide adequate shelter for their pets by financing such services as boarding, purchasing and building kennels, and invisible fence systems. We have provided financing for our clients’ pets, both big and small, for both the building of stables and the purchase of bird cages. We also assist pet owners in ensuring proper diet and nutrition, as many of our clients use us to finance specialty pet foods that are purchased exclusively at veterinarian offices. Pet owners come to us to seek help with dog training and obedience classes so their best friends can display their beauty and socialization!

We are proud of our role in safeguarding companion animals’ access to veterinary care by providing their human family members an opportunity to make choices concerning their pets’ health that are not based solely on their current financial situations. Petcard aims to provide our furry loved one’s human companions with an option, so they are not forced to make tough choices between providing shelter or proper nutrition and veterinary care.

It is our honor to help clients and patients in their greatest moment of need.

Petcard has been a long-time supporter of the CVMA and initiatives like Animal Health Week. Starting in March 2017, and in partnership with the CVMA, we are proud to offer all current CVMA members the CVMA Petcard Program! Members can now register to offer Petcard at their clinics or offices with complimentary registration. The CVMA Petcard Program comes with a host of other exciting benefits such as exclusive rewards programs and increased Search Engine Optimization (SEO) opportunities. Please contact us by calling 1-888-689-9876 or via e-mail (info@petcard.ca) if you would like to take part or learn more about the exciting CVMA Petcard Program.

Un message de Petcard
Pour Petcard, le bien-être animal n’est pas seulement un concept, c’est notre mission. Depuis plus de 20 ans Petcard aide les Canadiens à assurer le bien-être de leur animal de compagnie en fournissant une option de financement au cabinet du vétérinaire. Au Canada, les soins de santé sont parfois tenus pour acquis, mais lorsqu’il se produit une maladie ou un accident inattendu chez nos adorables membres de la famille à fourrure, beaucoup de personnes sont prises au dépourvu par les coûts associés aux meilleurs soins vétérinaires.

Petcard aide les propriétaires d’animaux à préserver les Cinq libertés animales de plusieurs façons en plus d’assurer que leurs animaux ont accès à des soins vétérinaires. Petcard fournit du financement pour toutes sortes de produits et de services allant des régimes de bien-être aux médicaments, en passant par les services de toilettage. Nous aidons les propriétaires d’animaux à fournir un hébergement adéquat à leurs animaux de compagnie en finançant des services comme la pension, l’achat et la construction de chenils et de systèmes de clôture invisible. Nous avons fourni du financement pour les animaux de nos clients, petits et grands, pour la construction d’œuvres d’art et l’achat de cages d’oiseaux. Nous aidons aussi les propriétaires d’animaux à assurer une alimentation appropriée, car beaucoup de nos clients ont recours à nos services pour financer les aliments spécialisés pour animaux qui sont achetés exclusivement dans les cabinets des vétérinaires. Les propriétaires d’animaux viennent solliciter notre aide pour des cours de dressage et d’obéissance afin que leurs meilleurs amis puissent afficher leur beauté et leur socialisation!

Nous sommes fières de notre rôle dans la préservation de l’accès des animaux de compagnie aux soins vétérinaires en offrant aux membres de leur famille humaine l’occasion de faire des choix concernant la santé de leurs animaux qui ne se basent pas uniquement sur leur situation financière actuelle. Petcard vise à offrir une option aux compagnons humains de nos membres de la famille à fourrure, afin qu’ils ne soient pas forcés de faire des choix difficiles entre l’hébergement ou une alimentation appropriée et des soins vétérinaires.

Nous sommes honorés d’aider les clients et les patients dans leur plus grand moment de besoin.

Petcard est un partisan de longue date de l’ACMV et d’initiatives comme la Semaine de la vie animale. Depuis mars 2017 et en partenariat avec l’ACMV, nous sommes fiers d’offrir le Programme Petcard de l’ACMV à tous les membres actuels de l’ACMV! Les membres peuvent maintenant s’inscrire afin d’offrir Petcard à leurs cliniques ou établissements grâce à une inscription gratuite.

Le Programme Petcard de l’ACMV offre un éventail d’autres avantages emballants comme des programmes de récompense exclusifs et des occasions accrues d’optimisation pour les moteurs de recherche. Veuillez nous contacter en composant le 1-888-689-9876 ou par courriel (info@petcard.ca) si vous aimeriez participer ou en apprendre davantage à propos de l’excitant Programme Petcard de l’ACMV.
CVMA Annual Source Guide — Check Your Listing
Répertoire annuel des ressources de l’ACMV — Avez-vous vérifié votre inscription?

The 2017–2018 CVMA Source Guide print edition, distributed exclusively to CVMA members, will arrive in early September. The Source Guide is your national professional Association’s reference guide; it provides CVMA members with an all-encompassing document that members consider a useful and valuable membership benefit.

Within the Source Guide, you will find a complete listing of member benefits and privileges that you are entitled to, our national issues and animal welfare position statements, and awards and honors information recognizing our colleagues’ achievements.

Use this guide to contact your peers, colleagues and classmates. The Source Guide contains listings of CVMA boards, committees and representatives, national and international veterinary medical associations, veterinary colleges and national species specific groups. There is a wealth of information in this guide so please peruse and use its resources.

In Section 4, lots of effort went into ensuring each veterinarian’s contact listing was current and listed their preferred contact information when the data was sent to the publisher. While transitioning to CVMA’s new national veterinary database, the preferred contact information we included in each veterinarian’s profile was the contact information we had on record or that was provided to the CVMA by the provincial veterinary medical associations. Please review your listing to ensure the accuracy of your contact information and the preferred address where you wish to receive mail from the CVMA.

Please review your listing to ensure the accuracy of your contact information and the preferred address where you wish to receive mail from the CVMA.

Veuillez vérifier votre inscription afin d’assurer l’exactitude de vos coordonnées et de l’adresse privilégiée où vous désirez recevoir votre courrier de l’ACMV.


Dans le Guide des ressources, vous trouverez une liste complète des avantages et des privilèges offerts aux membres auxquels vous avez droit, nos énoncés de position sur les enjeux nationaux et le bien-être animal ainsi que les prix et distinctions reconnaissant les réalisations de nos collègues.

Vous pouvez utiliser ce guide pour contacter vos pairs, vos collègues et vos confrères et consœurs de classe. Le Guide des ressources contient des détails sur les conseils, les comités et les représentants de l’ACVM, les associations nationales et internationales de médecins vétérinaires, les collèges de médecine vétérinaire et les groupes pour les espèces spécifiques. Ce guide recèle une foule de renseignements utiles et vous pourrez le consulter et utiliser ses ressources à loisir.

Dans la section 4, des efforts importants ont été déployés afin d’assurer que l’inscription et les coordonnées de chaque vétérinaire étaient à jour et représentaient leurs coordonnées privilégiées lorsque les données ont été envoyées à l’impression. Pendant la transition vers la nouvelle base de données nationale vétérinaire de l’ACVM, les coordonnées privilégiées que nous avons incluses dans le profil de chaque vétérinaire étaient les coordonnées que nous avions en dossier ou qui avaient été fournies à l’ACVM par les associations provinciales de médecins vétérinaires. Veuillez vérifier votre inscription afin d’assurer l’exactitude de vos coordonnées et de l’adresse privilégiée où vous désirez recevoir du courrier de l’ACVM; si les renseignements ne sont pas exacts, veuillez nous en informer en appelant au 1-800-567-2862 ou en visitant le site Web (www.veterinairesaucanada.net) et en mettant votre profil à jour en ligne. Les renseignements révisés seront instantanément reflétés dans la nouvelle base de données nationale vétérinaire. Vous pouvez aussi utiliser le formulaire «Modification du profil» et nous le retourner par télécopieur au (613-236-9681) ou par courriel (admin@cvma-acmv.org).
Le Programme de mentorat de l'ACMV appuie les besoins des nouveaux vétérinaires

“Tu me dis, j’oublie. Tu m’enseignes, je me souviens. Tu m’impliques, j’apprends.”

— Benjamin Franklin

Les diplômés vétérinaires sont confrontés à des défis difficiles lorsqu’ils entament leur carrière, notamment l’acquisition d’expérience pratique, la réalisation des chirurgies, le bon diagnostic, la prestation de bons traitements aux patients et le manque d’expérience et de confiance pour interagir et communiquer avec les clients et les collègues.

Pour aider les diplômés récents à surmonter les défis pendant leur adaptation à la vie professionnelle, l’ACMV a créé le Programme de mentorat de l’ACMV afin de tisser des liens entre les membres de l’ACMV qui désirent appuyer les étudiants de dernière année au D.M.V., les diplômés récents et les vétérinaires en début de carrière.

Pour participer au Programme de mentorat de l’ACMV, les mentorés doivent :

• être membre de l’ACMV
• remplir un formulaire de profil de mentoré
• être prêt à s’engager pour 12 mois
• initier la recherche, choisir le mentor et établir le premier contact
• maintenir un contact régulier avec votre mentor
• identifier les compétences et les habiletés que vous désirez acquérir.

Il n’y a pas de processus de jumelage, car on s’attend à ce qu’un mentoré effectue la recherche pour trouver les mentors potentiels dans la liste des mentors de l’ACMV et qu’il choisisse un mentor en fonction de ses buts et besoins. Les jumelages sont effectués par le mentoré et acceptés par le mentor, c’est ensuite la responsabilité des deux parties de poursuivre la communication.

Les mentorés peuvent initier le contact en acheminant une lettre ou un courriel d’introduction au mentor éventuel. Il pourra s’écouler 1 ou 2 semaines avant d’avoir une réponse de votre mentor, mais une fois que le contact a été établi, vous devriez prévoir une première réunion (virtuelle ou en personne) pour présenter les attentes face à la relation.

Le mentorat est une occasion de développement personnel et professionnel inestimable ainsi qu’un puissant outil pour bâtir la confiance chez les mentorés. De plus, l’accompagnement professionnel peut être satisfaisant et enrichissant pour les mentors par le partage de leurs connaissances et expertise pour aider des collègues à progresser dans leur carrière.
for mentors through sharing their knowledge and expertise to help others progress in their career.

The CVMA has mentors waiting for you. To learn more about the CVMA Mentoring Program and register as a mentor or mentee, visit the CVMA Mentoring Program section of the CVMA website (www.canadianveterinarians.net/practice-economics/cvma-mentoring-program).

2017 World Rabies Day:
Rabies: Zero by 30

World Rabies Day lands on September 28 of each year. The Canadian Veterinary Medical Association (CVMA) joins countries from around the world to promote rabies awareness and prevention.

At the global conference on rabies elimination in 2015, a common goal of zero human deaths from canine rabies by 2030 was agreed by the World Health Organization, World Organisation for Animal Health, UN Food and Agriculture Organization and Global Alliance for Rabies Control (GARC). In support of this goal, the 2017 World Rabies Day theme is Rabies: Zero by 30.

Visit the GARC website (www.rabiesalliance.org/world-rabies-day) to find information on how to organize your own World Rabies Day event. There, you will find Event Toolkits, Awareness Resources, and free downloadable logos in multiple languages. For any of your event promotion, use #WorldRabiesDay.

GARC also offers on their website free, online courses to improve the skills and knowledge of people working in rabies awareness and prevention.

The CVMA offers a Rabies Fact Sheet and Rabies Prevention Tips for Pet Owners under its animal owner section (www.animalhealthcare.ca). Feel free to share this information with your clients or through your social media channels.

Working together against rabies helps people and animals live safely, together, free from rabies.


Journée mondiale contre la rage
2017 — Rage : Zéro d’ici 2030

La Journée mondiale contre la rage se tient le 28 septembre de chaque année. L’Association canadienne des médecins vétérinaires (ACMV) se joint à d’autres pays partout dans le monde afin de promouvoir la sensibilisation à l’égard de la rage et la prévention de cette maladie.


Visitez le site Web de l’Alliance mondiale contre la rage (www.rabiesalliance.org/world-rabies-day) pour consulter d’autres renseignements sur la façon d’organiser votre propre activité de la Journée mondiale contre la rage. Vous y trouverez des trousses à outils pour des activités, des ressources de sensibilisation et des logos téléchargeables gratuits en plusieurs langues. Pour la promotion de vos événements, utilisez #WorldRabiesDay.

GARC also offers on their website free, online courses to improve the skills and knowledge of people working in rabies awareness and prevention.

L’Alliance mondiale contre la rage offre aussi des cours en ligne gratuits sur son site Web afin d’améliorer les compétences et les connaissances des personnes qui travaillent dans le domaine de la sensibilisation à la rage et de la prévention de cette maladie.

L’ACMV offre une Fiche d’information sur la rage ainsi que des Conseils de prévention de la rage pour les propriétaires d’animaux dans la section des propriétaires d’animaux (www.santeanimale.ca). N’hésitez pas à partager ces renseignements avec vos clients ou par l’entremise des réseaux des médias sociaux.

Le travail concerté contre la rage aide les personnes et les animaux à vivre en sécurité, ensemble et libre de rage.
Points clés du webinaire du Mois national de sensibilisation aux tiques 2017

Réponses de nos experts invités aux questions les plus fréquentes

Le 1er mars 2017, pour souligner le lancement du Mois national de sensibilisation aux tiques, l’Association canadienne des médecins vétérinaires, en partenariat avec Merck Santé animale, a diffusé un webinaire qui portait sur les tiques, les stratégies de prévention des maladies transmises par les tiques et les mises à jour sur la surveillance au Canada. Vous trouverez ci-dessous les cinq questions les plus souvent posées ainsi que les réponses gracieusement fournies par nos experts invités.

• Robbin Lindsay, Ph.D., National Microbiology Laboratory, Public Health Agency of Canada

• Scott Stevenson, B.M.Sc, M.Sc, D.M.V., co-owner of Thousand Islands Veterinary Services

1. La maladie de Lyme est-elle aussi préoccupante pour les humains qu’elle l’est pour les chiens?

Robbin Lindsay: En effet, Lyme disease is not just a problem for companion animals and doctors need to be aware of the changing dynamics of risk of tick exposure. Disease in humans is much more common after exposure to the Lyme disease agent than it is in dogs so pet owners need to be aware and take the necessary steps to protect themselves from tick bites.

2. Comment puis-je savoir quelle surveillance est effectuée dans ma région et/ou si ils veulent tiques des chiens?

Robbin Lindsay: The simplest approach would be to contact the website (www.ticks@phac-aspc.gc.ca) and they can provide a summary of which provinces are engaged in surveillance and which hosts ticks will be accepted from.

3. Comment puis-je savoir quelle surveillance est effectuée dans ma région et/ou si je peux soumettre les tiques trouvées sur des chiens?

Scott Stevenson: Les vaccins contre la maladie de Lyme sont efficaces pendant un an. Il est difficile d’évaluer l’efficacité du vaccin utilisé seul étant donné que nous les utilisons dans le...
dogs missing the vaccine, the incidence of Lyme positivity is higher. We do recommend it for all dogs in our practice, unless there is a real reason why that dog’s likelihood of exposure would be low (e.g. a Chihuahua who is only carried around in a purse). We will do an initial vaccine with a booster 3–4 weeks after the initial vaccine and then annually.

4. Do you recommend any particular preventative measures for ticks for outdoor cats or is there not much concern for cats?

Dr. Stevenson: At this time, the risk of tick-borne illness in cats remains very low in Canada. However, owners are increasingly asking if there is a way to prevent ticks on their outdoor cats. As there is now a labeled flea and tick control product for cats, we will be able to give a recommendation that will put clients at ease (preventing ticks) while also preventing fleas, which are much more likely to actually cause clinical illness in their cat!

5. If a dog tests positive for Lyme disease and is treated with doxycycline, is it 100% effective?

Dr. Stevenson: In some dogs treated with antibiotics Borrelia burgdorferi can still be found (in smaller numbers) along tendon sheaths, etc., meaning that even with antibiotic treatment we cannot guarantee complete clearance of the bacteria. This is why we put so much emphasis on preventing the exposure in the first place.

National Tick Awareness Month Webinar available to view until March 1, 2018. We invite you and your veterinary team to watch the National Tick Awareness Month webinar that is available for online streaming on demand. To view the presentation recording, please go to the website (www.canadianveterinarians.net/practice-economics/practice-tools-national-tick-awareness-month).

National Tick Awareness Month is an initiative of the Canadian Veterinary Medical Association, in partnership with Merck Animal Health.

The veterinary community is in a unique position to take a leadership role in the fight against ticks.
The CVMA and HRdownloads Partner to Offer Veterinarians Discounted Management Resources

One of the Canadian Veterinary Medical Association’s (CVMA) 3 strategic objectives is to help veterinarians achieve “a successful career and a balanced life.” Although achieving this state of balance may be considered a luxury by many practitioners, it is more easily attainable in profitable practices. As part of the CVMA Business Management Program, we are pleased to announce a new, exclusive partnership with HRdownloads™, delivering greater value for our members and providing additional management resources.

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L’ACMV et HRdownloads forment un partenariat afin d’offrir des ressources supplémentaires en gestion à tarif réduit aux membres

L’une des trois priorités stratégiques de l’Association canadienne des médecins vétérinaires (ACMV) consiste à aider les médecins vétérinaires à obtenir une carrière prospère et une vie équilibrée. Même si l’atteinte de cet équilibre peut être considérée comme un luxe par beaucoup de praticiens, il est beaucoup plus facile de l’atteindre dans les pratiques rentables. Dans le cadre du Programme de gestion commerciale de l’ACMV, nous sommes heureux d’annoncer un partenariat exclusif avec HRdownloadsMD pour offrir une valeur supérieure à nos membres et fournir des ressources supplémentaires en gestion.

HRdownloadsMD fournit à des milliers d’entreprises canadiennes de la documentation efficace vous permettant de gagner du temps, des conseils en ressources humaines (RH) par des conseillers principaux en RH, des sondages en ligne et des solutions de formation en vue de transformer et de maximiser l’efficacité des processus de RH.

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Un échantillon de documents en ressources humaines gratuit pour les membres de l’ACMV! Gagnez du temps et obtenez l’appui d’experts en RH qui connaissent les besoins de l’industrie vétérinaire canadienne. Cet échantillon comprend :
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Pour en apprendre plus au sujet de HRdownloadsMD et pour accéder à votre échantillon de documents en ressources humaines gratuit, visitez la section Avantages et services aux membres sous l’onglet Valeur de l’adhésion dans le site Web de l’ACMV (veterinairesaucanada.net).
Putative contact ketoconazole shampoo-triggered pemphigus foliaceus in a dog
Hyun-Jeong Sung, In-Hwa Yoon, Jung-Hyun Kim

Abstract — A 10-year-old spayed female cocker spaniel dog was referred for an evaluation of acute-onset generalized pustular cutaneous lesions following application of ketoconazole shampoo. Cytologic and histopathologic examinations of the lesions revealed intra-epidermal pustules with predominantly neutrophils and acantholytic cells. This is the first description of putative contact ketoconazole shampoo-triggered pemphigus foliaceus in a dog.

Résumé — Pemphigus foliaceus causé par le contact putatif avec un shampoing au kétoconazole chez un chien. Une chienne Cocker spaniel stérilisée âgée de 10 ans a été recommandée pour l’évaluation de l’apparition de lésions cutanées pustulaires générales après l’application d’un shampoing au kétoconazole. Les examens cytologiques et histopathologiques des lésions ont révélé des pustules intra-épidermiques composées surtout de neutrophiles et de cellules acantholyssées. Il s’agit de la première description de pemphigus foliaceus causé par le contact putatif avec un shampoing au kétoconazole chez un chien.

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Case description

A 10-year-old spayed female cocker spaniel dog weighing 8.5 kg was referred for an evaluation of acute-onset generalized pustular cutaneous lesions following the application of ketoconazole shampoo (Figure 1A). The owner reported that the skin lesions developed after a single application of 2% ketoconazole shampoo intended for human use and that the lesions became worse with repeated applications of the same shampoo. The owner also reported that there were no skin lesions before application of the shampoo. There was no history of any systemic medications or other topical applications such as ectoparasite preventatives before disease onset. The referring veterinarian instructed the owner to stop using the shampoo and empirically prescribed cephalexin (Falexin Cap; Donghwa Pharm, Seoul, Korea), 20 mg/kg body weight (BW), PO, q12h. However, the lesions did not resolve, and 1 wk before presentation to the Veterinary Teaching Hospital at Konkuk University (VTH-KU), the dog became febrile and the skin lesions spread to the face and footpads.

Upon arrival at the VTH-KU, the dog was depressed, tachypneic (80 breaths/min) and febrile (41°C) on physical examination. There was no heart murmur and the blood pressure, measured by an automated oscillometric method, showed normotension (systolic blood pressure, 125 mmHg). There was complete alopecia of the trunk (Figure 1B). The skin lesions consisted of pustules, erythema, edema, crusts, erosions, and alopecia with a symmetrical distribution primarily affecting the face. The dorsal muzzle and nasal planum showed encrusted erosions and on the footpads, severe peeling, fissures, swelling, and ulcerations were noted (Figures 2A, 2B, 2C). A complete blood (cell) count (CBC) revealed normocytic normochromic anemia [hematocrit (Hct), 27.6%; reference range (RR): 37% to 55%], neutrophilic leucocytosis [white blood cell count (WBC), 37.86 $\times 10^9$ cells/L; RR: 5.05 to 16.76 $\times 10^9$ cells/L], and thrombocytosis [platelet count (PLT), 712 $\times 10^9$ cells/L; RR: 148 to 484 $\times 10^9$ cells/L]. Mildly increased blood urea nitrogen (10 mmol/L; RR: 2.5 to 9.6 mmol/L) and alkaline phosphatase concentrations (292 U/L; RR: 23 to 212 U/L) were the only abnormalities noted on the serum biochemical analysis. The urinalysis and serum electrolyte analysis were within reference limits. Differential diagnoses included pemphigus foliaceus (PF), cutaneous drug reaction, erythema multiforme, cutaneous neoplasia, pyoderma, dermatophytosis, and superficial necrolytic dermatitis.

Cytology of the exudate under the crusts showed multiple acantholytic keratinocytes and neutrophils (Figure 3A). Fungal culture of the hairs and crusts was unremarkable. A punch biopsy sample was fixed by immersion in neutral-buffered 10% formalin for microscopic evaluation. The histopathological examination revealed superficial pustules with neutrophils and...
Acantholytic keratinocytes (Figure 3B). Immunohistochemistry (IHC) was performed, and confirmed the presence of an intracellular “fishnet”-like deposition of immunoglobulin G (IgG) in the lesions in the epidermis (Figure 3C). A diagnosis of contact ketoconazole shampoo-triggered PF was made based on the unique history, clinical signs, histopathology, and IHC.

Treatment was initiated with a combination of immunosuppressive dosages of prednisolone (Solondo Tab; Yuhan Pharm, Seoul, Korea), 1 mg/kg BW, PO, q12h and azathioprine (Immuthera Tab; Celltrion Pharm, Seoul, Korea), 2 mg/kg BW, PO, q24h. After 1 wk of treatment, the dog’s hyperthermia and anorexia disappeared and complete healing of the cutaneous lesions was noted within 2 mo of treatment (Figures 2D, 2E, 2F). During the first 2 mo, azathioprine was tapered and finally stopped. And during the following 4 mo, the dose of prednisolone was decreased by 25% every 2 wk on each alternate day, and the lesions remained in complete remission. A provocation test with ketoconazole shampoo was recommended, but the owner refused to do a re-challenge. The dog remained in complete remission at 9 mo (Figures 1C, 2G, 2H, 2I) and 15 mo (time of submission of this case report) after diagnosis.

**Discussion**

In this report, we present a dog with putative ketoconazole contact drug-triggered PF, which to the authors’ knowledge has not been previously documented. Pemphigus foliaceus represents the most common autoimmune skin disease in dogs and other animals (1,2). The autoimmune pathogenesis of canine PF is supported by the recognition of antikeratinocyte IgG autoantibodies (1,3–5). Multiple genetic, environmental, and drug-related factors have been proposed to initiate the production of antikeratinocyte autoantibodies (1).

Drug-related pemphigus in humans has been subdivided into drug-induced pemphigus and drug-triggered pemphigus (1,6). In drug-induced pemphigus, the drugs are pharmacologically linked to the development of pemphigus-like keratinocyte acantholysis, and the disease regresses following discontinuation of the drug (1,5). However, in drug-triggered pemphigus, the drug merely stimulates a predisposition to develop an autoimmune form of pemphigus, and the condition usually persists following drug discontinuation, rather than having the same course as spontaneously occurring pemphigus (1,5–7).

While drug-related PF is a well-recognized entity in humans (6), this entity is limited to sporadic putative cases in dogs (1,5,8,9). There are concerns, however, related to contact drug-triggered PF in veterinary medicine; recently there were reports of ectoparasiticide-triggered PF in dogs (1,10).

In this article, we report the clinical, microscopic, and immunological characteristics of a dog with unique dermatitis that arose after the application of 2% ketoconazole shampoo. Ketoconazole is an antifungal drug and is well-known to cause adverse reactions; hepatic and gastrointestinal side effects being the most frequently described problems (11). In humans there have been reports of itching, burning sensation and irritation in the skin, contact dermatitis, hypersensitivity, angioedema, alopecia, rash, and urticaria following use of the 2% ketoconazole shampoo. However, ketoconazole has not been proposed to be associated with the initiation of PF. We suggest that the
Figure 2. Gross skin lesions on a dog with putative contact drug-triggered pemphigus foliaceus (PF) on pre-treatment day 0 (A, B, C), post-treatment day 60 (D, E, F), and post-treatment day 270 (G, H, I) following immunosuppressive therapy are shown. On day 0, A — the dorsal and frontal aspects of the muzzle show depigmentation, erythema, erosions, and crusts. B — The nasal planum has lost its normal cobblestone surface architecture. Depigmentation, erythema, scales, and crusts are visible on the dorsal nasal planum. C — The footpads show severe peeling, fissuring, swelling, and ulcerations. Two months after starting treatment with immunosuppressive medications (D, E, F), all lesions on the muzzle and nasal planum are resolved. Note that the footpad became hyperkeratinized. After 9 mo of immunosuppression (G, H, I), the patient remained in complete remission.
adverse drug reaction (ADR) in this report might represent the first instance of ketoconazole shampoo-triggered PF to be published in veterinary medicine.

A direct causal drug — disease relationship often remained speculative in drug-related PF (1,5,8,9). Proving a cause-and-effect relationship between a drug and a disease is difficult, because it is confirmed ideally by exacerbation upon challenge. However, such suspected drug provocations are rarely performed because of ethical reasons and to avoid harm to the patient. In the present case, repeated applications of ketoconazole shampoo worsened the skin lesions, and finally the dog developed systemic signs such as hyperthermia and depression. This led the authors to suggest a drug-triggered etiology for the dog reported here.

A diagnosis of canine drug-related PF is based on history, clinical signs, and the demonstration of acantholytic keratinocytes in skin biopsy specimens (1,2). In humans with drug-related pemphigus, autoantibodies in the skin or serum have been noted in some, but not all cases (5,12–14). These antibodies recognize antigens that are identical to those in idiopathic forms of pemphigus (5,13). In the present case, the histologic features are consistent with lesions typically seen with PF (5,15,16), and IHC with antibodies against IgG identified the deposition of IgG in intercellular regions, which is a characteristic feature of PF.

Our diagnosis was based on the history, clinical signs, histopathology, and lack of resolution following discontinuation of the suspected drug. Humans with drug-related pemphigus may have been administered the suspect drug from 1 to 2 d to as long as 10 mo before onset of the disease (5,7,17); in this case, the skin lesions developed within 7 d after first application of a 2% ketoconazole shampoo. It must be noted, however, that the shampoo contains several ingredients and it cannot be ruled out that the lesions in this dog were triggered by a component other than ketoconazole.

The clinical signs in our case were similar to those previously reported, consisting of papules, pustules, crusts, and erythema, which rapidly became generalized (5,8,9). Moreover, post-inflammatory alopecia commonly develops and can be extensive, as observed in this case. Most patients with PF have lesions on the face, nasal planum, and ears (1,2). In this case, outside of the alopecic dorsal thorax, the most commonly affected body sites were the face, footpads, and nasal planum. Pemphigus foliaceus skin lesions can remain localized or can involve the entire body (1,2).

A distinct feature of this disease is the presence of footpad lesions that are visible in up to 1/3 of patients (1,18). Additionally, in our case, severe peeling, fissuring, swelling, and ulcerations were noted on the affected pads, and the lesions became hyperkeratinized. The lesions were compatible with a traditional diagnosis of “hard pad disease” (19). In addition to the dermatological signs, the patient in our case also experienced systemic signs including lethargy, pain, lameness, fever, and anorexia.

Oberkirchner et al (1) and Bizikova et al (10) reported that oral glucocorticoid therapy combined with other immunosuppressive drugs are likely needed for the successful management of canine contact drug-triggered PF. Immunosuppressive therapy was necessary in this case, and long-term maintenance was required to prevent relapse.

In this case, we provide evidence suggesting that ketoconazole shampoo-triggered pemphigus-like reactions most probably represent a unique contact drug-triggered PF, which has never been described in veterinary medicine. The case also highlights the need for clinicians to understand the mechanism of contact drug-triggered PF in order to ensure appropriate diagnosis and treatment. Furthermore, this report emphasizes that a careful topical medication history, including shampoo, is essential in the workup of cases of pemphigus.

Acknowledgment
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References

Figure 3. A — A cytology specimen from a pustule in the dog with putative contact drug-triggered pemphigus foliaceus (PF). Note the acantholytic cells with neutrophils surrounding and adhered to them (arrows) (Diff-Quik, 400×, scale bar = 20 μm). B — Histopathology of the dorsal muzzle shows floating acantholytic keratinocytes and inflammatory cells in the stratum spinosum (arrowheads). Hematoxylin and eosin staining, 400×, scale bar = 15 μm. C — Immunohistochemistry (IHC) shows that cells are immunolabeled with immunoglobulin G (IgG) in the intercellular space, which shows a “fishnet” pattern. 400×, scale bar = 15 μm.
Case Report  Rapport de cas

Retinal astrocytoma in a dog

Keiichi Kuroki, Nathan Kice, Juri Ota-Kuroki

Abstract — A miniature schnauzer dog presenting with hyphema and glaucoma of the right eye had a retinal neoplasm. Neoplastic cells stained positively for glial fibrillary acidic protein, vimentin, and S-100 and largely negatively for oligodendrocyte transcription factor 2 by immunohistochemistry. The clinical and histopathological features of canine retinal astrocytomas are discussed.

Résumé — Astrocytome rétinal chez un chien. Un chien Schnauzer miniature a été présenté avec de l’hyphéma et du glaucome dans l’œil droit et avait un néoplasme rétinal. Les cellules néoplastiques ont donné un résultat positif par immunohistochimie pour la protéine fibrillaire gliale acide, la vimentine et S-100 et les résultats étaient en grande partie négatifs pour le facteur de transcription 2 des oligodendrocytes. Les caractéristiques cliniques et histopathologiques des astrocytomes rétinaux canins sont discutés.

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Case description

A 9.5-year-old, spayed female miniature schnauzer dog was referred to the Midwest Veterinary Referral Center because of a 1-week history of increased redness and cloudiness to the right eye (OD) noted by a general veterinary practitioner. An ophthalmic examination of the right eye by a board-certified veterinary ophthalmologist (NK) revealed an absent menace response, absent dazzle reflex, absent direct pupillary light reflex, moderate episcleral injection, mild corneal edema, high intraocular pressure (60 mmHg), dense hyphema in the ventral 1/3 of the anterior chamber, and some blood clots adhered to the axial anterior lens capsule. No abnormalities were noted in the left eye (OS). The dog was otherwise healthy and no abnormalities were recognized by complete blood (cell) count, blood chemistry profile, and chest radiographs conducted by the general veterinary practitioner and a physical examination and a neurologic examination performed by one of the authors (NK). B-mode ultrasonographic examination OD using a 10 MHz probe (Acuson Sequoia 512; Siemens Healthineers, Malvern, Pennsylvania, USA) performed by one of the authors (NK) showed a mushroom-shaped, relatively homogeneously hyperechoic mass arising from the mid-dorsal chorioretinal region (Figure 1). Enucleation of the affected eye was performed and the globe was placed in 10% neutral buffered formalin and submitted for gross pathologic and histopathologic examination.

Grossly there was an approximately 5-mm sized, white to tan, solitary nodule arising from the detached dorsal retina (Figure 2). Based on the ultrasonographic and macroscopic findings, differential diagnoses included primary and secondary chorioretinal neoplastic lesions such as melanocytic tumors, gliomas, primitive neuroectodermal tumors and lymphomas, and chronic inflammatory lesions such as mycotic granulomatous inflammation.

Microscopically the specimen was characterized by an unencapsulated, well-circumscribed, highly cellular nodular mass that continued to the posterior aspect of the detached dorsal retina (Figure 3a). The mass was composed of highly cellular anaplastic spindle cells arranged in interlacing fascicles and had scattered frequent small caliber vessels and necrotic foci with pseudopalisading of tumor cells (Figure 3b). Approximately 50% of the tumor area was necrotic. Neoplastic cells had variably distinct cell borders, abundant pale eosinophilic fibrillar cytoplasm, and oval nuclei with finely stippled chromatin and 1 to 2 variably distinct nucleoli (Figure 3c). There were 8 mitoses observed in 10 high power fields. The retina contiguous to the mass showed blending of the 2 nuclear layers with vacuolar changes (Figure 3b) or atrophy with loss of ganglion cells and nuclei of the inner and outer nuclear layers. Serial sections of the paraffin-embedded specimen confirmed that the neoplasm was confined to the retina and there was no microscopic evidence of optic nerve invasion. The retina was detached from the underlying hypertrophic retinal pigmented epithelium. Other microscopic findings included hyphema, formation of a pretridal fibrovascular membrane, and peripheral anterior synechia.
The histopathologic findings of the mass were consistent with a retinal glioma.

Unstained paraffin-embedded tissue sections (5 μm) were prepared and immunohistochemical staining was carried out for further characterization of the neoplastic cells. Antibodies used were glial fibrillary acidic protein (GFAP) (Dako, Carpentaria, California, USA diluted 1:2000), a marker for glial cells; vimentin (Dako, M70311, diluted 1:200), a marker for mesenchymal cells; S-100 (Dako, Z0311, diluted 1:600), a marker for glial cells; oligodendrocyte transcription factor 2 (Olig2) (Millipore; Billerica, Massachusetts, USA. AB9610, diluted 1:750), a marker for oligodendrocytes, and melan A (Dako, M7196, diluted 1:100), a marker for melanocytes. Horseradish peroxidase-based EnVision system with AEC chromogen kit (Dako) was used to visualize the sites recognized by primary antibodies. Canine cerebrum sections (for GFAP and Olig2), intestinal sections (for vimentin) and cutaneous melanoma (for S-100 and melan A) served as positive control samples. Non-immune serum from the same species of animals as the primary antibody was used as a negative control. Neoplastic cells stained diffusely positive for GFAP, vimentin, and S-100 confirmed the diagnosis of an astrocytoma. It has been reported that astrocytomas exhibit positive immunohistochemical staining for GFAP, vimentin, and S-100 (1–3,5–9). Olig2 is a marker of oligodendrocytes and oligodendrogliomas. Studies in humans have shown that some astrocytomas stain positively for Olig2 by immunohistochemistry and hence distinction between oligodendrogliomas and astrocytomas cannot be made by Olig2 immunohistochemistry alone (10,11). Even though it is not specific for oligodendrogliomas, Olig2 immunohistochemistry can help differentiate oligodendrogliomas from other gliomas (10,11). The immunohistochemistry finding of only occasional positive nuclear staining for Olig2 in this case was suggestive of an astrocytoma. In addition, the microscopic findings of the neoplasm were not consistent with oligodendrogliomas that demonstrate a so-called “fried-egg” or “honeycomb” appearance due to distinct cell membranes, cytoplasmic clearing and round hyperchromatic nuclei (4). The distinction between oligodendrogliomas and astrocytomas can be important since it has been reported that oligodendrogliomas are more chemosensitive and have a better outcome than astrocytomas in humans (12). No large studies have been reported concerning tumor behavior in dogs with brain gliomas. Reported survival time based on case reports of canine brain astrocytomas has ranged from 3 to 8 mo with chemotherapy (3).

Primary intraocular tumors in domestic animals are uncommon; however, melanocytic tumors and iridociliary adenomas are the 2 most common types of these tumors in dogs (13,14). The distribution of choroidal melanomas can be similar to the case herein; however, melanoma was ruled out in this case based on the histomorphologic findings and negative immunostaining.

Discussion

In this case, a retinal glioma, particularly an astrocytoma, was strongly suspected by the histomorphologic findings (1–4). Positive immunohistochemistry staining for GFAP, vimentin, and S-100 confirmed the diagnosis of an astrocytoma. It has been reported that astrocytomas exhibit positive immunohistochemical staining for GFAP, vimentin, and S-100 (1–3,5–9). Olig2 is a marker of oligodendrocytes and oligodendrogliomas. Studies in humans have shown that some astrocytomas stain positively for Olig2 by immunohistochemistry and hence distinction between oligodendrogliomas and astrocytomas cannot be made by Olig2 immunohistochemistry alone (10,11). Even though it is not specific for oligodendrogliomas, Olig2 immunohistochemistry can help differentiate oligodendrogliomas from other gliomas (10,11). The immunohistochemistry finding of only occasional positive nuclear staining for Olig2 in this case was suggestive of an astrocytoma. In addition, the microscopic findings of the neoplasm were not consistent with oligodendrogliomas that demonstrate a so-called “fried-egg” or “honeycomb” appearance due to distinct cell membranes, cytoplasmic clearing and round hyperchromatic nuclei (4). The distinction between oligodendrogliomas and astrocytomas can be important since it has been reported that oligodendrogliomas are more chemosensitive and have a better outcome than astrocytomas in humans (12). No large studies have been reported concerning tumor behavior in dogs with brain gliomas. Reported survival time based on case reports of canine brain astrocytomas has ranged from 3 to 8 mo with chemotherapy (3).

Primary intraocular tumors in domestic animals are uncommon; however, melanocytic tumors and iridociliary adenomas are the 2 most common types of these tumors in dogs (13,14). The distribution of choroidal melanomas can be similar to the case herein; however, melanoma was ruled out in this case based on the histomorphologic findings and negative immunostaining.
A primitive neuroectodermal tumor was unlikely in this case as rosettes and other histologic features typical of primitive neuroectodermal tumors were not observed. In addition, GFAP positive immunoreactivity in this tumor was not consistent with primitive neuroectodermal tumors (15,16).

Gliomas are common primary tumors of the central nervous system in dogs. They arise from glial cells and can be classified into astrocytoma, oligodendroglioma, oligoastrocytoma, and ependymoma according to their cellular lineage (1). Astrocytomas are the most common glioma in dogs and histologically subclassified as low-grade astrocytoma (well-differentiated), medium-grade astrocytoma (anaplastic), and high-grade astrocytoma (glioblastoma) (1–4). Low-grade astrocytomas are composed of well-differentiated astrocytic cells without cytological atypia or mitotic activity, medium-grade astrocytomas are composed of highly cellular anaplastic astrocytic cells with mitotic activity and high-grade astrocytomas additionally have vascular proliferation and/or necrosis (1–4). In this case, histopathologic findings of cellular and nuclear pleomorphism, mitoses, vascular proliferation, and necrosis supported a diagnosis of high-grade astrocytoma (glioblastoma). In humans, necrosis is a central feature of high-grade gliomas and no histological feature is reported to be more powerful in predicting poor prognosis in human brain gliomas (17). Although the prognosis of canine brain astrocytomas based on the histopathologic classification has not been established, similar to human cases, high-grade astrocytomas most likely involve a poor prognosis in dogs (9). Naranjo et al (5) reported that necrosis was observed in all 17 canine ocular astrocytomas in their retrospective study of 18 ocular gliomas regardless of their histopathologic grade. The presence of necrosis was also noted in other canine cases of ocular astrocytomas (6,7). Unlike brain or spinal cord astrocytomas, necrosis appears to be a common pathologic change in ocular astrocytomas with limited value for the grading of histological malignancy. Naranjo et al (5) suggested that the most reliable positive prognostic indicator for canine ocular gliomas was the absence of tumor invasion of the optic nerve at surgery. In accordance with this suggestion enucleation alone was effective in this case despite the histological features suggestive of a high-grade astrocytoma. Although a thorough follow-up including chest radiographs was not performed after enucleation in this case, no clinical signs of recurrence or metastasis were evident to the owner 40 mo after the surgery.

This report presents the diagnosis of a retinal astrocytoma in a dog and provides further insights into the clinical and histopathological aspects of this rare intraocular neoplasm in dogs. Although rare, an astrocytoma should be considered as a differential diagnosis for a solitary retinal mass in dogs.

Figure 3. a – Subgrossly there is a well-circumscribed nodular mass arising from the detached dorsal retina. b – The mass is highly cellular and composed of spindle cells arranged in interlacing fascicles with frequent small caliber vessels and foci of necrosis (“N”) with pseudopalisading of tumor cells. Note that the retina (“R”) contiguous to the neoplasm was degenerate with vacuolar changes. H&E stain. Bar = 100 μm. c – Neoplastic cells have variably distinct cell borders, abundant fibrillar cytoplasm, and oval nuclei with finely stippled chromatin and 1 to 2 variably distinct nucleoli. Mitoses are observed. H&E stain. Bar = 50 μm.
Immunohistochemistry for GFAP, vimentin, S-100 and Olig2 is useful for confirming the diagnosis of an astrocytoma. Unlike brain/spinal cord astrocytomas, necrosis appears to be a common pathology finding in retinal astrocytomas regardless of their histopathologic grade. The prognosis of a retinal astrocytoma following enucleation alone appears to be good when the lesion is confined to the retina.

References

Figure 4. Neoplastic cells stain diffusely positive for GFAP (a), vimentin (b), and S-100 (c) by immunohistochemistry. Only a small number of cells’ nuclei within the tumor exhibit positive nuclear immunostaining for Olig2 (d). Bar = 100 μm.
Case Report Rapport de cas

Atlanto-axial malformation in an adult Quarter horse gelding

Robert Cole, Jennifer Taintor, Reid Hanson

Abstract — An adult gelding was evaluated for bilateral intermittent forelimb lameness of approximately 2 years duration. The horse was found to have grade 2/5 upper motor neuron-general proprioception ataxia with no cranial nerve deficits. During radiographic and gross necropsy examinations a novel atlanto-axial malformation of possible congenital etiology was found.

Malformations of the cranial cervical region are uncommon in the horse. Most reported cases can be classified as congenital occipitoaltantoaxial malformation (OAAM) of which there are 3 types: occipitalization of the atlas and atlantilization of the axis; asymmetrical OAAM; and asymmetrical atlanto-occipital fusion (1,2). This malformation most commonly occurs in the Arabian breed. Atlanto-axial abnormalities, most prominently subluxation, can occur secondary to OAAM, developmental abnormality, or malformation of the odontoid process of the axis (dens) (1,3). Malformation and fusion of the atlas and axis without luxation has also been reported in a half Arabian yearling (4).

Clinical signs of OAAM and atlanto-axial abnormalities usually develop in foals within 1 y of age, but in some horses signs were not observed until maturity (1,2,5,6). Varying degrees of ataxia have been reported, including symmetrical ataxia of all 4 limbs that may progress with age and tetraparesis (1,2,5). Cranial nerve deficits have not been reported in these cases (1,2,5). Some horses have no ataxia but are unable to move the cranial aspect of the neck. Palpable abnormalities of the atlas have also been noted in a majority of OAAM cases (1).

Diagnosis of OAAM and atlanto-axial abnormalities is generally achieved through radiographic and/or computed tomographic examination; however, diagnosis can be complicated by degenerative changes secondary to malarticulation of these joints in older foals or adults. Diagnostic imaging findings may include: symmetrical or asymmetrical fusion of the atlas to the occiput, hypoplastic dens, and distorted atlas (7). Most horses diagnosed with OAAM or atlanto-axial abnormalities are euthanized, but positive response to surgical stabilization for atlanto-axial luxation has been reported. Conservative treatment of affected horses with no neurologic deficits has also been reported (1,2).

This report describes a novel atlanto-axial malformation of suspected congenital origin in a mature Quarter horse gelding. The horse was currently in work as a ranch horse when referred for lameness examination. Clinical presentation, radiographic findings, and gross necropsy findings are described.

Case description

A 6-year-old Quarter horse gelding used for ranch work was presented for intermittent bilateral forelimb lameness of approximately 2-years’ duration that was unresponsive to rest and anti-inflammatory therapy. There was no history of trauma. Navicular disease had been previously ruled out based on examination by the referral veterinarian and lack of improvement following regional anesthesia. On physical examination, the rectal temperature was normal and no abnormalities of the cardiac or respiratory system were detected. The horse had been vaccinated against rabies, eastern equine encephalomyelitis virus, western equine encephalomyelitis virus, West Nile virus, influenza virus, and equine herpes virus type 1.

The horse was trotted in a straight line on asphalt and on lunge to the right and left, demonstrating a gait abnormality in all 4 limbs. The gait abnormality at a walk and trot in a straight line was characterized by an overreach at the end of protraction.
movement of the forelimbs and hind limbs. When the horse was turned in a tight circle in either direction abduction of the outside hind limb was observed. Walking up and down a slope exaggerated the gait abnormalities. Based on these observations, a grade 2/5 upper motor neuron-general proprioception ataxia was assigned. Decreased response was noted during placement tests of all 4 limbs. No cranial nerve deficits were observed. Cutaneous sensation was present bilaterally from the 3rd cervical vertebra to the hindquarters. Anal and perineal reflexes were present. Palpation of the neck detected symmetrical hypertrophy of the splenius capitus muscle but no pain was elicited on palpation of this area. The horse could bend its neck to the right and left but decreased motion of the cranial aspect of the neck was observed. The horse would lower its head to graze with no marked exaggeration of ataxia.

Standing lateral radiographs of the cervical spine from the base of the skull through the level of cervical vertebra 7 were obtained along with a ventrodorsal projection centered at the atlas (cervical vertebra 1) and axis (cervical vertebra 2). There was notable malformation centered at the atlas and axis (Figure 1). This included a loss of normal space between the dorsal process of the axis and the dorsal tubercle of the atlas due to ventral and cranial displacement of the axis. The dens of the axis was blunted. The cranial articular process of the axis and caudal articular fovea of the atlas were widened, resulting in an abnormal atlanto-axial articular facet. There was no evidence of fusion between the atlas and axis. The caudal articular facets of the axis as well as the cranial articular facets appeared normally developed. The cranial articulation of the atlas (atlanto-occipital junction) was normal. A widened irregular articulation between the atlas and axis was evident on the ventral dorsal projection (Figure 2). There was also curvature of the dorsal spinous process of the axis indicating an abnormal shape with the cranial aspect of the axis being positioned slightly to the right of midline. The remainder of the cervical spine was within normal limits.

Because of the poor prognosis for athletic performance in the future, the horse was euthanized.

During gross necropsy, hypertrophy of the splenius and obliquus capitis muscles was observed but no other soft tissues changes were noted. Gross examination of the spinal cord did not show any changes; however, histopathologic examination was not performed. The skull, atlas, axis, and 3rd cervical vertebrae were obtained and cleaned. The skull and the 3rd cervical vertebrae were normal. The atlas and axis were not fused but had significant malformation. Atlas malformations included: wide and flattened dorsal tubercle, lack of transverse foramen,
remodeling of the ventral tubercle, flattening and narrowing of the fovea dentis, and condyloid shaped caudal articular fovea (Figure 3). The axis malformations included: wide blunted dens, excessive remodeling of the left cranial aspect of the dorsal spinous process resulting in deviation to the right, remodeling of the cranial articular facets such that they were foveid, and narrowing of the cranial vertebral canal (Figure 4). The abnormal atlanto-axial articulation, as a result of the ventral and cranial deviation of the axis leading to the dorsal tubercle of the atlas being adjacent to the dorsal spinous process of the axis, produced a spinal canal deviation on the sagittal plane of approximately 30° and on the median plane of approximately 5°.

Discussion

Although the atlanto-axial joint showed changes consistent with OAAM, such as condyloid shaped caudal articular fovea of the atlas and enlarged cranial articular facets of the axis, the malformation does not fall into the OAAM classification as there was no fusion of the atlas to the occiput (lack of occipitilization of the atlas) and the axis dorsal spinous process was normal in size (1). Malformation of the atlanto-axis without involvement of the occiput is extremely rare in the horse as there is only one reported case in a half-Arabian yearling (4). The clinical presentation of this yearling was similar to that of the horse herein except that the horse we report was an adult and the yearling had pole deviation to the right as a result of rotation of the atlas (4). Additionally, on radiographic examination of the yearling there was also occipitoatlanto-subluxation, which was not present in this case (4). Many of the malformation features seen in this case are similar to the previously reported case, except for lack of fusion of the atlas and axis, no rotation of the atlas from midline. There were no gross changes in the surrounding soft tissue or spinal cord but histopathologic examination was not performed in the present case; the yearling had mild multifocal myelomalacia secondary to compression of the spinal cord (4).

This malformation could be congenital or due to degenerative changes secondary to trauma or infection. In this case, there was no history of previous trauma or neurologic disease and no evidence suggesting previous cervical orthopedic infection. The lack of transverse foramen of the atlas, the malformation features similar to OAAM, and the previously reported case suggest a congenital origin. Embryologic development of the atlas and axis has been studied in the dog in which the atlanto-axial joint develops from the same cervical somites (8,9). Abnormal embryologic development and ossification could have led to the observed malformations.

References

Case Report  

Surgical removal of a gastric trichophytobezoar in a foal

Guillaume B. Manneveau, Mickaël P. Robert, Caroline Tessier, Céline Bizon-Mercier

Abstract — This report describes a rare case of gastric impaction caused by a trichophytobezoar in a foal. This case highlights the difficulty in diagnosing this condition and reports surgical removal via a gastrotomy after failure of medical treatment.

Résumé — Ablation chirurgicale d’un trichophytobézoar gastrique chez un poulain. Ce rapport décrit un rare cas d’obstruction gastrique causé par un trichophytobézoar chez un poulain. Ce cas souligne la difficulté à diagnostiquer cette affection et fait rapport sur l’ablation chirurgicale lors d’une gastrotomie après l’échec du traitement médical.

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A bezoar is an intraluminal mass in the gastrointestinal system formed by the accumulation of indigestible materials. Trichobezoar (an accumulation of hair and fur) affects younger horses and weanlings mainly because of their tendency to chew the tails or manes of other horses (1). Obstructions by trichobezoars occur most commonly at transverse (2,3) and small colon (4–6) sites. Less frequently, obstructions are reported in the duodenum (7,8) but to our knowledge, never in the stomach. This report describes a rare case of a trichophytobezoar causing an impaction of the stomach and large colon in a foal. The trichophytobezoar was first managed medically, without success, and then an exploratory laparotomy was performed to successfully remove the trichophytobezoar via a gastrotomy and pelvic flexure enterotomy.

Case description

An 8-week-old 59-kg Mustang foal had a normal delivery but was rejected by his mother and kept in the owner’s living space. He was fed milk replacer with a bottle at regular intervals. During the 6 wk before an episode of colic, the foal was regularly examined at the clinic for congenital digital hyperextension of all 4 fetlocks and ulcerative dermatitis involving all 4 limbs which occurred soon after birth. The hyperextension was managed with controlled exercise and glued-on shoes with palmar/plantar extensions. The ulcerative dermatitis was treated with light bandaging and with meloxicam (Metacam; Boehringer Ingelheim, Reims, France), 0.6 mg/kg body weight (BW), PO, q24h for 4 wk and then q36h, for pain management. A bilateral congenital inguinal hernia was also present and managed with daily manual reduction.

The foal was presented as an emergency case at the ONIRIS equine clinic for acute colic with suspected strangulated inguinal hernia. On the morning of presentation the foal was exhibiting signs of abdominal discomfort after a milk meal (recumbency, rolling); the previous evening he had refused to drink his milk.

On admission, the foal was dull and displayed mild colic signs. The heart and respiratory rates were 80 beats/min and 24 breaths/min, respectively. The mucous membranes were pink with a capillary refill time of < 2 s, rectal temperature was 38.5°C. No abdominal distension was noticed but abdominal borborygmi were decreased in all quadrants. Right and left inguinal hernias were present but reducible and not painful. Blood analysis revealed moderate anemia: red blood cell count, hemoglobin, and packed cell volume were 7.3 × 10⁶/mL [reference range (RR): 9.2 to 12 × 10⁶/mL], 86 g/L (RR: 117 to 153 g/L), and 26% (RR: 32% to 42%), respectively. Blood lactate was low (1.6 mmol/L, RR: < 2 mmol/L). Other biochemistry parameters were within normal ranges except for alkaline phosphatase (2146 U/L, RR: 201 to 747 U/L).

No abnormality was detected on abdominal ultrasound examination. Intestinal loops were present in the right and left scrotum but motility was preserved and there was no thickening of the intestinal wall. The stomach did not appear to be distended as the caudal wall was located at the 11th intercostal space. However, the stomach had a rounded shape and was filled with gas.

Because of long-term meloxicam (Metacam) administration, gastric ulcers were suspected and a gastroscopy was performed after sedation and analgesia with butorphanol (Dolorex; MSD Santé Animale, Beaucouzé, France), 0.04 mg/kg BW, IV, and diazepam (Diazepam TVM; Laboratoire TVM, Lempdes, France), 0.1 mg/kg BW, IV. A large accumulation of predominantly hair-like fibers and a small amount of plant fibers were...
found obstructing the pylorus and occupying all the glandular portion of the stomach (Figure 1). Concurrent gastric ulcers (grade 2) were present on the stratified squamous mucosa. After questioning the owner regarding the hair-like fibers seen in the stomach, she reported that the foal would frequently lick and chew the hair of the house dog. A diagnosis of trichophytobezoar was made.

An initial attempt at separating the trichophytobezoar into smaller fragments with a 2.3-mm diameter oval-cup gastroscopic biopsy forceps was unsuccessful because of the hardness of the mass and small jaws of the forceps. Lavage with 20 L of warm water was performed via nasogastric intubation but no fragments of the trichophytobezoar could be retrieved. Eventually, 3 L of water with 330 mL of carbonated cola soft drink were left in the stomach in order to help dissolve the trichophytobezoar. Two hours later, the foal had moderate signs of discomfort with frequent rolling attempts. Abdominal ultrasonography revealed the presence of distended and nonmotile small intestinal loops cranially with a liquid content. A decrease in the size of the trichophytobezoar was observed on gastroscopy and it was suspected that the trichophytobezoar was partially passing into the intestine with water previously left in the stomach in order to help dissolve the trichophytobezoar.

Two hours later, the foal had moderate signs of discomfort with frequent rolling attempts. Abdominal ultrasonography revealed the presence of distended and nonmotile small intestinal loops cranially with a liquid content. A decrease in the size of the trichophytobezoar was observed on gastroscopy and it was suspected that the trichophytobezoar was partially passing into the intestine with water previously left in the stomach. A surgical option was discussed with the owner but declined at that time.

Xylazine (Rompun 2%; Bayer Healthcare, Puteaux, France), 0.35 mg/kg BW, and metamizole (Calmaine; Laboratoire Vétoquinol S.A., Lure, France), 18.5 mg/kg BW, were given IV and the foal was walked regularly. However, 3 h later, colic signs recurred with increased severity. Ultrasonography revealed no improvement of intestinal distension and motility. The owner elected to have the gastric trichophytobezoar surgically removed to treat probable intestinal obstruction.

Cefiofur (Excenel; Zoetis, Paris, France), 2.2 mg/kg BW, and flunixin meglumine (Meflosyl; Zoetis), 1.1 mg/kg BW, were administered, IV. Following premedication with butorphanol (Dolorem), 0.04 mg/kg BW, IV, and diazepam (Diazepam TVM), 0.2 mg/kg BW, IV, general anesthesia was induced with ketamine (Ahasketin; Dechra veterinary products SAS, Montigny-le-bretonneux, France), 2.5 mg/kg BW, IV, and maintained with isoflurane (IsoFlo; Zoetis). Lactated Ringer’s solution, 10 mL/kg BW per hour, IV, was also administered. The foal was placed in dorsal recumbency and the abdomen was prepared for exploratory celiotomy. A ventral midline incision was made from the umbilicus and extending approximately 20 cm cranially. Upon exploration, a left dorsal colon impaction by an 8-cm long intraluminal mass 15 cm distal to the pelvic flexure was diagnosed fully occluding the lumen, causing marked fluid distension of the ventral colon and left dorsal colon up to the mass. A pelvic flexure enterotomy for colon evacuation was performed. Large amounts of hair and some plant fibers (grass and hay) were removed. Closure was done in 2 layers (full thickness closure in a simple continuous pattern followed by a seromuscular Cushing pattern) with 2-0 polyglactin 910. Abdominal exploration revealed no abnormality of the small intestine and small colon but the gastric obstruction was still present on palpation. Therefore it was decided to exteriorize the greater curvature of the stomach after having extended the abdominal incision cranially, up to 5 cm caudal to the xiphoid process. Soaked laparotomy sponges were packed around the stomach to avoid abdominal contamination. Two stay sutures were placed in the seromuscular layer to maintain the stomach incision above the abdominal incision. A 6-cm long full thickness stab incision with a #24 scalpel blade was made between the 2 sutures, parallel and caudal to the attachment of the omentum on the greater curvature, taking care to avoid the short gastric vessels. Upon opening the gastric wall, the trichophytobezoar was visualized occupying a large part of the stomach and obstructing the pylorus. A large amount of hair agglomerated with plant fibers, as well as plastic pieces and sand were gently removed with Allis and sponge forceps (Figures 2, 3). The stomach was lavaged with warm Lactated Ringer’s solution. Aspiration was used to prevent leakage from the stomach content into the abdominal cavity, resulting in limited contamination. Finally, closure of the
Gastrotomy was performed in a 2-layer fashion (full-thickness simple continuous pattern then seromuscular Cushing pattern with 2-0 polyglactin 910). The abdominal cavity was lavaged with 3 L of warm Lactated Ringer’s solution. The abdominal wall was closed in a simple continuous pattern using number 2 polyglactin 910. A modified subcuticular pattern with 2-0 polyglecaprone 25 completed the closure (9).

The foal was also castrated via a routine inguinal approach to resolve the bilateral congenital inguinal hernia; the remaining vaginal parietal tunic and the superficial inguinal rings were closed on both sides with simple continuous suture pattern (1 polyglactin 910). The subcutaneous tissue and skin were closed in a simple continuous suture pattern (2-0 polyglecaprone 25). The laparotomy incision was covered with an iodine-imregnated drape (Ioban 2; 3M Health Care, St. Paul, Minnesota, USA). The foal recovered uneventfully from anesthesia and an abdominal bandage was applied after he stood up. Lactated Ringer’s solution, 2 mL/kg BW per hour, IV, was administered for 1 d; Ceftiofur (Excenel), 2.2 mg/kg BW, was given IV q12h for 7 d; and flunixin meglumine (Meflosyl), 1.1 mg/kg BW, IV, was given q12h for 2 d then q24h for 1 d. Firocoxib (Equioxx; Mérial SAS, Villeurbanne, France), 0.1 mg/kg BW, PO, q24h was given for 2 d, but due to a poor analgesic response this treatment was discontinued and replaced by flunixin meglumine (Finadyne pâte; MSD Santé Animale), 1 mg/kg BW, PO, q24h for 2 d followed by 0.5 mg/kg BW, PO for 2 d.

Sucralfate (Kéal; EG lab, Boulogne-Billancourt, France), 30 mg/kg BW, PO, q6h, and omeprazole (Pepitrec; Audevard, Clichy, France), 4 mg/kg BW, PO, q24h, were administered for 8 d and 5 d, respectively for treatment of the gastric ulcers.

The abdominal bandage was changed once, 3 d after surgery and no abnormalities were noted.

Following surgery, the foal’s appetite was good. Milk feeding was resumed the evening of surgery and the foal accepted only 250 mL of milk replacer every 2 h. The quantity of milk replacer was progressively increased up to 750 to 1000 mL every 2 h by the 3rd day after surgery. The meals were given every 2 h to avoid overdistension of the stomach in the post-operative period.

Signs of mild discomfort were noticed occasionally when the foal tried to lie down or stand. Discomfort was exacerbated when flunixin meglumine was stopped and firocoxib was started. The signs of discomfort disappeared when flunixin meglumine was reintroduced and no recurrence was observed.

Feces were passed the day after surgery. An episode of diarrhea was observed 3 days after surgery but was self-limiting within 3 d. Probiotics and activated charcoal were administered during this period.

The foal was discharged 8 d after the surgery with sucralfate (Kéal) to be administered 3 times a day for 8 d. Stall rest was advised until the first follow-up examination (2 wk after discharge). Hay and grass were recommended to be progressively re-introduced into the foal’s diet after discharge. Housing in the owner’s house was strongly discouraged because of potential future behavioural issues and foal welfare.

The foal was rechecked 14 d after surgery. He had gained 4.5 kg in weight and was bright and alert. No abnormality was observed at the clinical examination. Gastroscopy revealed no ulcers and the gastrotomy scar was not visible. Examination of the laparotomy incision revealed suppuration, mild pain on palpation, subcutaneous edema, and granulation tissue with sinus tracts on the ventral midline and slightly abaxially (left side). Ultrasonography revealed subcutaneous thickening due to edema and a sinus tract on the ventral midline and laterally at the location of intradermal suture bites. No fluid accumulation was observed. Local disinfection of the sinus tract was advised for 10 min twice a day: chlorhexidine scrub (0.05%) rinsed with 70% isopropyl alcohol for 5 min and then the same procedure with chlorhexidine solution (0.05%) for 5 more min. During disinfection, compressing of the abdominal wall around the sinus tract was advised in order to promote drainage of fluid from the sinus tract. The procedure was repeated by the owner for approximately 10 d. A bacteriological swab of the sinus tracts was proposed but declined by the owner due to financial constraints.

The second follow-up examination was carried out 40 d after surgery and revealed an improvement of the laparotomy wound infection. There were no sinus tracts or suppuration but there was granulation tissue causing mild persistent edema. No fluid accumulation was observed during ultrasonography. Box rest for a further month was advised before returning to pasture with other horses.
Discussion

Trichobezoars affect young horses and weanlings mainly because of their tendency to chew the tails or manes of others horses (1). In our case, the foal lived in the owner's house and we later learned that the foal frequently licked and chewed the hair of the house dog. Given that no specific sign was observed, in particular, no gastric abnormality on ultrasonography, the diagnosis might have been delayed if gastrointestinal examination had not been performed. Moderate anemia and mild hyperthermia were noticed and could be attributed to inflammation caused by ulcerative dermatitis occurring soon after birth. Trichobezoars have been reported to cause nonspecific clinical signs in calves (decreased fecal output, inappetence, abdominal distension and signs of abdominal pain) (10,11). In cats, trichobezoars are commonly located in the stomach but are usually diagnosed by radiography (12), but in our case a foreign body was not suspected before endoscopy so radiography was not performed. In humans, due to nonspecific clinical signs (vomiting, weight loss, chronic abdominal pain) and the inconsistent presence of alopecia, this disease is also commonly not recognized initially, which may lead to a delayed diagnosis and severe complications (13). A frequent complication in humans, occurring in 11 of 108 cases (13), is stomach or intestinal perforation. The abrasive effect of the mass and its size (that could alter the mucosal blood supply) could cause ulceration and subsequent perforation. It is difficult to know if the ulcers in our foal were caused by the abrasive effect of the bezoar or long-term NSAID administration, or both.

It is likely that the obstruction was only partial, allowing for some outflow of liquid and gas from the stomach. This would account for the absence of gastric distension on ultrasonographic examination. The reduction of outflow from the stomach to the small intestine and the abrasive effect of the bezoar could explain the mild colic at admission after a milk meal. Also, the fact that the large colon was fully obstructed by another trichophytobezoar and subsequently distended might have played a role in colic signs worsening after medical management.

To our knowledge, there are no reports of a gastric trichophytobezoar causing obstruction in a foal. Obstructions by trichobezoars are reported to occur most commonly at transverse (2,3) and small colon (4–6) sites. Less frequently, some obstructions are reported in the duodenum (7,8). However, human trichobezoars are usually located in the stomach of young females with psychiatric disorders: trichotillomania and trichophagia (13,14). In calves, luminal obstruction by a trichobezoar most commonly occurs in the abomasum and small intestine (10,11). In cats, trichobezoars are commonly located in the stomach but are usually eliminated by vomiting without causing obstruction (12).

We don’t know why the bezoar was located in the stomach, but the use of long-term NSAIDs could have resulted in modified gastric motility and subsequent accumulation of hair in the stomach leading to obstruction (15). In cats, gastric trichobezoars appear linked to factors which may contribute to decreased gastric motility, such as gastritis (12).

Due to financial constraints, medical management was attempted at first. In humans, however, medical treatment of trichobezoar has been ineffective (16,17). Endoscopic removal was successful in only 2 of 40 human cases (13) and some parts could migrate after fragmentation causing intestinal obstruction distally (18). Among 15 calves, 6 that were treated medically (orally administered mineral oil, dioctyl sodium sulfosuccinate, detergent, and transfuision) died or were euthanized (10). In cats, migration of the trichobezoar to the intestine from the stomach could cause partial or complete obstruction and the use of a petroleum-based laxative has been suspected to cause migration of the gastric trichobezoar in the intestine leading to distal obstructions (12). The use of carbonated cola soft drink was reported to be efficient in the case of phytobezoar causing impaction in horses (19,20) and humans (21). In contrast to plant fiber impactions, hair strands, which were the major component of the bezoar in our case, could not be disrupted with this method. Furthermore, successful treatment was reported with a large volume of carbonated cola soft drink: 20 to 24 L/d for an adult horse (19) and only 330 mL was used in our 60-kg foal in order to not worsen gastric ulcers. The initial medical management herein was unsuccessful and may have worsened the situation because the trichobezoar in the colon might have resulted from fragmentation of the larger gastric bezoar with use of gastrointestinal forces. Moreover, the presence of distended small intestinal loops on ultrasound examination after fragmentation attempts seems to favor the fragment migration hypothesis more than another independent trichophytobezoar.

Surgical intervention appears to be the best method to manage a trichobezoar. The success rate was 100% in a case study of 100 human patients who underwent laparotomy for the removal of a gastric or gastrointestinal trichobezoar (13). In a series of 15 calves, trichobezoars were diagnosed and treated by enterotomy in 9 calves, 7 of which survived (10). In cats, intestinal obstructions caused by trichobezoars are usually removed by enterotomy (12). Gastric massage following laparotomy was reported to result in the successful fragmentation of persimmon phytobezoars in horses (19). However, fragmentation can result in obstruction distally and could be inefficient in removing gastric impaction necessitating a second surgery (19). In our case, the mass in the stomach was very firm and fragmentation of this bezoar seemed to be impossible by external massage of the stomach with an infusion of fluid because most of the bezoar was composed of hair-like fibers that could not be dissolved. Gastrotomy is more easily performed in foals (22) than in adults (14) due to better surgical access. In our foal, there were no complications during or after the procedure. On follow-up examination 14 d after surgery, no scar on the gastric mucosa could be found upon gastrointestinal examination. Nevertheless, if only medical management is to be attempted, longer and serrated biopsy forceps should be more efficient in removing the fragments of the bezoar in the stomach. Stomach lavage seems to be ineffective in the case of firm and non-dissolvable trichobezoars.

The surgical site infection could be attributed to possible contamination during the gastrotomy despite the preventive measures taken.

This report describes the management of a rare type of gastric impaction due to a trichophytobezoar in a foal with
pica behavior. The obstruction was removed *via* a gastrotomy and the foal made a complete recovery. The present report also emphasizes the usefulness of gastroscopy in colic patients in which the diagnosis is unclear. Medical management of a gastric trichophytobezoar in this foal was unsuccessful and first intention surgical management should be considered in future cases.

References

Case Report  Rapport de cas

Intramuscular mast cell tumors in 7 dogs
William P. Robinson, James Elliott, Stephen J. Baines, Laura Owen, Chris J. Shales

Abstract — Mast cell tumors (MCTs) are commonly encountered in dogs and have been reported in cutaneous, conjunctival, oral mucosal, and gastrointestinal locations, but not in an intramuscular location. Medical records at 2 referral centers in the UK were examined to find cases of MCTs in this location. Seven dogs were identified as having an intramuscular MCT by a combination of fine-needle aspirate cytology and computed tomography or ultrasound. None of the dogs had evidence of local lymph node metastasis. Six dogs had no evidence of distant metastasis and surgery was carried out as the primary treatment option. Three of those dogs also had adjunctive chemotherapy due to a high Ki67 value or high mitotic index. All 6 dogs that had had surgery were alive at follow-up with a minimum elapsed time of 7 months. One dog had a course of chemotherapy due to the location, size, and evidence of biological activity of the tumor and died 23 days afterwards. The prognosis of intramuscular mast cell tumors appears to be favorable in most cases.

Résumé — Tumeurs à mastocytes intramusculaires chez sept chiens. Les tumeurs à mastocytes (MCT) sont couramment observées chez les chiens et elles sont signalées à des emplacements cutanés, conjonctivaux, gastro-intestinaux et dans les muqueuses orales, mais non dans des régions intramusculaires. Les dossiers médicaux de deux centres spécialisés du Royaume-Uni ont été examinés afin de trouver des cas de MCT à cet endroit. Sept chiens ont été identifiés comme ayant un MCT intramusculaire en utilisant une combinaison de cytologie par aspiration à l'aiguille fine et de tomodensitométrie ou d'échographie. Aucun des chiens ne présentait des signes de métastasé des ganglions lymphatiques locaux. Six chiens ne manifestaient aucun signe de métastase distante et la chirurgie a été réalisée comme option de traitement primaire. Trois de ces chiens ont aussi subi une chimiothérapie d’appoint en raison d’une valeur élevée de Ki67 ou d’un indice mitotique élevé. Les six chiens qui avaient subi la chirurgie étaient vivants au suivi avec un délai écouté de 7 mois. Un chien a subi un traitement de chimiothérapie en raison de l’emplacement, de la taille et de signes d’activité biologique de la tumeur et est mort 23 jours plus tard. Le pronostic de tumeurs à mastocytes intramusculaires semble être favorable dans la plupart des cas.

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Mast cell tumors (MCTs) are commonly encountered in dogs and in the UK are the second most common canine malignancy encountered after soft tissue sarcomas (1). They constitute 16% to 21% of all cutaneous tumors and represent the most common canine skin tumor (2). Considerable work has been done investigating the dermal form of MCTs (3–9). Mast cell tumors have been reported in numerous other locations including the conjunctiva (10), oral mucosa (11), subcutaneous tissue (12,13), gastrointestinal tract, spleen, and liver (14,15). Marked variability exists in the prognosis for different anatomical locations and makes extrapolation of information between these locations difficult (6,11).

Cutaneous MCTs are generally graded histologically using the Patnaik system (3) which splits MCTs into 3 grades and guides prognosis and choice of treatment options. Grade I MCTs are well-differentiated lesions which are typically cured by complete surgical excision alone. Conversely, grade III MCTs are highly malignant and poorly differentiated with a high metastatic rate and poor long-term outcome. Most grade II tumors are also cured by complete surgical excision; however, a proportion can exhibit more aggressive behavior and biological behavior can be more difficult to predict. A new 2-tier grading system has also been described by Kiupel (9) which appears to predict the behavior of MCTs more accurately by not using an
intermediate grade. One limitation is that these grading systems have only been validated in cutaneous MCTs.

Surgery is typically the treatment of choice for the primary tumor, with adjunctive local radiation being considered if complete excision cannot be achieved (16,17). Chemotherapy and tyrosine kinase inhibitors are also used as appropriate depending on resectability, grade, and the presence of metastatic disease (18–20).

To the authors’ knowledge, intramuscular mast cell tumors have not been reported and this case series aims to present the clinical, pathologic, and outcome features from 7 canine patients with intramuscular MCTs.

**Case descriptions**

Seven dogs were presented to either Willows Veterinary Centre, Solihull or the Queens Veterinary School Hospital, Cambridge between June 2012 and February 2015. They included 3 Labrador retrievers, 2 crossbreeds, 1 Scottish terrier, and 1 lhasa apso. Four dogs were female and 3 were male. All animals were neutered except 1 of the female Labrador retrievers. Median age at presentation was 6 y (range: 4 y 9 mo to 19 y 8 mo). Median patient weight was 23 kg (range: 7.4 kg to 47.6 kg).

All 7 dogs were presented with a history of a palpable mass which was confirmed as a MCT via fine-needle aspiration (FNA) cytology. Three of the MCTs were located within the sternoccephalicus, 2 within the latissimus dorsi, 1 within the intercostal muscle group, and 1 within the semimembranosus/semitendinosus muscles. They ranged in diameter from 12 to 36 mm. All patients had further imaging performed before surgery for staging purposes. Four dogs had contrast computed tomography (CT) of the mass and thorax and 3 dogs had an ultrasound scan of the mass and abdominal organs. Computed tomography of 4 dogs revealed no evidence of pulmonary metastases or thoracic lymph node enlargement. The 3 dogs that had ultrasound had no thoracic imaging performed. Two animals with palpably enlarged local lymph nodes had an FNA which showed no evidence of metastasis on cytology. The remaining patients did not have lymph node aspirates taken as they were not palpably enlarged or enlarged on imaging. Of the 3 dogs that had abdominal ultrasound, 1 had evidence of lymphadenopathy of the right external iliac lymph node and 6 hypoechoic nodules were noted throughout the liver, all of which were < 10 mm in diameter (Case 3). The other 2 dogs had no significant ultrasonographic findings. All the MCTs were graded using the cutaneous Patnaik grading system (3) as Grade II or an intermediate grade, apart from 1 dog in which histopathology was not performed (Case 3). This grading system has not been validated for intramuscular MCT’s. One dog had a Ki67 value evaluated and 2 dogs had KIT staining performed. Case 2 had a Ki67 value of 2.32% and also demonstrated pattern 2 on KIT staining and another dog (Case 6) demonstrated pattern 1 on KIT staining.

Six dogs had wide local excision of masses with the lateral margins of 2 to 3 cm and a deep margin of 1 fascial plane. In 3 cases this included the entire muscle belly as a compartmental resection. The dog in Case 3, which did not undergo surgery and for which only a cytological diagnosis was available, was managed with a chemotherapy regime of vinblastine (Hospira, Maidenhead, UK), lomustine (Medac, Wedel, Germany), and prednisolone (Dechema; Hadnall, Shrewsbury, UK) according to the protocol described by Rassnick et al (21). Of the 3 dogs which had surgery had adjunctive chemotherapy, either due to a high mitotic index (MI) (> 5 per 10 high power field (hpf)) or a high Ki67 labelling index (> 1.8%) (22,23). Two dogs were prescribed prednisolone (Decha) and vinblastine (Hospira) using the protocol described by Thamm et al (18) (Cases 1 and 2) and the 3rd (Case 5) was prescribed prednisolone (Decha), vinblastine (Hospira) and chlorambucil (Aspen Holdings; Swindon, Wiltshire, UK). This was administered following a protocol of vinblasitne (Hospira), 2 mg/m², IV, once a week for 4 wk then every other week, chlorambucil (Aspen Holdings), 3 mg/m², PO, every other day, and tapering doses of prednisolone (Decha), 1 mg/kg body weight (BW), PO daily reducing to 0.2 mg/kg PO daily over 6 wk. This protocol was discontinued after 3 mo due to pancreatitis. All dogs except the dog in Case 3 were alive at time of follow-up (between 7 and 22 mo) with no detectable disease on physical examination. No diagnostic imaging was conducted at the time of follow-up in any of the cases. The dog in Case 3 died acutely with no confirmed cause, but gastrointestinal perforation was suspected. The mass in that case had shown good clinical response to the chemotherapy and had markedly reduced in size. Information on the patient’s clinical data, staging procedures performed, potential prognostic factors, treatment, and outcome is summarized in Table 1.

**Discussion**

In the patients reported in this study, intramuscular MCTs appeared to behave in a biologically low grade manner and had a good prognosis when treated with surgery and, where appropriate, adjunctive chemotherapy. All but 1 dog survived until follow-up with no signs of local recurrence or nodal/distant metastasis. The dog that died was suspected to have died from paraneoplastic effects of the tumor rather than progressive local or distant MCT.

When compared with the findings of other studies investigating subcutaneous MCT’s (12,13), dogs with intramuscular MCT’s appear to behave in a similar way with 6 out of 7 dogs (86%) alive at follow-up. None of the dogs had evidence of local recurrence or distant metastasis at follow-up. Surgery appeared to be curative for the majority of intramuscular MCT’s as is described with subcutaneous MCT’s. A study with a larger cohort and longer follow-up time would be needed to allow statistical analysis and therefore effective comparison with the current literature, which is precluded by the low number of dogs in the current study.

In all cases in which histopathology was available, the masses were graded using the Patnaik grading scheme (3), although this has only been validated for cutaneous MCTs. Therefore, this was of limited value in predicting biological behavior and metastatic potential of intramuscular MCTs in the present study. A grade II designation was given in all cases that were graded. In cutaneous MCTs, predicting prognosis of those that are grade II is still difficult due to the variation in biological behavior (4,22).
Table 1. Clinical data, staging procedures, potential prognostic factors, treatment, and outcome for 7 dogs with intramuscular mast cell tumors

<table>
<thead>
<tr>
<th>Case</th>
<th>Breed</th>
<th>Age (y)</th>
<th>Gender/Neutered status</th>
<th>Weight (kg)</th>
<th>Muscle involved</th>
<th>Imaging modality for primary tumor</th>
<th>LN sampled</th>
<th>Mitotic index (per 10 hpf)</th>
<th>Patnaik grade</th>
<th>KI67</th>
<th>c-Kit</th>
<th>Local therapy</th>
<th>Adjunctive treatment</th>
<th>Disease-free interval (mo)</th>
<th>Alive at follow-up</th>
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<tr>
<td>1</td>
<td>Scottish terrier</td>
<td>6</td>
<td>FN</td>
<td>17.5</td>
<td>Right latissimus dorsi</td>
<td>CT</td>
<td>Yes</td>
<td>9</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
<td>Surgical excision with 3 cm lateral margins</td>
<td>Vinblastine/prednisolone</td>
<td>7</td>
<td>Yes</td>
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<tr>
<td>2</td>
<td>Lhasa apso</td>
<td>10</td>
<td>FN</td>
<td>7.4</td>
<td>Left latissimus dorsi</td>
<td>CT</td>
<td>Yes</td>
<td>2</td>
<td>2</td>
<td>2.32%</td>
<td>KIT pattern 2 on IHC</td>
<td>Surgical excision with 3 cm lateral margins</td>
<td>Vinblastine/prednisolone</td>
<td>19</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Crossbreed</td>
<td>10</td>
<td>MN</td>
<td>15.4</td>
<td>Semimembranosus/sartorius</td>
<td>US</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
<td>Vinblastine/lomustine/prednisolone</td>
<td>NA</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
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<td>4</td>
<td>MN</td>
<td>39</td>
<td>Sternocephalicus muscle</td>
<td>CT</td>
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<td>1</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
<td>Surgical excision with 2 cm lateral margins</td>
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<td>US</td>
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<td>6</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
<td>Compartmental excision of muscle</td>
<td>Vinblastine/chlorambucil/prednisolone</td>
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<td>7</td>
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<td>6</td>
<td>FE</td>
<td>23</td>
<td>Intercostal muscles</td>
<td>CT</td>
<td>No</td>
<td>3</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
<td>Thoracic wall resection</td>
<td>NA</td>
<td>18</td>
<td>Yes</td>
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</table>

FN — female/neutered; MN — male/neutered; FE — female/intact; CT — computed tomography; US — ultrasound; c-Kit — c-kit tumor marker; KI67 — Ki-67 antigen test; IHC — immunohistochemistry; NA — not available or not applicable; hpf — high power field.
Prognostication has, in part, been improved by the acknowledgment of mitotic index (MI) and Ki67 as prognostic indicators, but these are imperfect. This is related to varying opinion as to which cutoffs should be used for these indicators and which are statistically significant as predictors of death (22–24). Three dogs had adjunctive systemic therapy following surgical resection and this was based on extrapolation from MCTs at other sites, namely the published utility of MI and Ki67 in both cutaneous and subcutaneous MCTs (12,22,23) as negative prognostic factors. It was therefore deemed reasonable to assume that these factors could be predictive of a negative outcome for intramuscular MCTs and was the rationale for recommending adjunctive systemic chemotherapy in these cases.

It is of interest that despite the presence of negative prognostic indicators in 3 of the cases (high Ki67 value, high mitotic index), survival time was prolonged, showing that an adverse outcome was not inevitable in these cases. It is unknown whether Ki67 or mitotic index are indeed negative prognostic factors in intramuscular MCTs and this requires further study with a larger cohort. Adjunctive chemotherapy has been shown to improve the outcome of high-risk cutaneous MCTs compared to surgery alone (18,19) and it is possible that the adjunctive therapy received by these patients resulted in a good outcome.

Computed tomography was deemed useful for patient assessment in some of the cases due to its ability to determine the exact location and dimensions of the intramuscular tumors. This may be important in this subtype of MCT compared to the more common, cutaneous types as the latter are more amenable to manual surgical planning due to their more superficial location. Computed tomography also allows for the assessment of the presence of metastatic disease (25).

Regional lymph nodes were aspirated for cytological analysis when any lymphadenopathy was detected. In some cases, regional lymph nodes were not assessed cytologically/histologically at initial staging either because the lymph node(s) draining the tumor was unknown due to the primary tumor location or because imaging studies revealed no evidence of regional lymphadenopathy. In the latter situation it would have also been very difficult to non-invasively assess the regional lymph nodes, particularly if they had an intra-thoracic or intra-abdominal location. Metastatic nodal disease may, therefore, have been underestimated in the current study, but the survival times would suggest that this did not affect outcome. However, the authors would advocate routine sampling of regional lymph nodes when possible (26).

Thoracic imaging as part of initial staging was not consistently performed which was due to differences in clinician approaches and preferences. While this may have resulted in the underestimation of metastatic disease, pulmonary metastasis is extremely rare (20,26) and the outcome of the patients does not support missing distant metastasis. It is possible, however, that intra-thoracic lymphadenopathy may be underestimated by omission of thoracic imaging. Given that regional nodes are usually the initial site of metastasis in canine MCTs, thoracic imaging should be considered in canine MCT cases particularly where the regional draining lymph node(s) may be within the thoracic cavity.

The margins for surgery were extrapolated from those recommended for cutaneous MCTs (16,17) and all 6 dogs that underwent surgery were determined to have complete margins. Some of these margins, especially the deeper ones in cases 5, 6, and 7, were very close (< 1 mm) but were still likely to have benefitted from excision within a compartment (compartmental resection) or with a fascial plane as an acceptable deep margin. Despite the observation of close margins in some cases, there was no recurrence of any of the masses seen in the follow-up period. Radiotherapy was not employed as an adjunctive therapy given the histological completeness of excision in all cases in which surgery was performed.

Case 3 was the only case to be managed following diagnosis with FNA biopsy alone. Surgery was not conducted due to the size and location of the mass within the hamstring muscles as well as the marked swelling and inflammation around the mass indicating significant biological activity. It was deemed that even cytoreductive surgery would have resulted in significant morbidity and lack of limb function due to the size and ill-defined nature of the tumor. While the dog died acutely 3 wk after starting chemotherapy and no etiology was confirmed, there was clinical suspicion of gastrointestinal perforation due either to chemotherapy, paraneoplastic hyperhistaminemia due to mast cell disease, or a combination of thereof. The patient was heavily pre-treated with omeprazole before and during chemotherapy to reduce the risk of GI ulceration, which is a known risk in the therapy of patients with MCT (20,27).

This case series, as with any retrospective study, was subject to the completeness and accuracy of medical notes recorded over several years. The number of dogs herein was small and, except for 2 cases, each was managed by a different clinician introducing inter-clinician variability with regard to decision-making and case management.

Intramuscular MCTs seem to appear histologically similar to grade II (Patnaik) cutaneous MCTs from a pathologist’s perspective. The prognostic relevance of additional analysis including Ki67 and mitotic index is still unclear and thus their utility in deciding on the need for adjunctive therapy requires further study. A good prognosis and long-term survival appears to be possible with appropriate surgical excision (+/− adjunctive chemotherapy) of intramuscular MCTs, although additional case numbers are required to further support these conclusions.

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References


Post-operative *Salmonella* surgical site infection in a dog

Marc Kent, Lindsay Boozer, Eric N. Glass, Susan Sanchez, Simon R. Platt, Lisa M. Freeman

**Abstract** — Following decompressive surgery for degenerative lumbosacral stenosis, a 6-year-old German shepherd dog developed a subcutaneous infection at the surgical site and discospondylitis at the lumbosacral intervertebral disc. *Salmonella enterica* subsp. *enterica*, serotype Dublin was recovered from the surgical site. *Salmonella* of a different serovar was isolated from a sample of the raw meat-based diet that the owner fed the dog.


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A 6-year-old, 35-kg, intact male German shepherd dog was evaluated at the University of Georgia, College of Veterinary Medicine Veterinary Teaching Hospital for a right pelvic limb lameness of approximately 8-months’ duration. Before onset of the chronic lameness, the dog was reported to be very active, working intensively several times a week in Schutzhund training exercises. Initially, the dog was treated conservatively for the lameness with meloxicam (Metacam; Boehringer Ingelheim Vetmedica, St. Joseph, Missouri, USA), 0.1 mg/kg body weight (BW), PO, as needed, and exercise restriction.

At the time of presentation to the veterinary teaching hospital, the dog had a body condition score (BCS) of 5/9 and a normal muscle condition score (MCS). The medical record indicated that the dog was being fed an “agility formula diet, multivitamins, and omega-3 supplements.” The neurological examination revealed a postural reaction deficit, normal patellar tendon reflex, and a reduced withdrawal reflex in the right pelvic limb. The dog was not in pain upon palpation over the lumbosacral vertebral articulation or with manipulation of the pelvic limbs or tail. No other abnormalities were identified on physical examination. Based on these neurological deficits, the anatomic diagnosis was consistent with a lesion involving the right L6 to S1 spinal cord segments, spinal nerve roots, spinal nerves, or sciatic nerve. Differential diagnoses included degenerative lumbosacral stenosis, intervertebral disc (IVD) disease, neoplasia, inflammatory (infectious and noninfectious) meningo(myelitis, trauma, or discospondylitis.

Results of a complete blood (cell) count (CBC), serum chemistry profile, urinalysis, and 3-view thoracic radiographs were all normal. Magnetic resonance imaging (MRI) (GE 3.0T Signa HDx; GE Healthcare, Milwaukee, Wisconsin, USA) of the lumbosacral vertebral column was conducted under general anesthesia. The MRI identified protrusion of the lumbosacral (L7-S1) IVD resulting in compression of the cauda equina. Also, there was compression of the cauda equina from the articular processes and yellow ligament. On T2-weighted images, there was a reduction in the signal intensity of the epidural fat in the vertebral canal and of the nucleus pulposus at the lumbosacral IVD (Figure 1). Following intravenous administration of gadolinium-based contrast medium (Magnevist; Bayer Healthcare Pharmaceuticals, Wayne, New Jersey, USA), abnormal contrast enhancement was not observed. The MRI findings were consistent with degenerative lumbosacral stenosis (1).

After discussion of the MRI findings with the owner, the dog underwent a dorsal laminectomy at the lumbosacral articulation and partial discectomy of the L7-S1 IVD. Aseptic technique was maintained throughout the surgical procedure. Briefly, the hair...
was clipped over the surgical site and the skin was aseptically prepared using alcohol and chlorhexidine gluconate. Standard draping using 4 towels placed around the surgical area followed by an overlying water-impenetrable disposable paper drape was used. An iodophor-impregnated adhesive drape (Ioban 2 antimicrobial incise drape; 3M, Saint Paul, Minnesota, USA) was placed over the exposed skin in the surgical field. During surgery, cefazolin (Sandoz, Princeton, New Jersey, USA), 22 mg/kg BW, IV, was administered approximately 30 min before making the skin incision; a second dose was administered 90 min after the initial administration.

After surgery, prednisone (West-Ward Pharmaceutical, Eatontown, New Jersey, USA), 0.4 mg/kg BW, PO, q12h, tramadol (Janssen Pharmaceuticals, Titusville, New Jersey, USA), 2.8 mg/kg BW, PO, q12h, and gabapentin (Amneal Pharmaceuticals of New York, Hauppauge, New York, USA), 0.8 mg/kg BW, PO, q12h, were administered. The dog's recovery from surgery was uneventful and he was discharged from the hospital 2 d after surgery. The owner was instructed to continue administering tramadol and gabapentin and to gradually reduce the prednisone dose over a 2-week course.

Nine days after surgery, the owner reported that the dog acutely developed lethargy, anorexia, diarrhea, and a right pelvic limb pain and weakness. The dog's medications at that time included prednisone at 0.4 mg/kg BW, PO, q24h and tramadol and gabapentin at the previously prescribed dosages. At the time of re-evaluation, the dog's rectal temperature was 39.4°C. He was reluctant to walk and he was paraparetic, but more affected in the right pelvic limb. There was a small non-painful fluctuant swelling at the incision site. Neurological examination revealed normal patellar reflexes, but there were reduced withdrawal reflexes bilaterally. The remainder of the neurological examination was normal. A CBC showed a leukocytosis [15.7 × 10^9 cells/L, reference interval (RI): 5.5 to 13.9 × 10^9 cells/L] and mature neutrophilia [13.6 × 10^9 cells/L, RI: 2.9 to 12 × 10^9 cells/L]. The serum chemistry profile showed hyperalbuminemia (41 g/L, RI: 22 to 39 g/L) and an elevated alkaline phosphatase (420 U/L, RI: 10 to 117 U/L). Radiographs of the lumbosacral vertebral column disclosed a narrowed L7-S1 IVD space and ventral spondylosis deformans (Figure 2). Cytological examination of fluid obtained from the subcutaneous tissues overlying the surgical area showed mixed inflammation (59% non-degenerate neutrophils, 38% large mononuclear cells with foamy cytoplasm, and 3% small lymphocytes). Samples from the aspirate at the surgical site and urine collected via cystocentesis were submitted for aerobic culture at the university's diagnostic laboratory.

The dog was treated with amoxicillin/clavulanic acid (Clavamox; Zoetis, Kalamazoo, Michigan, USA), 12.5 mg/kg BW, PO, q12h, and enrofloxacin (Baytril; Bayer Animal Health, Shawnee Mission, Kansas, USA), 8.4 mg/kg BW, PO, q24h. Tramadol and gabapentin were continued, but prednisone was discontinued. Within 24 h, the fever and discomfort resolved and the dog had improved strength in both pelvic limbs; he was discharged from the hospital 24 h after admission with instructions to continue the amoxicillin/clavulanic acid and enrofloxacin at the same doses for a minimum of 8 wk.

Six days after re-evaluation at the hospital, the sample from the surgical site grew Gram-negative bacilli identified by the Kauffman-White scheme (2) as Salmonella enterica subsp. enterica, serotype Dublin. The organism was susceptible to enrofloxacin. Urine culture did not yield any organisms. The owner was instructed to continue administering enrofloxacin and to restrict the dog's activity to short leash walks. Based on the finding of Salmonella spp. in the surgical site, the clinicians attempted to identify the source of the infection. At that time, it came to light in conversation with the primary care veterinarian that the dog was being fed a raw meat-based diet (RMBD). The owner confirmed that the dog (and 2 other dogs in the household) were typically fed a commercial extruded diet.

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**Figure 1.** The sagittal T2-weighted magnetic resonance image of the caudal lumbar vertebrae and sacrum of a 6-year-old German shepherd dog reveals intervertebral disc herniation (arrowhead), along with a loss of the signal intensity of the nucleus pulposis (arrow) and epidural fat.

**Figure 2.** On the lateral radiograph of the lumbosacral vertebral column obtained 9 days after surgery, the L7-S1 intervertebral disc space is narrowed (arrow) and ventral spondylosis deformans is present. Changes compatible with discospondylitis are not present. The absence of the cranial laminae of the sacrum, and caudal aspect of the laminae and spinous process of the L7 vertebra are a consequence of the surgery.
weight, BCS, and MCS were unchanged. Enrofloxacin had exercise restriction and enrofloxacin therapy for a total of 12 wk. Radiographic findings were consistent with discospondylitis. The L7-S1 intervertebral disc space remains narrowed. Periosteal new bone formation is present ventrally. The radiographic findings are consistent with discospondylitis.

At the time of re-evaluation 4 mo after surgery, the dog’s weakness had improved. Radiographs of the lumbosacral vertebral column showed changes similar to those observed 4 mo after surgery. Based on the persistent gait deficits, possible future relapses with activity, and the owner’s perception that the dog would never return to its intensive training activity, the owner decided to euthanize the dog at that time. The owner allowed a limited necropsy restricted to evaluation of the L7 vertebra, sacrum, and IVD. Grossly, the IVD space was collapsed with fibrous tissue in the area of the IVD. Microscopically, there were areas with masses of connective tissue and islands of fibrocartilage filling the medullary spaces of the trabecular bone adjacent to the IVD space. Basophilic reveal lines were seen within the trabeculae. Rare macrophages and lymphocytes were observed. Findings were consistent with remodeling of bone.

Discussion

Discospondylitis is an infection involving the IVD that extends to the adjacent vertebral endplates and vertebral bodies (4–6). Discospondylitis is usually the consequence of hematogenous spread of bacteria (7), and can occur secondary to cardiovascular infections (8), foreign bodies (9), epidural injection (10), as well as surgery (4,11,12). However, direct infection of the vertebra or disc space also can occur (7).

In most reports of discospondylitis, the etiologic agent is identified or suspected based on a positive blood or urine culture and response to therapy. Culture of the infected IVD material provides definitive identification but is rarely performed (13). In the present case, Salmonella was the organism suspected to be responsible for discospondylitis as it was cultured from the subcutaneous tissue overlying the surgical site at the time of clinical signs of infection; however, Salmonella was not cultured from the affected IVD space so confirmation of Salmonella spp. as the cause of the discospondylitis was not possible. Salmonella spp. are not a common cause of discospondylitis; however, discospondylitis and epidural empyema in a dog have been reported secondary to Salmonella spp. infection (14). In that case, the diagnosis was established through positive blood cultures alone (cultures of the subcutaneous tissues were negative and IVD aspirates were not obtained) (14). A complete diet history was not provided, nor was the diet cultured, so diet could not be linked as a possible source of Salmonella infection. In that case report and in the current case, Salmonella as the cause of discospondylitis remains presumptive since cultures of the affected IVDs were not obtained.
Salmonella enterica subsp. enterica, serotype Dublin was cultured from the subcutaneous tissues overlying the surgical site. This bacterium is a host-adapted bovine strain that can infect young calves and adults; some infected calves fail to clear the infection and serve as carriers (15). Given its host adaptation, clinical infection by S. enterica subsp. enterica, serotype Dublin in dogs is uncommonly reported, however, one study identified S. enterica subsp. enterica, serotype Dublin as the second most common Salmonella serotype isolated from dogs in the United Kingdom (16). Although limited clinical data were reported, clinical disease included diarrhea, meningoencephalitis, and a vaginal infection, along with its isolation from clinically healthy dogs (16). Since the RMBD fed to the dog in the current report was beef-based, this is additional evidence that the RMBD may have been the source of the surgical site infection, although it is important to note that S. enterica subsp. enterica, serotype Dublin was not isolated from the dog’s food. The fact that 2 different Salmonella serotypes were isolated from the surgical site and diet — S. Dublin from the surgical site and S. enterica subsp. enterica, serotype Uganda from the RMBD — does not preclude a link between the diet and the surgical site infection. When fed Salmonella-contaminated diets, some dogs shed 1 or more than 1 serotype different from those isolated from the diet, suggesting infection with multiple serotypes (17). In the present case, the RMBD may have been contaminated with multiple serotypes despite isolation of a single type. The inability to culture or identify that serotype in the feces also could be related to the long lag period after the last ingestion of a RMBD, to antibiotic therapy before analysis, or to intermittent shedding of Salmonella spp.

The presence of Salmonella spp. in the surgical site of the dog, as well as in the dog’s diet are concerning for the dog and for public health. Although the RMBD and the infection of the surgical site in the present case cannot be definitively linked, the contaminated RMBD is important for the dog, the owner, and the veterinary healthcare team. The identification of Salmonella in the RMBD is not surprising since studies show a prevalence rate of 21% to 48% of Salmonella contamination of commercially available RMBDs (17–20). While less information is available for home-prepared RMBD, Salmonella-positive culture results were obtained in 8 of 10 home-prepared RMBDs (21). A variety of other pathogens also can be found in commercial or home-prepared RMBD, including Esherichia coli O157:H7 (22), Clostridium spp. (20), Listeria monocytogenes (18), Campylobacter jejuni (23), and Toxoplasma gondii (24–27). Both home-prepared and commercially available RMBDs are at risk for contamination since many of these pathogens are not completely destroyed by freezing and freeze-drying which are the forms in which most commercially available diets are sold. Even commercial RMBDs which have been treated by high-pressure pasteurization may contain pathogens as susceptibility to high-pressure pasteurization varies among pathogens (28), and the shipping or storage conditions of these diets may put them at risk for cross-contamination.

Given the high prevalence of contamination and the fact that between 3% and 50% of dogs fed RMBD intermittently or as a primary diet shed Salmonella organisms in their feces (17, 21, 29, 30), a gastrointestinal (GI) source of contamination of the surgical site appears most likely. There are at least 2 possible mechanisms of spread via the GI tract. One could have been contamination of the surgical site from the dog’s feces. Another possible route could have been via bacterial translocation from the GI tract with hematogenous spread to the surgical site. In humans, bacterial translocation from the GI tract occurs during surgical procedures, particularly those involving the GI tract (31). The dog’s perioperative corticosteroids also could have increased the risk for bacterial translocation (32). Contamination also may have occurred via other routes including direct contact with contaminated RMBD, cross-contamination of owner’s hands, food bowls, counters, freezers, or the feces of other dogs. Although a GI route of transmission is most likely, a recent report of Salmonella bacteriuria in a cat fed a Salmonella-contaminated diet raises the possibility of a urinary route of contamination (33), although the urine culture of the dog herein was negative. Other environmental sources of Salmonella infection also are possible.

The pathophysiology of discospondylitis may involve slow blood flow through the vertebral epiphyses, allowing for hematogenous spread of bacteria into the adjacent IVD (7). While such pathophysiology may underpin discospondylitis, it highlights the need for a primary site of infection as a source of bacteria. Although urinary tract infections are commonly implicated as the primary source of bacteremia in dogs with discospondylitis, other sources include skin, dental, and cardiovascular infections (7, 34). For dogs undergoing surgery involving the vertebral column, the prevalence of postoperative discospondylitis ranges from < 1% to 2.2% of cases (12). In the case herein, the combination of a laminectomy and partial discectomy of the L7-S1 IVD and Salmonella infection of the surgical site could have predisposed the dog to Salmonella infection of the IVD via a hematogenous route or via direct extension along the surgical field. Alternatively, it is possible that the infection was present before surgery as 23% of dogs undergoing lumbosacral decompressive surgery for degenerative lumbosacral stenosis had positive cultures when the IVD material was tested (although only 52/156 of the dogs in that retrospective study had disc material evaluated) (35).

In this dog, the authors hypothesize that ingestion of a Salmonella-contaminated commercial RMBD led to colonization of the GI tract, Salmonella shedding in the feces, and subsequent infection of the surgical site. The dog’s perioperative corticosteroids also could have increased the risk for infection. While a causal relationship between the RMBD and discospondylitis in the current case is not proven but surmised, this case highlights another potential hazard of feeding RMBDs (36). The veterinary healthcare team should obtain a diet history for every companion animal during every evaluation to help with diagnosis and optimal treatment (37, 38). The diet history can not only help to identify if the animal’s diet is optimized, but may also identify potential health risks. If a diet history reveals that owners are feeding a RMBD (or raw dried or freeze-dried pet treats, which would carry similar risks to RMBD), those owners should be counseled on the health risks to themselves and their pets as a result of this feeding strategy. The diet history
also should make clinicians consider salmonellosis in dogs fed a RMBD that develop post-operative complications such as surgical site infection, diarrhea, or other GI illness. The diet history also can help to determine precautions during handling and hospitalization for the animals themselves, other animals in the hospital, and for staff. Given the potential association between a RMBD and a serious post-operative infection, future research is warranted to evaluate the risk of post-operative infections in animals consuming RMBDs.

References

Effect of acupuncture on pain and quality of life in canine neurological and musculoskeletal diseases

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Abstract — This prospective study investigated the effects of acupuncture alone or combined with analgesics in chronic pain and quality of life assessed by owners for up to 24 weeks in 181 dogs with neurological and musculoskeletal diseases. The scores before and after the onset of treatment were evaluated using the Wilcoxon test and the evolution of success was evaluated by Kaplan-Meier curves. Differences were considered significant at \( P < 0.05 \). The success rates for Helsinki chronic pain index (HCPI), quality of life assessment, and visual analog scales (VAS) for pain and locomotion were 79%, 84%, 78%, and 78% of the animals, respectively, when both diseases and groups of treatment were combined. Dogs with musculoskeletal disorders had greater improvement in HCPI (\( P = 0.003 \)) and VAS locomotion (\( P = 0.045 \)) than those with neurological disorders. Use of acupuncture alone or in combination with analgesics reduced pain and improved quality of life in dogs with neurological and musculoskeletal diseases.

Résumé — Effet de l’acupuncture dans la douleur et la qualité de vie dans les maladies neurologiques et musculo-squelettiques chez le chiens. Cette étude prospective a étudié les effets de l’acupuncture (AP) seul ou combiné avec des analgésiques pour traiter la douleur chronique et de la qualité de vie évaluée par les propriétaires pendant 24 semaines à 181 chiens atteints de maladies neurologiques et musculo-squelettiques. Les scores des animaux ont été évalués avant et après le début du traitement au moyen du test de Wilcoxon et l’évolution du succès par des courbes de Kaplan-Meier. Les différences ont été considérées comme significatives lorsque \( P < 0.05 \). Le taux de réussite pour l’indice de la douleur chronique de Helsinki (IDCH), évaluation de la qualité de vie et des échelles visuelles analogiques (EVA) pour la douleur et la locomotion étaient respectivement de 79 %, 84 %, 78 %, et 78 %. des animaux, respectivement, lorsque les deux types de maladies, et les deux groupes de traitement ont été combinés. Les chiens souffrant de maladies musculo-squelettiques ont une plus grande amélioration de IDCH (\( P = 0.003 \)) et EVA locomotion (\( P = 0.045 \)) scores que ceux souffrant de maladies neurologiques. Utilisation d’AP seul ou associé à traitements analgésiques réduit la douleur et meilleure qualité de vie chez les chiens atteints de maladies neurologiques et musculo-squelettiques.

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Introduction

Although the assessment and management of acute pain in animals has advanced considerably, chronic pain is still underestimated and, therefore, undertreated, because the diagnosis is complex and treatment is limited (1). Validated tools have been developed for evaluation of acute (2) and chronic pain (3–6), and although acute pain is well-evaluated by veterinarians (2), the owner is more apt to identify chronic pain based on changes in the pet’s attitude and behavior (7). Assessment of quality of life is important to measure treatment efficacy in chronic cases (3,7). Chronic pain and quality of life have been assessed by validated questionnaires in dogs with joint diseases (4,6,8), cancer (3), spinal cord injuries (9), and quality of life in general (7).

Due to the complex multi-dimension of chronic pain and the limitation of pharmacological treatment, acupuncture (AP) may be a good option in a multimodal approach (10,11). Meta-analyses of high-quality, randomized and well-controlled studies demonstrated that the analgesic effect of AP was better than sham AP or no treatment in 29 clinical studies with nearly 18 000 human patients with osteoarthritis (OA) and chronic headache and shoulder, back, and neck pain (12). Another meta-analysis including 14 studies with about 4000 human patients with OA of the knee showed that AP provided better pain relief than sham AP or standard care treatment (13).

Acupuncture is a traditional Eastern medicine therapy performed by introducing needles in acupoints. This technique...
embraces several clinical applications due to its wide mechanism of action involving the neuroendocrine system (14). Several techniques may be used alone or in combination to stimulate the acupoints, such as single needle, electroacupuncture (EA), laserpuncture (LASER), and ozone therapy. Electroacupuncture is the most used technique for relieving central and peripheral pain, as it combines mechanical and electrical effects (14). Laserpuncture involves the use of laser in acupoints (15) and is recommended for animals that do not tolerate needling. Ozone therapy is used in acupoints (ozonepuncture) or by intra-rectal insufflation (16).

There are few high-quality veterinary medical studies that have evaluated the effects of AP in treating pain and improving quality of life in dogs. Gold implants in acupoints reduced pain scores by 65% in dogs with hip dysplasia and improved mobility and decreased pain signals in 83% of these animals (17). Recovery of ambulation and deep pain sensation was faster in dogs with thoracolumbar intervertebral disk disease (IVDD) treated with EA, combined with standard medical treatment, such as corticosteroids and/or opioids, than with conventional treatment alone (10). Electroacupuncture was more effective (79%) than delayed decompressive surgery (40%), as measured by return of ambulation and decreased neurologic deficits, in dogs with grades IV and V thoracolumbar IVDD (11).

Based on the hypothesis that AP reduces pain and improves the dog's quality of life either when used alone or in combination with conventional and adjuvant analgesia, and that dogs affected by musculoskeletal diseases would improve faster than dogs with neurological diseases, the aim of this study was to evaluate the efficacy of AP and related techniques alone or in combination with analgesics in chronic pain and quality of life of dogs with neurological and musculoskeletal diseases, using pre-validated scales answered by owners.

**Materials and methods**

**Animals**

This prospective study involved dogs with 2 main causes of chronic pain: neurological ($n = 145$) and musculoskeletal ($n = 36$) diseases. The selection of animals was based on physical, neurological, and orthopedic examination and complementary diagnostics: radiography, computed tomography, magnetic resonance imaging (MRI), electroneuromyography, and

![Figure 1. A — Prevalence (%) of the types of neurological diseases ($n = 145$) (PNS — peripheral nervous system; NMJ — neuromuscular junction); B — spinal cord injury ($n = 119$) (IVDD — intervertebral disc disease); and C — musculoskeletal diseases (HD — hip dysplasia) in dogs treated with acupuncture and related techniques (ALG) and acupuncture and analgesic therapy (AAG), for up to 24 wk ($n = 36$).](image-url)
Clinical pathology tests. Intervertebral disk disease (IVDD) and non-compressive myelopathy were diagnosed by MRI and compressive myelopathy and trauma by radiographic image. All musculoskeletal diseases were diagnosed by radiography. According to these assessments, each clinical case was classified and included in the main types of specific conditions of neurological or musculoskeletal diseases which are discriminated in the results (Figure 1).

Initially all animals were subjected to once-weekly sessions of AP, for about 20 min and the maximum trial period was 24 wk. Once the animals improved, the AP sessions were conducted every other week. Success of treatment was analyzed by comparing data before, during, and after the proposed therapy. The dogs were discharged when treatment was successful before 24 wk. Cancer patients were excluded, as well as animals with comorbidities or when treatments were modified since the first assessment carried out before any treatment at the beginning of the study.

This study was approved by the Institutional Ethical Committee on Animal Use for Research (protocol number 150/2014). The owners were informed about the study and signed a consent form.

Evaluation
Dog owners answered at each treatment session, every wk or at least every other wk, 2 validated questionnaires, the HCPI (8) and health-related quality of life scale for dogs with signs of pain secondary to cancer (QLA) (3) and the VAS for pain and locomotion (5). The HCPI is a multifactorial and descriptive questionnaire to assess chronic pain in dogs and consists of 11 questions, with a minimum score of 0 and a maximum score of 44, representing maximum intensity of chronic pain (8). The QLA consists of 12 questions; “0” and “36” are considered the worst and best quality of life, respectively (3). The VAS is a line of 100 mm length; for pain (VASpain) or locomotion (VASloc), “zero” is the best and “100” is the worst possible condition (5).
The HCPI was translated to the native language of the owners and was in process of validation during the study; QLA was already validated in the native language of owners.

Successful treatment was based on a composite score of \( \geq 22 \) in the HCPI, which corresponds to 50% of the total score, \( \geq 24 \) for QLA, which is the score empirically indicative of good quality of life (66% of the total score) and \( \leq 33 \) mm for both VAS, which is a score empirically used for intervention analgesia in acute pain. Success was considered for each individual scale; therefore, some cases were included as success in one scale but not in another. All baselines scores were taken at the first AP session before the beginning of treatment. Dogs that had baseline scores below the success cut-off scores for HCPI, QLA, and VAS and worsened after treatment were classified as treatment failures or unsuccessful and were included in the analysis. Dogs that were already scored as success at the beginning of treatment and remained as such, were not included in the survival curves.

**Treatment**

Animals were treated as follows: alternative medicine (ALG, \( n = 50 \)), which included AP and related techniques [EA, LASER and ozone and/or less frequently pharmacopuncture (injection of microdoses of drugs into acupoints) or moxibustion (the stimulation of an acupoint by burning a cylinder of moxa placed close to the acupoint)] and alternative medicine associated with conventional analgesics and adjuvant analgesics (AAG, \( n = 131 \)). In this group, analgesics [nonsteroidal (NSAIDs) and steroidal (SAIDs) anti-inflammatory drugs, opioids, amitriptyline, amantadine, gabapentin] and adjuvant analgesics [nutraceuticals, transcutaneous electrical nerve stimulation (TENS), magnetic and antalgic physical therapy] were used alone or in combination, and the protocols were discontinued or modified according to the individual clinical response.

Animals that were not under treatment before or were not treated with analgesics or adjuvant analgesics after the beginning of AP, were included in the ALG group. Animals that were under
any treatment before or were treated with analgesics or adjuvant analgesics after the beginning of AP were included in the AAG group. In most animals of the AAG group, the use of analgesics, especially NSAIDs and SAIDs, was already in progress. When the clinical condition improved after the AAG treatment, drugs were discontinued, AP was continued but the dogs remained in the same group (AAG).

**Statistical analysis**

Non-parametric data were analyzed by Wilcoxon test to compare the scores of each scale and type of disease (neurological versus musculoskeletal) before and after the onset of treatments. Kaplan-Meier curves were used to evaluate the percentage of success during AAG and ALG treatments. The dogs were only discharged when treatment was successful before 24 wk. Differences were considered significant when $P < 0.05$.

**Results**

We selected 181 of 254 evaluated animals based on the inclusion and exclusion criteria. Demographic data included: 61% female and 39% male dogs; 29% crossbred, 16% dachshund, 9% poodle, 8% Labrador, 3% Rottweiller, and 35% other breeds; 8% were <1-year-old, 55% between 1- and 10-years-old, and 37% >10-years-old; 31% were <10 kg, 43% weighed between 10 and 25 kg, and 26% weighed >25 kg.

Statistical power of all analyses was >95%. In about 15% of the cases it was not always the same owner who filled out the questionnaires from 1 session to another. The distribution of each specific type of neurological and musculoskeletal disease is expressed in Figure 1.

The frequency of use of different techniques associated with AP to treat neurological and musculoskeletal cases is described...
in Figure 2. From the dogs that received EA, 6% also received laser and ozone in acupoints.

The AAG treatment was predominant in both neurological and musculoskeletal cases (Figure 3).

Scale evaluation
Before treatments all animals scored outside the success range in at least 1 of the scales and most dogs scored outside the success score range for all 4 scales. At the beginning of treatment, there was no difference between ALG and AAG for HCPI, QLA, and VASloc, when both neurological and musculoskeletal disorders were grouped (n = 181) (Figure 4) or in neurological patients only (n = 145) (Figure 5). Success was achieved in QLA and VASloc at the end of both treatments, with no difference between them; however, HCPI scores were lower in ALG than in AAG (P = 0.01).

The initial VASpain scores for the AAG group were higher than the scores for the ALG group in all animals (Figure 4) and in neurological patients (Figure 5). VASpain scores were reduced in both groups at the end of the trial.

There was no difference between groups for QLA and both VAS scores in musculoskeletal patients (n = 36), at the beginning and at the end of the trial period. These scores were reduced after both treatments (Figure 6). Initial HCPI scores for the ALG group were lower than for the AAG group (P = 0.01), with no difference between groups at the end of treatment. The HCPI scores were reduced in both groups (Figure 6).

Survival curves
According to the analysis of Kaplan-Meier curves, at the end of 24 wk, success was achieved in 79%, 84%, 78% and 78% of animals suffering from neurological and musculoskeletal diseases combined (submitted to both treatments), according to HCPI, QLA and both VAS, respectively (Figure 7).

Dogs with musculoskeletal diseases improved faster than those with neurological diseases according to HCPI and VASloc scores (P = 0.003 and P = 0.045, respectively) (Figure 8). Although there was no difference for QLA and VASpain scores between the 2 types of diseases, QLA scores also improved faster in dogs with musculoskeletal disorders (Figure 8).
There was no difference between treatments when both diseases were grouped or when each disease was analyzed separately (Figures 9–11).

Discussion

Acupuncture and related techniques or the combination of AP and other analgesic modalities reduce chronic pain and improve quality of life in dogs suffering from neurological and musculoskeletal diseases (10,11,17). Conditions such as spinal cord injuries and hip-joint arthritis usually show moderate clinical benefits after conventional or surgical treatment (10,11,18).

The analgesic effect produced by AP and related techniques in this study has been previously shown in both acute (16,19,20) and chronic pain (10,11,17,21). Possible local and systemic mechanisms behind the AP effect are based on the release of several neurotransmitters (such as endorphins, enkephalins, dynorphins, serotonin, norepinephrine, dopamine, and acetylcholine), changes in cell signaling, modulation of the N-methyl-D-aspartate receptor and reduction of hyperalgesia and allodynia in patients suffering from chronic and neuropathic pain. These mechanisms have been reviewed elsewhere (22,23). Acupuncture also regulates inflammation processes and growth factors by increasing blood circulation in affected areas (24).

Electroacupuncture is the most common AP-related technique used for analgesia in previous studies (10,11,18) and here. This technique combines the mechanical effect of the needle and electrical stimulation. The quality and intensity of the hypoalgesic effect depend on the choice of acupoints and frequency of electrical stimulation used, which determine the class of neuropeptides released in the central nervous system (18).

When OA is considered specifically, AP reduces metalloproteinases and increases their tissue inhibitors, suggesting a chondroprotective effect in rats (25). The combination of other techniques with AP in the ALG group also likely contributed to the analgesic effect observed here. Both laserpuncture (15) and intra-rectal ozone insufflation and ozoniopuncture (16) were effective in avoiding or minimizing postoperative pain in dogs undergoing ovariohysterectomy. Ozone therapy has anti-inflammatory and analgesic properties, and by promoting a very short acting oxidative stress, stimulates the endogenous defence mechanisms and mediates an immune response (16).

In this study, the treatment with AP (ALG) or AP combined with analgesics (AAG) was chosen according to specific requirements of each case and, therefore, there were no defined criteria by which to assign animals to each group and it is not possible to make any comparison about efficacy between these different treatments. This is a limitation of the study as one would expect that other analgesic regimes were included in AAG, because animals were suffering more intense pain, as shown by the greater pre-treatment VAS pain scores in the AAG group. The inclusion of analgesics could contribute to a better and quicker recovery in this group. However, according to all assessed instruments, both treatments improved neurological and musculoskeletal signs. There is some controversy regarding the benefit of combining AP and conventional medicine. A previous report suggested that the use of NSAIDs and SAIDs combined with AP, provided better results than the use of AP alone in dogs with thoracolumbar IVDD (26). However, in our study, the neurological patients treated with AP only showed a better recovery compared to those in which AP was combined with conventional medicine but this result may be biased by different disease severity between groups. In humans suffering from chronic low back pain, AP was more effective for pain relief and functional improvement compared with no treatment or AP associated with conventional therapy (27).

Our results suggest, like previous ones, that when used alone or in combination with analgesics or adjuvant analgesics, AP is a relevant conservative treatment to alleviate pain and improve quality of life in dogs with neurological and/or musculoskeletal diseases. The use of a multimodal therapeutic approach may
reduce doses of conventional analgesics and therefore their adverse effects (14).

Although AP and related techniques (ALG) produced similar results to the combination of AP with conventional analgesics (AAG) when success curves of the neurological diseases were compared, in contrast, especially for HCPI, musculoskeletal patients showed a better outcome after AP associated with other analgesic modalities, as reported in some human OA studies (28).

Previous studies reported that both AP and carprofen reduced pain in dogs with hip dysplasia, but only AP maintained the effect for 2 wk after the end of treatment (29). Other types of local stimulation, such as gold implant, without the need for weekly AP sessions, reduced pain for up to 2 y in dogs with hip dysplasia (17). In humans AP was more effective than NSAID to treat carpal tunnel syndrome (30), thus it is important to highlight the additional value of this technique to minimize chronic pain. Our study included a wide range of diseases and analgesics, strengthening the importance of a multimodal treatment in dogs with chronic pain.

Osteoarthritis can cause hyperalgesia and evolve into neuropathic pain, given the fact that, for example, 80% of afferent neurons in the knee joint are nociceptors (31). Therefore use of analgesic adjuvants, such as gabapentin and amitriptyline may be required, combined with AP, as in this study, because treatment with NSAID or SAID is limited (1).

The promising results of the association of AP with conventional medicine strengthen the concept that AP may be used in...
addition to conventional therapy to treat chronic pain. Medicine should be integrative, wherein all possible therapies should be used to improve the patient’s condition.

Animals with musculoskeletal diseases achieved better results for HCPI and VASloc than those with neurological disorders. This may be biased by the fact that some dogs with neurological problems were suffering from mild to moderate OA, which may have hindered their recovery. In contrast, musculoskeletal cases were exclusively orthopedic, with no neurological deficits.

There is no validated test to assess outcome in canine neurological diseases. The HCPI has only been validated for OA, and not for neurological cases; however, it was necessary to use the same scales to compare both neurological and musculoskeletal diseases. Since most of the HCPI assessment involves locomotion, which is also compromised in neurological cases, the authors considered that this instrument might be used for the neurological cases as well in this study.

Although the QLA questionnaire was designed for dogs with cancer-related pain, we considered it useful to evaluate the quality of life in dogs with neurological and musculoskeletal diseases in this study, as by the time the study was started, to our knowledge, there was no other tool to assess quality of life in dogs (3). A new tool to assess quality of life in various diseases was published after the beginning of this study (7).

A study investigating reliability and validity of VAS to measure chronic pain in dogs with OA (5) concluded that there was a significant correlation between the VAS score and the quality-of-life scale and HCPI scores. Use of VAS was valid and reliable, but face validity was only observed once the owners perceived that pain had abated and returned after initiating and withdrawing NSAID treatment, respectively. Considering that VAS is a poor pain assessment tool for untrained owners (5), we included 2 other validated questionnaires in the study.

This study had some limitations. For ethical reasons a placebo was not included as a negative control group, once the owner had requested AP to treat their pet. However a previous study showed that the analgesic effect of inserting needles into sham points was not significant (19). A temporal and/or placebo

Figure 9. Kaplan-Meier curve for Helsinki chronic pain index (HCPI), quality of life assessment (QLA), visual analog scale for pain (VASpain) and locomotion (VASloc) for dogs with neurological (n = 145) and musculoskeletal (n = 36) diseases grouped, during 24 wk of treatment with acupuncture and related techniques (ALG, n = 50) or acupuncture and analgesic therapy (AAG, n = 131). Each rung represents the percentage of animals which obtained scores of $\leq 22$ at HCPI, $\geq 24$ at QLA and $\geq 33$ in both VAS over time. The small vertical lines in each graph represent the week in which treatment was successful in at least 1 patient. The vertical axis represents the percentage success achieved at each week of treatment until 24 wk.
Figure 10. Kaplan-Meier curve for Helsinki chronic pain index (HCPI), quality of life assessment (QLA), visual analog scale for pain (VASpain) and locomotion (VASloc) for dogs with neurological diseases ($n = 145$), during 24 wk of treatment with acupuncture and related techniques (ALG, $n = 42$) or acupuncture and analgesic therapy (AAG, $n = 103$). Each rung represents the percentage of animals which obtained scores of $\leq 22$ at HCPI, $\geq 24$ at QLA and $\leq 33$ in both VAS over time. The small vertical lines in each graph represent the week in which treatment was successful in at least one patient. The vertical axis represents the percentage success achieved at each week of treatment until 24 wk.

Figure 11. Kaplan-Meier curve for Helsinki chronic pain index (HCPI) and visual analogue scale for locomotion (VASloc) of 36 dogs with musculoskeletal diseases, during 24 wk of treatment with acupuncture and related techniques (ALG, $n = 8$) or acupuncture and analgesic therapy (AAG, $n = 28$). Each rung represents the percentage of animals which obtained scores of $\leq 22$ at HCPI, $\geq 24$ and $\leq 33$ in VASloc over time. The small vertical lines in each graph represent the week in which treatment was successful in at least 1 patient. The vertical axis represents the percentage success achieved at each week of treatment until 24 wk.
improvement effect cannot be disregarded, but HCPI has been validated to compensate for this effect (8). In a recent blinded controlled study from our group comparing AP versus carprofen versus placebo to treat hip dysplasia in dogs, by using the same measurement tools, the placebo effect was negligible (29).

Another limiting factor was the difficulty that some owners felt in interpreting some questions, but the owners were not given any guidance on how to complete the questionnaires. In about 15% cases it was not always the same owner who filled out the questionnaires from one session to another, but as questionnaires were filled every week or every other week, this would reduce a possible variation of the overall results based on evaluation by different owners.

As we used patients from the routine practice, some variables could not be controlled. A limitation, inherent to any clinical experiment, is the heterogeneity of the population and epidemiological data, with different severity of diseases and associations among them. Therefore the authors did not use the same treatment protocol or same acupoints and treatments were adjusted individually according to the specific need of each animal.

We conclude that, when used alone or combined with analgesics, AP and related techniques reduced pain and improved quality of life in dogs with neurological and musculoskeletal diseases. Dogs with musculoskeletal disorders had a better improvement in chronic pain and locomotion than those with neurological disorders. The clinical relevance of our findings is that AP is an important conservative therapeutic tool to be included in the multimodal treatment protocols of neurological and musculoskeletal diseases in dogs.

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References


WSAVA, Hill’s Congress Outreach Program Welcomed by Pet Owners in Colombia

An outreach program run by the World Small Animal Veterinary Association and supported by Hill’s Pet Nutrition highlights the benefit that veterinarians can offer to companion animals and their owners living in the most deprived areas of the world by simply volunteering a few days of their time.

Ten veterinarians from around the world participated in the WSAVA-Hill’s program, which is part of the WSAVA’s 2016 Global Outreach initiative and was held just prior to the organization’s world congress in September in Cartagena, Columbia. The volunteer veterinarians and members of ‘Organizacion por el Respeto y Ciudadano de los Animales’, a local non-governmental organization, provided preventative health treatments and routine veterinary care for more than 300 dogs and cats in a Cartagena district where poverty levels are high. They also carried out a spay-neuter program to help limit population growth among dogs and cats in the city.

Dr. Jolle Kirpensteijn, Chief Professional Relations Officer at Hill’s, commented: “Hill’s is delighted to support the WSAVA’s Global Outreach initiative because it aligns perfectly with our mission to support the veterinary community in caring for companion animals around the world. WSAVA Global Outreach empowers veterinarians to apply their skills in an environment that may be very different from the clinic where they work. In our experience, they invariably rise to the challenge and find the experience of helping animals with so little access to veterinary care very rewarding. It was touching to hear the gratitude of so many owners and of our colleagues at ORCA, and we were delighted to be able to offer them the help they so badly needed.”

The owners of many of the animals treated during the two-day outreach program, as well as members of ORCA, expressed their thanks in a video filmed while the temporary volunteer-run clinic was open. It can be viewed at the following link: https://youtu.be/oPGG5V-PP9w

WSAVA President Walt Ingwersen said: “Global Outreach enables volunteer veterinarians to use their knowledge and experience to help build a better future for people and animals in another part of the world. We regularly hear from those taking part in these programs how much they enjoyed them — and how much they learned. Global Outreach benefits everyone involved — including the veterinarians who volunteer their time — and we encourage more members of our veterinary community to participate.”

Dr. Ivanov Castellanos, a veterinarian from the ‘Asociacion Colombiana de Medicos Veterinarios Especialistas en Pequenos Animales’, volunteered for Global Outreach. He said, “We do this because, as veterinarians, we share a love of animals and for people who own animals. The queue of animals on the day our clinic opened said it all. There is a huge need for the type of care we offered in Cartagena in many places around the world, and programs such as this play a key role in delivering this vital support.”

Dr. Walt Ingwersen added: “We are delighted that this year’s program was so successful and thank Hill’s Pet Nutrition for its continued support with Global Outreach.”

Contact: WSAVA Secretariat, 72 Melville Street, Dundas, Ontario L9H 2A1; Phone: 905-627-8540; Fax: 905-627-8425; E-mail: wsavasecretariat@gmail.com

Dechra Veterinary Products enters into an Exclusive North American Sales and Marketing Partnership with Kane Biotech for Patented Dental and Dermatology Technology

Dechra Veterinary Products is pleased to announce a North American partnership with Kane Biotech, a Canadian based technology company engaged in the development of products that prevent and remove microbial biofilms. The initial joint project will be the development and launch of a premium line of veterinary exclusive oral health products designed to fight plaque and tartar utilizing Kane’s patented and patent-pending biofilm and mineral chelation technology.

“With periodontal disease being a leading contributor to health problems in pets, we are eager to expand our dental range with clinically-proven, innovative technology that is safe and efficacious. We are pleased to partner with Kane Biotech to further develop their technology in the veterinary market. Kane’s intellectual property has received positive feedback from many Key Opinion Leaders,” says Mike Eldred, President of Dechra North America.

Mark Ahrens-Townsend, CEO of Kane commented on the partnership with Dechra, “We are pleased to have partnered with Dechra, a leader in the veterinary dental and dermatology markets. In a controlled clinical study in sixty healthy dogs, the calculus score for the treated dogs was 25.4% lower than the control group. The study demonstrated our technology is effective in preventing dental calculus. We look forward to a long-term strategic partnership with Dechra.”

In addition to the dental applications, Dechra and Kane will further partner to develop new dermatological therapies employing this patented and patent-pending biofilm technology and dispersin-B, another patented molecule.

The Kane oral health product range is currently being sold under the brand StrixNB. Dechra expects to transition these dental products under a new Dechra tradename over the coming months.

Contact: Dechra Veterinary Products Inc., 1 Holiday Avenue, East Tower, Suite 345, Pointe-Claire, Quebec H9R 5N3; Phone: 1-855-332-9334; website: www.dechra.ca
L'euthanasie de convenance des animaux de compagnie : portrait du dilemme au sein de la profession vétérinaire québécoise

Dominick Rathwell-Deault, Béatrice Godard, Diane Frank, André Ravel, Béatrice Doizé

Résumé — L’euthanasie de convenance des animaux de compagnie représente un dilemme auquel sont confrontés les vétérinaires travaillant dans le domaine des animaux de compagnie au Québec. De par leur formation comme professionnels de la santé, les vétérinaires sont formés pour soigner les animaux qui leur sont présentés. Il est donc facile d’envisager que le fait d’euthanasier des animaux sains provoque un dilemme moral au sein de la profession. Les balises réglementaires entourant cette pratique se concentrent sur la méthode employée, mais ne sont pas impératives sur la légitimité des circonstances qui devraient entourer les demandes d’euthanasie. À ce jour peu d’écrits sur le sujet au sein de la littérature sont disponibles et la voix des vétérinaires y est peu décrite. Cet article présente les résultats obtenus suite à une étude menée auprès des vétérinaires québécois. Pour ce faire, un sondage en ligne a été effectué et portait sur la vision des vétérinaires concernant l’euthanasie de convenance, sur les conséquences découlant de cet acte et sur les pistes de solutions envisageables par la profession pour améliorer la situation de l’euthanasie de convenance. Les données recueillies ont permis de mettre de l’avant la dualité d’allégeance à laquelle les vétérinaires doivent faire face dans ce dilemme. D’une part, les vétérinaires reconnaissent que l’euthanasie de convenance va à l’encontre du bien-être animal et d’autre part ils reconnaissent qu’ils doivent respecter le droit décisionnel du propriétaire de se départir de son animal en demandant son euthanasie.

Abstract — Convenience euthanasia in companion animals: Dilemma among veterinarians in Quebec. Many veterinarians working in the field of companion animal medicine have to deal with requests for convenience euthanasia in their practices. As it is the case in other medical fields, veterinarians are trained to treat their patients. It is thus easy to understand that veterinarians consider convenience euthanasia as one of the most difficult ethical dilemmas they have to deal with in their practice. Regulatory boundaries concerning the practice of euthanasia are limited to the method use to induce the death of the animal but do not give any indication as to what should be the proper circumstances surrounding the request. To date, there are few articles on this matter and the perspective of veterinarians on the subject was rarely addressed. This article reports results obtained following a study conducted upon Québec’s veterinarians on the topic of convenience euthanasia. The data was obtained via an online survey created by the research team to evaluate the perspective of veterinarians on the topic, how they perceived consequences of convenience euthanasia and what were the solutions they would take into consideration in order to help the profession on resolving their dilemma. The data collected sheds light on the existing duality between double allegiance regarding the duties emerging from the relation with the patient (animal) and the client (pet owner) veterinarian are facing in their daily practice. On one hand veterinarians recognized that 'convenience euthanasia' is contrary to animal welfare. On the other hand they also recognized the pet owner's right to ask for 'convenience euthanasia' when he can no longer care for its pet.

(Translated by Dr. Rathwell-Deault)
**Introduction**

L’euthanasie de convenance des animaux de compagnie suscite de plus en plus d’intérêt, et ce, autant dans la société en général qu’auprès de la communauté vétérinaire. L’American Veterinary Medical Association (AVMA) a publié des lignes directrices concernant l’euthanasie des animaux de compagnie et a inclus dans sa plus récente version des recommandations sur l’évaluation éthique de cette pratique pour les vétérinaires (1). L’euthanasie de convenance se définit comme la mise à mort par des moyens humanitaires d’animaux qui sont en parfaite santé physique et psychique. Des articles écrits par différents auteurs reflètent le caractère éthique qui entoure les décisions d’euthanasie de convenance (2–5). Dans leur article Yeates et Main (3) évaluent le processus décisionnel des vétérinaires entourant les euthanasies pratiquées en cliniques vétérinaires au Royaume-Uni. Les arguments avancés par les vétérinaires pour justifier leur acceptation ou leur refus de pratiquer des euthanasies ont été classés selon qu’ils reflétaient les intérêts des animaux ou les intérêts des clients, propriétaires de ces animaux. L’euthanasie de convenance a été reconnue comme étant éthiquement problématique et les vétérinaires ont justifié leur refus de pratiquer ces euthanasies en utilisant des arguments prônant les intérêts de leurs patients, les animaux. De son côté, Rebuelto (2) rapporte ses réflexions concernant les dilemmes éthiques émanant de la pratique de l’euthanasie des animaux de compagnie et suggère un canevas décisionnel pour orienter les décisions des vétérinaires entourant ce sujet. Rebuelto décrit l’euthanasie de convenance plus largement en y incluant les patients ayant des maladies traitables ou des problèmes comportementaux et elle confirme que ces euthanasies sont des dilemmes moraux reconnus par les vétérinaires (2). Elle suggère de prendre les décisions dans ces demandes en priorisant les intérêts des patients et en respectant l’autonomie décisionnelle des clients. Finalement, Morgan et McDonald (5) se sont aussi intéressés aux dilemmes éthiques entourant la profession. Sans nécessairement s’intéresser en profondeur au dilemme de l’euthanasie de convenance, ils décrivent les différents rôles que le vétérinaire peut jouer au sein des pratiques consultatives et les mettent en lumière avec les conséquences relatives des intérêts des propriétaires d’animaux de compagnie et des responsabilités des vétérinaires et finalement dans la perception de ce qui est bien pour l’animal.

Le fait de voir davantage de questionnements au sein de la profession n’implique toutefois pas nécessairement des changements au sein des pratiques vétérinaires. Par exemple, certaines pratiques éthiquement discutables, comme les chirurgies d’essorillement et les caudectomies, ont été débattues à de nombreuses reprises et sont interdites sur le territoire du Québec depuis janvier 2017 (6). D’autres pratiques éthiquement discutables comme les chirurgies de dévocalisation et l’euthanasie de convenance suscitent des débats et continuent d’avoir lieu au sein des établissements vétérinaires.

En considérant que l’euthanasie de convenance continue de se pratiquer dans le domaine des animaux de compagnie malgré le fait que cette pratique soit reconnue comme étant éthiquement problématique, quels sont les fondements permettant de comprendre ce positionnement de la part des vétérinaires? À la connaissance des auteurs, à ce jour aucune étude ne s’est penchée sur la question dans la perspective des médecins vétérinaires. Afin de commencer à répondre à ce questionnement, une étude qualitative a été entreprise par notre équipe de recherche afin de décrire la situation de l’euthanasie de convenance (7, 8). Selon les résultats de cette étude, certains vétérinaires perçoivent cette pratique comme un service offert parmi tant d’autres alors que d’autres la considèrent comme un acte qui ne devrait pas être autorisé par les ordres professionnels vétérinaires (7, 9). Devant une telle dualité de pensée, il est possible de percevoir le dilemme auquel les vétérinaires doivent faire face régulièrement. Les vétérinaires interviewés lors de cette étude évaluent les cas de demandes d’euthanasie de convenance selon le lien unissant le propriétaire de l’animal et l’animal concerné. Lors de cette étude, la majorité des liens unissant l’animal et son propriétaire était décrite selon une perspective anthropocentrique, axée exclusivement sur la relation avec un être humain. L’animal en tant que tel n’a pas de valeur inhérente. Sa valeur dépend de celle que lui attribue son propriétaire. À l’opposé, une vision zoocentrique décrit l’animal comme ayant une valeur qui lui est propre. Selon cette perspective, la valeur de l’animal n’est aucunement dépendante de l’appartenance à un propriétaire. De plus, il a été démontré que les intérêts pris en considération lors d’euthanasies de convenance sont presque exclusivement reliés au propriétaire de l’animal et au vétérinaire pratiquant (7, 8).

En gérant les souffrances physiques et le stress provoqués par les manipulations lors des euthanasies, les vétérinaires interviewés considéraient leur rôle et leur responsabilité professionnels envers l’animal comme étant accomplis (7). Cette première étude qualitative a permis de cerner des balises descriptives concernant la situation de l’euthanasie de convenance au Québec et a servi de canevas pour sonder des vétérinaires québécois et tenter de quantifier auprès d’eux le dilemme de l’euthanasie. Le but de cette seconde étude, dont les résultats sont présentés ici, était de vérifier la prévalence des constats établis lors de l’analyse qualitative du dilemme, de vérifier si les données étaient variables en fonction des informations démographiques disponibles et d’évaluer le dilemme de l’euthanasie à plus grande échelle.

**Matériaux et méthodes**

**Devis de recherche**

Un questionnaire a été élaboré afin de collecter des informations sur la prévalence des constats mis de l’avant par une étude qualitative (7, 8). Le questionnaire comportait huit catégories de questions entourant le dilemme de l’euthanasie de convenance. Une échelle de Likert allant de (1) totalement en accord avec l’énoncé, (2) partiellement en accord avec l’énoncé, (3) partiellement en désaccord avec l’énoncé, à (4) totalement en désaccord avec l’énoncé permettait de colliger les réponses des vétérinaires aux différentes questions. Avant de débuter le questionnaire, le participant était invité à lire un court texte qui définissait le dilemme de l’euthanasie de convenance et...
expliquait le but de la recherche. Le participant était invité à poser ses questions à l’équipe de recherche si nécessaire. Une phase de pré-test du questionnaire fut effectuée auprès de 10 vétérinaires généralistes afin de vérifier la compréhension et la formulation des questions. Cette étude fut approuvée par le comité d’éthique de la recherche en santé de l’Université de Montréal (CERES).

**Population et échantillonnage**
La population visée par ce projet de recherche était les vétérinaires pratiquant partiellement ou totalement dans le domaine des animaux de compagnie au Québec. Aucune distinction n’a été faite entre les généralistes et les spécialistes.

Les vétérinaires furent sollicités à participer à l’étude via une annonce dans le *Vétérinarius flash*, un journal web distribué par l’Ordre des médecins vétérinaires du Québec (OMVQ). L’annonce décrivait le but de la recherche et incluait un hyperlien permettant l’accès au sondage. La plateforme web Survey Monkey fut utilisée pour la collecte de données et le sondage fut disponible en ligne pendant 2 mois (du 26 août au 26 octobre 2014). Pendant cette période, des rappels de l’invitation à participer au sondage étaient fréquemment effectués via le journal web. Lors de la mise en ligne du sondage, l’OMVQ répertoriait 1302 vétérinaires inscrits au Tableau des membres en pratique des animaux de compagnie. La représentativité de l’échantillon recueilli par rapport à la population générale en regard des variables représentant le genre et le nombre d’années de pratique a été faite par un test de Chi carré de conformité avec une erreur alpha à 0,005 et par un intervalle de confiance à 95 % selon la méthode de Clopper-Pearson. Une standardisation des données a été effectuée avec les informations démographiques disponibles sur la population (genre et nombre d’années de pratique).

**Analyse de prévalence**
Une analyse statistique des données recueillies a été effectuée avec l’aide du logiciel XL stat®. Une évaluation individuelle de la proportion de répondants en accord avec chacune des propositions a été effectuée. Un intervalle de confiance à 95 % selon la méthode de Clopper-Pearson a été calculé pour chaque question du questionnaire. À des fins d’analyse de la proportion de réponses en accord ou en désaccord avec l’énoncé, les réponses étaient effectuées. Aucun test de Chi carré de conformité avec une erreur alpha à 0,005 et par un intervalle de confiance à 95 % selon la méthode de Clopper-Pearson. Une standardisation des données a été effectuée avec les informations démographiques disponibles sur la population (genre et nombre d’années de pratique).

**Analyse factorielle exploratoire des déterminants**
Une analyse factorielle exploratoire (10) a été effectuée sur les catégories des questions 2, 3 et 4 selon l’hypothèse que des facteurs inconscients existaient dans le profil de réponses des répondants pour ces catégories. L’analyse factorielle permet d’évaluer un ensemble de données recueillies et de vérifier s’il existe un profil dans les réponses des participants sans que ce profil ne soit consciemment exprimé par ceux-ci. Ces profils s’expriment en termes de facteurs au sein de l’analyse factorielle.

L’extrac tion des facteurs a utilisé la méthode des moindres carrés non pondérés tel que recommandé pour le traitement de données ordinales (11) et la méthode de rotation oblique tel que recommandé pour l’analyse des mesures psychosociales (12). Les variables représentées par une qualité inférieure à 0,2 n’ont pas été retenues, ni les facteurs avec une valeur propre inférieure à 1. La mesure Kaiser-Meyer-Olkin a été calculée pour vérifier l’adéquation de la solution factorielle (13). La contribution principale de la variable a été déterminée pour chaque facteur selon la valeur du coefficient de saturation qui devait être supérieure à 0,3. La valeur Cronbach alpha a été calculée pour chaque facteur selon la contribution principale aux variables basée sur un échantillon total tel que le facteur de consistance interne de la configuration factorielle (14).

Une analyse de régression linéaire simple puis multivariée a été effectuée séparément pour chaque facteur retenu suite à l’analyse factorielle pour en explorer les déterminants parmi les variables démographiques. Les facteurs standardisés étaient les variables dépendantes, alors que les variables indépendantes investiguées étaient le milieu de pratique, le genre, le statut au sein de l’entreprise et le nombre d’années de pratique. Une régression univariée a été effectuée indépendamment pour chaque variable indépendante en premier lieu. Ensuite, un modèle de régression multivariée avec interaction a été construit et testé à partir des variables pour lesquelles la probabilité d’être indépendante du facteur dans le modèle univarié était inférieure ou égale à 0,15. Lorsqu’aucune interaction statistiquement significative n’était trouvée, l’interaction était retirée et le modèle était testé de nouveau.

**Résultats**

**Description de l’échantillon**
Au total, 248 vétérinaires ont répondu au sondage ce qui représente un taux de réponse de 19 %. Six de ces vétérinaires ont refusé de participer suite à la lecture de la lettre d’introduction. Des 242 vétérinaires, 185 d’entre eux ont complété le sondage en entier, ce qui représente 74 % d’entre eux. Cet échantillon comprenait 154 (83 %) femmes et 31 (17 %) hommes, 43 vétérinaires comptant entre 0 et 5 ans de pratique (23 %), 26 entre 6 et 10 ans de pratique (14 %), 37 entre 11 et 15 ans de pratique (20 %) et 79 ayant 16 ans ou plus de pratique (43 %). Cent huit vétérinaires étaient des employés dans leur milieu de pratique (58 %) tandis que 77 vétérinaires étaient des employeurs (42 %). Finalement, 59 vétérinaires identifiaient leur milieu de pratique comme étant localisé en milieu rural (32 %) et 125 en milieu urbain (68 %). Ces données ont été regroupées dans le tableau 1. Il a été possible de vérifier la représentativité de l’échantillon en regard des données démographiques relatives au genre et au nombre d’années de pratique disponibles via le Tableau des membres de l’OMVQ. La distribution de notre échantillon en regard
des données disponibles ne respectait pas les caractéristiques démographiques de la population étudiée pour le genre (Chi-carré de Pearson = 9,89, ddl = 1; \( P = 0.001658 \)) et pour le nombre d’années de pratique (Chi-carré de Pearson = 11,03, ddl = 3; \( P = 0.01129 \)). L’échantillon comportait une proportion plus importante de femmes que celle connue dans la population générale. Notre échantillon comportait aussi une plus grande proportion de vétérinaires ayant entre 0 et 15 ans d’expérience pratique et une plus faible proportion de vétérinaires ayant 16 ans et plus d’expérience pratique que les proportions connues dans la population générale. Une standardisation des données a donc été effectuée afin de limiter l’impact des différences existantes entre la population générale et l’échantillon recueilli (15). Ces résultats sont rapportés dans le Tableau 1.

Analyse des proportions de répondants en accord avec les énoncés

Tel que mentionné dans la section du devis de recherche, le questionnaire comportait huit catégories de questions. La première catégorie visait à évaluer quelles catégories d’animaux font l’objet de demande d’euthanasie de convenance. La deuxième catégorie vérifiait la définition du bien-être animal et son implication dans le dilemme étudié. Les troisième et quatrième catégories visaient à évaluer les intérêts des vétérinaires et les intérêts des propriétaires d’animaux respectivement. La cinquième catégorie vérifiait la perception du rôle du vétérinaire. La sixième et la septième catégorie sondaient la fréquence des demandes d’euthanasie de convenance et les habitudes de pratique reliées à celle-ci au sein des établissements vétérinaires. La huitième et dernière catégorie évaluait l’opinion des vétérinaires concernant des pistes de solutions soulevées afin d’améliorer la situation problématique. Les résultats obtenus sont rapportés dans le Tableau 2.

L’analyse des réponses concernant la première catégorie de questions, qui concerne les catégories d’animaux pouvant être présentés pour une euthanasie de convenance, a démontré que les vétérinaires sont influencés par l’âge des animaux en acceptant les demandes reliées à des animaux âgés et en refusant les demandes visant les animaux pédiatriques à 82 %.

La perception personnelle de la valeur morale de l’animal par le vétérinaire (répondant totalement ou partiellement en accord : 32 %), le lien relationnel (30 %), la durée de la relation entre l’animal et son propriétaire (12 %), la valeur monétaire de l’animal (2 %), ainsi que l’appartenance de l’animal à une race pure (2 %) ne sont pas jugés comme des critères importants dans la prise de décision des répondants lors de demande d’euthanasie.

Dans la deuxième catégorie de questions qui portent sur la définition du concept de bien-être animal, les vétérinaires estiment que la souffrance physique ne peut être reconnue comme étant le seul et unique critère permettant de juger du bien-être d’un animal (30 %). Les vétérinaires jugent du bien-être d’un animal en évaluant sa santé physique, psychique (80 %) et son environnement (81 %). Selon les vétérinaires ayant répondu au sondage, un animal en santé psychique et physique a intérêt à poursuivre sa vie (93 %) et l’euthanasie de convenance d’un tel animal va à l’encontre de son bien-être (74 %).

L’analyse des réponses de la troisième catégorie de questions, qui ont trait aux intérêts du vétérinaire au sein du dilemme, démontre que les vétérinaires n’identifient aucun des éléments présentés comme étant un critère de prédilection dans leur prise de décision. Il ne considèrent pas que leurs décisions en regard des euthanasies de convenance aient un impact sur les relations entre les établissements (13 %), sur la santé financière de l’établissement (16 %), sur la perception de la qualité des soins qu’ils prodiguent (20 %) et sur la relation qu’ils entretiennent avec leur clientèle (41 %). Une ambivalence dans la position des vétérinaires interviewés est présente en regard de la prévention du stress lié à la fatigue de compassion lors de refus...
Tableau 2. Choix de réponses des 185 participants

<table>
<thead>
<tr>
<th>Énoncés</th>
<th>n</th>
<th>%</th>
<th>Intervalle de confiance à 95 %</th>
<th>Énoncés</th>
<th>n</th>
<th>%</th>
<th>Intervalle de confiance à 95 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catégorie 1 : Catégorisation des patients</td>
<td></td>
<td></td>
<td></td>
<td>Catégorie 3 : Intérêts du vétérinaire dans le dilemme</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q.1.1 J’accepte d’euthanasier les animaux errants</td>
<td>92</td>
<td>50</td>
<td>43–57</td>
<td>Q.3.1 Il est dans l’intérêt financier du vétérinaire de procéder à l’euthanasie</td>
<td>29</td>
<td>16</td>
<td>11–21</td>
</tr>
<tr>
<td>Q.1.2 J’accepte d’euthanasier les animaux de travail ne pouvant plus accomplir leur fonction</td>
<td>78</td>
<td>42</td>
<td>35–49</td>
<td>Q.3.2 L’acceptation de l’euthanasie permet au vétérinaire de rester en contrôle de la destinée de l’animal</td>
<td>24</td>
<td>13</td>
<td>8–18</td>
</tr>
<tr>
<td>Q.1.3 J’accepte d’euthanasier les animaux de compagnie sans fonction de travail spécifique</td>
<td>90</td>
<td>49</td>
<td>42–56</td>
<td>Q.3.3 L’acceptation de l’euthanasie de convenance préserve le climat de bonne entente entre les établissements</td>
<td>75</td>
<td>41</td>
<td>34–48</td>
</tr>
<tr>
<td>Q.1.4 Le lien relationnel entre l’animal et son propriétaire influence ma décision d’euthanasie</td>
<td>54</td>
<td>30</td>
<td>23–37</td>
<td>Q.3.4 L’acceptation de l’euthanasie préserve la réputation des soins prodigués par le vétérinaire</td>
<td>39</td>
<td>20</td>
<td>14–26</td>
</tr>
<tr>
<td>Q.1.5 J’accepte d’euthanasier les animaux gériatriques</td>
<td>152</td>
<td>82</td>
<td>76–88</td>
<td>Q.3.5 L’acceptation de l’euthanasie permet au vétérinaire de rester en contrôle de la destinée de l’animal</td>
<td>99</td>
<td>54</td>
<td>47–61</td>
</tr>
<tr>
<td>Q.1.6 J’accepte d’euthanasier les animaux pédiatriques</td>
<td>51</td>
<td>28</td>
<td>22–34</td>
<td>Q.3.6 Le refus de l’euthanasie préserve le vétérinaire du stress relatif à la fatigue de compassion</td>
<td>97</td>
<td>53</td>
<td>46–60</td>
</tr>
<tr>
<td>Q.1.7 La durée de la relation entre l’animal et le propriétaire influence ma décision d’euthanasie</td>
<td>22</td>
<td>12</td>
<td>7–17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q.1.8 La valeur monétaire de l’animal influence ma décision d’euthanasie</td>
<td>3</td>
<td>2</td>
<td>0–4</td>
<td></td>
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</tr>
<tr>
<td>Q.1.9 L’appartenance de l’animal à une race pure influence ma décision d’euthanasie</td>
<td>3</td>
<td>2</td>
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<td>Q.1.10 La valeur morale que j’attribue personnellement à l’animal influence ma décision d’euthanasie</td>
<td>58</td>
<td>32</td>
<td>25–38</td>
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<td>Catégorie 2 : Évaluation de la définition du bien-être animal</td>
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<td>Catégorie 4 : Intérêts du propriétaire</td>
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<tr>
<td>Q.2.1 Le bien-être animal s’évalue uniquement en termes de souffrance physique</td>
<td>49</td>
<td>30</td>
<td>23–37</td>
<td>Q.4.1 Le propriétaire de l’animal a le droit de demander son euthanasie</td>
<td>111</td>
<td>65</td>
<td>58–72</td>
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<td>Q.2.2 L’évaluation psychologique est une composante permettant l’évaluation du bien-être de l’animal</td>
<td>132</td>
<td>80</td>
<td>73</td>
<td>Q.4.2 Le démontre du respect envers le propriétaire en acceptant l’euthanasie</td>
<td>63</td>
<td>36</td>
<td>29–43</td>
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<tr>
<td>Q.2.3 L’évaluation des composantes environnementales est essentielle pour juger du bien-être animal</td>
<td>151</td>
<td>81</td>
<td>75–87</td>
<td>Q.4.3 Un refus de procéder à une euthanasie constitue un jugement envers le propriétaire</td>
<td>108</td>
<td>59</td>
<td>52–66</td>
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<tr>
<td>Q.2.4 Il est dans l’intérêt de l’animal de poursuivre sa vie s’il est en bonne santé physique et psychique</td>
<td>169</td>
<td>93</td>
<td>89–97</td>
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<td>Q.2.5 L’euthanasie de convenance ne va pas à l’encontre du bien-être animal</td>
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<td>26</td>
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Tableau récapitulatif des choix de réponses des 185 participants.

Intérêts du vétérinaire dans le dilemme.

2. Q3.2: État d’acceptation de l’euthanasie de convenance pour préserver le climat de bonne entente entre les établissements.
3. Q3.3: État d’acceptation de l’euthanasie de convenance pour préserver le climat de bonne entente entre les établissements.
4. Q3.4: État d’acceptation de l’euthanasie pour préserver la réputation des soins prodigués par le vétérinaire.
5. Q3.5: État d’acceptation de l’euthanasie pour préserver l’animal du stress relatif à la fatigue de compassion.
7. Q3.7: État de refus de l’euthanasie pour préserver l’animal du stress relatif à la fatigue de compassion.
8. Q3.8: État de refus de l’euthanasie pour préserver l’animal du stress relatif à la fatigue de compassion.

Catégorie 4: Intérêts du propriétaire

2. Q4.2: État de démontration du respect envers le propriétaire en acceptant l’euthanasie.
3. Q4.3: État de refus de procéder à une euthanasie envers le propriétaire.

Catégorie 5: Rôle du médecin vétérinaire

1. Q5.1: État de minimisation des souffrances physiques des animaux.
2. Q5.2: État de minimisation des souffrances psychologiques des animaux.
4. Q5.4: État de rôle neutre lors de la pratique consultative.
5. Q5.5: État de conseiller les propriétaires de façon à prioriser le bien-être animal.
6. Q5.6: État de conseiller les propriétaires de façon à prioriser leurs intérêts.
7. Q5.7: État de conseiller les clients de façon à orienter leur décision.
8. Q5.8: État de conduire le public général sur le bien-être animal.
9. Q5.9: État de conduire les clients sur le bien-être animal.

Tableau récapitulatif des choix de réponses des 185 participants.
For personal use only

Tableau 2. Choix de réponses des 185 participants (suite)

<table>
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<tr>
<th>Énoncés</th>
<th>n</th>
<th>%</th>
<th>Intervalle de confiance à 95%</th>
<th>Énoncés</th>
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<th>%</th>
<th>Intervalle de confiance à 95%</th>
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<tr>
<td>Catégorie 6 : Habitudes et fréquence des euthanasies de convenance</td>
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<td>Catégorie 8 : Pistes de solution</td>
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<tr>
<td>Q.6.1 En acceptant l'euthanasie je renforce son utilisation socialement</td>
<td>136</td>
<td>74</td>
<td>71</td>
<td>68–80</td>
<td>Q.8.1 Augmenter les activités visant la stérilisation massive à faible coût</td>
<td>113</td>
<td>67</td>
</tr>
<tr>
<td>Q.6.2 En pratiquant des euthanasies, je m'habite et je considère sa pratique comme moins problématique</td>
<td>41</td>
<td>23</td>
<td>21</td>
<td>17–29</td>
<td>Q.8.2 Normes gouvernementales plus strictes concernant la stérilisation</td>
<td>166</td>
<td>90</td>
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<tr>
<td>Q.6.3 La pratique de l'euthanasie est routinière</td>
<td>31</td>
<td>17</td>
<td>17</td>
<td>12–22</td>
<td>Q.8.3 Normes gouvernementales plus strictes encadrant l'élevage</td>
<td>177</td>
<td>96</td>
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<tr>
<td>Q.6.4 J'ai un rôle actif dans le dilemme de l'euthanasie quand je pratique la procédure</td>
<td>131</td>
<td>72</td>
<td>71</td>
<td>65–79</td>
<td>Q.8.4 Normes gouvernementales plus strictes encadrant l'adoption des animaux de compagnie</td>
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<td>Q.8.5 Augmentation des tarifs reliés à l'euthanasie de convenance</td>
<td>115</td>
<td>63</td>
<td>64</td>
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<tr>
<td>Q.7.1 Questionnement systématique du propriétaire</td>
<td>154</td>
<td>88</td>
<td>84</td>
<td>83–93</td>
<td>Q.8.6 Augmentation des ressources alternatives par le gouvernement (SPCA, Refuge)</td>
<td>158</td>
<td>85</td>
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<tr>
<td>Q.7.2 Consultation avec vétérinaire obligatoire</td>
<td>92</td>
<td>57</td>
<td>53</td>
<td>49–65</td>
<td>Q.8.7 Augmentation des activités de sensibilisation concernant l'euthanasie visant le public par les vétérinaires</td>
<td>174</td>
<td>96</td>
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<tr>
<td>Q.7.3 Politique d'acceptation systématique de toute demande d'euthanasie auprès de l'établissement</td>
<td>48</td>
<td>32</td>
<td>26</td>
<td>25–39</td>
<td>Q.8.8 Augmentation des activités de sensibilisation visant le public concernant les exigences de la vie avec un animal par les vétérinaires</td>
<td>175</td>
<td>96</td>
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<tr>
<td>Q.7.4 Politique de refus systématique de toute demande d'euthanasie auprès de l'établissement</td>
<td>40</td>
<td>25</td>
<td>22</td>
<td>18–32</td>
<td>Q.8.9 Améliorer la formation des futurs vétérinaires concernant la gestion émotive et l'euthanasie</td>
<td>163</td>
<td>90</td>
</tr>
<tr>
<td>Q.7.5 Pression de la part des employeurs afin d'accepter les euthanasies</td>
<td>32</td>
<td>31</td>
<td>ND*</td>
<td>22–40</td>
<td>Q.8.10 Fournir aux propriétaires des ressources alternatives dans le cadre de leur pratique</td>
<td>176</td>
<td>96</td>
</tr>
<tr>
<td>Q.7.6 Pression de la part des pairs afin d'accepter les euthanasies</td>
<td>21</td>
<td>15</td>
<td>11</td>
<td>3–27</td>
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<tr>
<td>Q.7.7 Pression de la part des clients afin d'accepter les euthanasies</td>
<td>119</td>
<td>70</td>
<td>62</td>
<td>63–77</td>
<td></td>
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</tbody>
</table>

* Cette question s’adressait aux vétérinaires employés de l’échantillon. La proportion de vétérinaire employeur/employé au sein de la population n’étant pas disponible, il est impossible de standardiser cette donnée.

Les demandes (53 %). Effectivement, la moitié de l’échantillon considère que la pratique de l’euthanasie de convenance provoque un stress relié à la fatigue de compassion alors que l’autre moitié est en désaccord avec ce constat. Une ambivalence a aussi été identifiée auprès des vétérinaires concernant le possible avantage que procure l’acceptation des demandes d’euthanasie de convenance afin de garder un contrôle sur la situation pouvant être précaire pour l’animal (54 %). Dans cette situation, la moitié de l’échantillon considère qu’en acceptant de procéder à des euthanasies de convenance, elle a la satisfaction de garder le contrôle de la situation et de la destinée de l’animal concerné. L’autre moitié est en désaccord avec ce constat.

L’analyse des réponses de la quatrième catégorie de questions, qui s’intéressent aux intérêts des propriétaires d’animaux de compagnie au sein du dilemme, a démontré que les vétérinaires considèrent qu’il est du droit du propriétaire de faire la demande d’euthanasie de convenance pour son animal (65 %). Toutefois, les vétérinaires ne considèrent pas qu’un refus face à une telle demande représente un non-respect du propriétaire (36 %). Les vétérinaires identifient le refus de procéder comme étant une forme de jugement du professionnel face au processus réflexif du propriétaire concernant sa décision (59 %).

L’analyse des réponses de la cinquième catégorie, qui vise la description du rôle du médecin vétérinaire, a démontré que les vétérinaires perçoivent qu’ils doivent protéger leurs patients en minimisant les souffrances physiques (99 %) et psychologiques (99 %) et défendre leur bien-être (99 %).

La perception des vétérinaires de leurs rôles en pratique consultative a été définie de différentes façons par les répondants. Les vétérinaires se perçoivent toujours comme des défenseurs des intérêts des clients (48 %) et parfois comme des défenseurs des intérêts des clients (48 %). Les vétérinaires considèrent aussi qu’ils ont un devoir d’éducation.
Les analyses de Chi-carré effectuées afin de vérifier si certaines variables démographiques indépendantes avaient un impact sur le patron de réponse n’ont pas démontré de variation significative pour les catégories de questions 1 et 5 à 8. Les variations relatives aux données démographiques pour les questions des catégories 2 à 4 sont présentées dans la section rapportant les résultats de l’analyse factorielle.

**Analyse factorielle**

L’analyse factorielle permet de mettre en lumière des liens sous-conscients dans les réponses recueillies. Pour ce faire, l’analyse factorielle utilise un logiciel qui permet de vérifier si des concepts émanant de ces profils de réponses. Dans cette analyse, les questions 2.1 et 2.4 ont été retirées suite à la première analyse factorielle en raison de la qualité de représentation inadquate. Suite à la seconde analyse, deux facteurs latents ont été identifiés avec la contribution de huit questions pour le facteur 1, six pour le facteur 2 et quatre questions contribuant aux deux facteurs : q4.2, q3.3, q3.4 et q3.5 (Tableau 3). En évaluant l’ensemble des questions regroupées dans le facteur 1, ce dernier a été interprété comme représentant la volonté des vétérinaires de respecter l’autonomie décisionnelle des propriétaires. En évaluant l’ensemble des questions regroupées dans le facteur 2, ce dernier a été interprété comme représentant l’importance des liens relationnels entre le propriétaire de l’animal et le vétérinaire lors de prise de décision en pratique consultative. Les coefficients de saturation de ces questions se situaient entre 0,409 et 0,790 pour le premier facteur et entre 0,425 et 0,822 pour le second, avec une variance totale expliquée de respectivement 38,2 % et 16,4 % (Tableau 3). La mesure de Kaiser-Meyer-Olkin valait 0,833, indiquant que l’adéquation de la solution factorielle était bonne. La cohérence interne était assurée avec une valeur obtenue pour l’indice alpha de Cronbach supérieur au seuil de 0,7 défini comme acceptable.

Ensuite, une évaluation de l’impact des variables démographiques indépendantes sur les facteurs identifiés a été effectuée. Le facteur 1 a été associé au milieu de pratique et au nombre d’années de pratique mais pas au genre ni au statut au sein de l’entreprise vétérinaire (Tableau 4). Le facteur 1 était statistiquement plus élevé pour les vétérinaires travaillant dans le milieu rural en comparaison avec ceux travaillant dans le milieu urbain et pour les vétérinaires ayant plus de 16 ans de pratique en comparaison avec les vétérinaires ayant entre 0 et 5 ans et entre 6 et 10 ans de pratique. Le facteur 2 était associé avec le nombre d’années de pratique ou bien avec le statut au sein de l’entreprise vétérinaire (Tableau 4). Il existe une forte association entre les deux variables, les employeurs ayant en moyenne davantage d’années de pratique (Chi-carré de Pearson = 46,371, ddl = 3; P < 0,001). La valeur du facteur 2 était statistiquement plus élevée chez les employeurs que chez les employés et était d’autant plus grande lorsque les années de pratique augmentaient (Tableau 4).
L'OMVQ a statué que la notion de bien-être animal doit être définie en termes d’adéquation entre le milieu de vie de l’animal et ses besoins éthologiques et physiologiques incluant, évidemment, la notion d’absence de souffrance et de stress injustifiés. Les vétérinaires ayant répondu à cette étude ont défini le bien-être animal en corroborant la position de leur ordre professionnel. Ce résultat complémente la conclusion de l’analyse qualitative qui suggérait que les vétérinaires décrivaient la problématique de l’euthanasie de convenance en référence uniquement à la souffrance physique et au stress émanant des manipulations. Il est à cet égard paradoxal que les vétérinaires continuent de pratiquer en majorité les euthanasies de convenance malgré le fait qu’ils identifient clairement cette pratique comme étant néfaste au bien-être animal. Par ce fait, les vétérinaires interrogés démontrent une vision similaire à celle défendue par Yeates concernant la place de la mort dans l’évaluation du bien-être d’un animal. La mort est donc évaluée non seulement par la méthode employée pour l’induire mais aussi dans la perspective qu’elle atteint foncièrement le bien-être d’un animal en santé qui a intérêt à poursuivre sa vie.

L’analyse factorielle a démontré la présence de deux facteurs latents dans les profils de réponses. Le profil de répondant décrit par le facteur 1 démontre que les vétérinaires accordent de l’importance au respect de l’autonomie décisionnelle du client. L’autonomie est une valeur prédominante dans les écrits de Beauchamp et Childress, auteurs reconnus dans le domaine de l’éthique médicale humaine (18). Ces auteurs expliquent qu’il est possible d’évaluer la justesse éthique d’une action en médecine humaine en l’évaluant selon quatre facteurs qui sont l’autonomie, la justice, la bienveillance et la non-malveillance. Le respect de l’autonomie du patient est donc un élément essentiel lors de pratique consultative en médecine humaine. C’est la raison pour laquelle une position paternaliste de la part du praticien humain envers son patient est difficile à justifier éthiquement. Il est possible d’extrapoler cette valeur au domaine de la médecine vétérinaire. Toutefois, une nuance s’applique, car ici, le sujet vers qui ce respect est dû n’est pas l’animal-patient, mais bien le propriétaire-client. La présence de l’allègement du médecin vétérinaire envers le client-propriétaire et non envers l’animal-patient est mise de l’avant. Les médecins vétérinaires acceptant de procéder à des euthanasies de convenance en justifiant leurs décisions par une argumentation basée sur le respect de l’autonomie décisionnelle du propriétaire démontrent donc du même coup qu’ils perçoivent le propriétaire comme étant le sujet principal de leur attention. Le propriétaire devient donc en quelque sorte le patient dans cette relation.

Le facteur 1 a été corrélé avec la variable indépendante représentant le milieu rural. Il est possible d’expliquer ce lien par la place prépondérante que les propriétaires d’animaux en milieu rural occupent auprès de leurs animaux. Il est reconnu dans la pratique des animaux de consommation que le propriétaire a une expertise non négligeable concernant la santé et les décisions médicales de ses animaux (9). Il est donc possible que les vétérinaires travaillant dans ce milieu soient plus enclins à accepter les décisions des propriétaires de par leurs habitudes à côtoyer des producteurs. De plus, le milieu rural est reconnu par la présence importante de la vision instrumentale de l’animal.
Tableau 4. Association entre les facteurs 1 et 2 et les variables : milieu de pratique (Milieu), années d’expérience (Pratique), genre ou statut au sein de l’entreprise vétérinaire (Statut)

<table>
<thead>
<tr>
<th>Facteur 1</th>
<th>Modèle complet</th>
<th>Coefficient de régression Estimé</th>
<th>Valeur de P</th>
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<tr>
<td>6–10 ans</td>
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<tr>
<td>11–15 ans</td>
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<tr>
<td>Genre</td>
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Analyses multivariées

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<th>Pratique et Statut avec interaction</th>
<th>Pratique et Statut sans interaction</th>
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Reference catégorie a Urbain; b 16 ans et plus; c Homme; d Employeur.

dans les activités agricoles. En effet, sur une ferme, l’animal a un rôle de production et est perçu comme une unité de production. Dans ce système, la valeur de la vie animale est donc intrinsèquement reliée à son utilité. Le milieu urbain pour sa part est reconnu pour sa diversité de vision concernant l’animal. Il est donc possible que ce résultat corrobore cette vision instrumentaliste de l’animal. Ce système d’attribution de valeur a été décrit par Morgan et MacDonald et a été identifié comme un élément déterminant dans l’évaluation de dilemme éthique propre à la profession vétérinaire (5).

Le facteur 2 a été interprété comme représentant les liens relationnels entre le propriétaire de l’animal et le vétérinaire. Lorsqu’interrogés sur leurs rôles lors de pratique consultative, les vétérinaires ont décrit leurs rôles selon un vaste éventail de possibilités. Il est possible que ces rôles varient selon les circonstances présentes en pratique consultative. Ceci démontre que les vétérinaires ne perçoivent pas leur rôle comme étant un rôle exclusif et précis lorsqu’ils sont confrontés à une demande d’euthanasie de convenance. Le facteur 2 identifie la priorité accordée par le vétérinaire à la relation avec son client lors de pratique consultative. Le résultat obtenu concernant les pressions émanant de la clientèle sur le vétérinaire afin de le pousser à accepter la pratique de l’euthanasie de convenance est aussi un élément qui soutient les constats mis de l’avant par le facteur 2. L’animal est important pour le vétérinaire mais les décisions ne seront pas prises au détriment de la relation entre le vétérinaire et le propriétaire de l’animal. Tannenbaum, reconnu comme un pionnier dans le domaine de l’éthique vétérinaire, décrit la pluralité des relations et des allégeances pouvant être trouvées dans la pratique de la médecine vétérinaire (9). Tannenbaum décrit cette double allégeance dans les cas où les intérêts des animaux se retrouvent diamétralement opposés à ceux de leurs propriétaires qui sont les payeurs du service. En ce qui concerne le dilemme de l’euthanasie de convenance, les vétérinaires peuvent prioriser leur allégeance envers l’animal et refuser de pratiquer l’acte et d’un autre côté ils peuvent accepter de le faire et démontrer une allégeance envers les propriétaires. Une acceptation des demandes d’euthanasie démontrerait que le vétérinaire apporte une plus grande attention aux besoins et intérêts de son client. Au contraire, des refus de procéder à des euthanasies de convenance démontreraient une plus grande importance portée aux intérêts de l’animal. Ainsi, dans un souci de garder une bonne relation avec la clientèle, les vétérinaires acceptent de procéder aux euthanasies de convenance. Yeates et Main ont également confirmé la présence de la notion de double loyauté, mais cette fois en l’étudiant directement dans le contexte général de l’euthanasie tel que vécu par les vétérinaires au Royaume-Uni (3). Dans leur étude, les vétérinaires refusant les demandes d’euthanasie de convenance démontraient une prédisposition à mettre les intérêts des animaux en priorité.
Les résultats représentés par le facteur 2 corroborent ces écrits de Tannenbaum et de Yeates et Main concernant la double allégresse à laquelle font face les vétérinaires.

L’étude qualitative précédemment effectuée auprès de vétérinaires québécois dans le but de décrire la situation de l’euthanasie de convenance des animaux de compagnie montrait que les vétérinaires n’identifiaient pas l’ensemble des intérêts des acteurs impliqués dans ce dilemme (7, 8). En fait, les vétérinaires n’évaluaient le dilemme que selon une perspective restreinte en ce qui concerne les intérêts des animaux. Les vétérinaires avaient décrit les intérêts des animaux d’un point de vue de la souffrance physique et psychologique pouvant être ressentie lors des actes d’euthanasie. En aucune circonstance, les vétérinaires n’avaient évalué le dilemme sous l’angle que les animaux sains ont intérêt à poursuivre leur vie. Dans la présente étude, les vétérinaires répondants n’ont pas démontré de lacunes dans la reconnaissance des intérêts de chaque acteur principal (propriétaire, animal, vétérinaire) dans ce dilemme. Ils avaient donc une bonne vision de l’impact des décisions concernant les euthanasies de convenance sur l’ensemble des acteurs impliqués dans le dilemme.

Il est important de prendre en considération que l’impact de la relation avec la clientèle peut aussi être influencé par la représentativité des répondants appartenant au groupe des employeurs et des vétérinaires ayant un plus grand nombre d’années d’expérience. En effet, tel que mentionné dans la section des résultats, le nombre de vétérinaires employeurs est de plus en plus important au fur et à mesure que les vétérinaires prennent de l’expérience en clinique. L’importance de la satisfaction de la clientèle est un élément important en médecine vétérinaire mais est aussi un élément non négligeable dans une entreprise. En tant qu’employeur, il peut être normal que les pensées concernant l’euthanasie de convenance reflètent l’impact sur la relation professionnel-client.

Finalement, les facteurs 1 et 2 sont intrinsèquement liés entre eux, car ils représentent l’importance de la relation d’affaire existante entre le vétérinaire et son client. Il ne faut pas oublier que la pratique vétérinaire est une pratique privée et que le revenu des vétérinaires dépend de leur clientèle. Il est donc difficile de refuser catégoriquement les demandes de sa clientèle. Nonobstant, il est possible d’engager un dialogue sur la question et d’aboutir à une décision commune. Il faut également noter que la clientèle exerce une pression sur la profession afin que les vétérinaires continuent d’accepter cette pratique. L’analyse factorielle a permis de mettre en évidence deux facteurs inconscients dans les réponses des vétérinaires : le souci de respecter l’autonomie du propriétaire de l’animal et l’importance de maintenir un bon lien relationnel avec ce dernier. Ces deux facteurs sont des arguments clés permettant de mieux comprendre les décisions cliniques lors des euthanasies de convenance. En effet, ces deux facteurs corroborent l’importance pour le vétérinaire de respecter les demandes de sa clientèle, même si elles vont à l’encontre de leurs convictions concernant le bien-être animal. Advenant que les vétérinaires se positionnent de plus en plus fermement sur les dilemmes éthiques, il serait intéressant de suivre l’évolution des positions des vétérinaires par rapport à ces dilemmes et d’en examiner les conséquences futures sur la pratique de l’euthanasie de convenance des animaux de compagnie au Québec.

Limitations
En considérant le nombre potentiel de réponses ayant pu être collectées, le taux de réponses au questionnaire utilisé pour collecter les données fût de 19% (248 réponses sur une possibilité de 1302). Toutefois, 248 vétérinaires se sont rendus sur la page web du questionnaire et 185 d’entre eux ont fourni un ensemble de réponses complet permettant une analyse, ce qui représente un taux de réponse de 74% parmi ceux qui se sont montrés intéressés. Quoique le premier taux puisse à première vue sembler faible, il est reconnu qu’en moyenne un taux de 11% est obtenu dans les sondages externes (19). Le taux de réponse à la présente étude est donc nettement au-dessus de la moyenne. Le biais potentiel provoqué par le taux de non-réponse ne peut être ignoré, mais ne permet pas de juger de la qualité de la représentativité des données recueillies (20).

L’analyse factorielle a permis de déceler la présence de deux profils inconscients dans les réponses recueillies dans cette
étude. Toutefois, l’analyse factorielle ne permet pas d’évaluer la prévalence de ces profils au sein de l’échantillon étudié. Une absence de données comparatives entre les pratiques vétérinaires canadiennes ne permet pas d’extrapoler les informations recueillies dans cette étude aux autres populations vétérinaires canadiennes.

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Comparison of methicillin-resistant *Staphylococcus pseudintermedius* adherence to 2 canine limb salvage endoprosthesis implants

Alim Nazarali, Ameet Singh, Shauna Morrison, Thomas W.G. Gibson, Joyce Rousseau, J. Scott Weese, Sarah E. Boston

**Abstract** — The objective of our study was to compare adhesion of methicillin-resistant *Staphylococcus pseudintermedius* (MRSP) to stainless steel (SS) and to tantalum (TA) canine limb salvage endoprosthesis implants in an *in vitro* experimental study. The median of the mean log10 colony forming units/mL for adherent MRSP was 4.96 (range: 4.63 to 6.33) for the TA endoprosthesis and 4.31 (range: 3.86 to 5.05) for the SS endoprosthesis (*P* = 0.009). Although the trabecular and porous design of the TA endoprosthesis provides mechanical benefits over the SS endoprosthesis, it may increase the risk of developing infection due to higher levels of bacterial adherence.

**Résumé** — Comparaison de l’adhérence de *Staphylococcus pseudintermedius* résistant à la méthicilline à deux implants d’endoprothèse pour sauver des membres canins. L’objectif de notre étude consistait à comparer l’adhésion de *Staphylococcus pseudintermedius* résistant à la méthicilline (MRSP) à des implants d’endoprothèse en acier inoxydable (AI) et en tantale (TA) pour sauver des membres canins lors d’une étude expérimentale *in vitro*. La médiane des moyennes en log10 des unités formateurs de colonies/mL pour le MRSP adhérent était de 4,96 (écart : de 4,63 à 6,33) pour l’endoprothèse TA et 4,31 (écart : de 3,86 à 5,05) pour l’endoprothèse d’AI (*P* = 0.009). Même si la conception trabéculaire et poreuse de l’endoprothèse de TA offre des avantages mécaniques par rapport à l’endoprothèse d’AI, elle peut accroître le risque de développer une infection en raison des taux supérieurs d’adhérence bactérienne.

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**Introduction**

Osteosarcoma (OSA) is a malignant primary bone tumor that is locally aggressive, highly metastatic, and accounts for 80% of primary bone neoplasia in dogs (1). The appendicular skeleton is the main site of OSA, with the distal radius being the most commonly affected site (1). Various curative-intent and palliative treatments for canine OSA have been described, including limb amputation, limb-sparing surgery, radiation therapy, and chemotherapy (1). Local control is most often achieved with limb amputation (1). Surgical limb salvage is another option in dogs, with the distal radius being the most common site for this procedure (1,2). Limb salvage for OSA of the distal radius involves resection of the affected bone and replacement with an endoprosthesis (1–3). The limb salvage endoprosthesis is affixed with a plate that spans the carpus and creates an ankylosis of the joint. Limb salvage in dogs is associated with a high rate of complication (2,4). Limb amputation is more commonly performed due to the decreased cost, as well as the decreased risk of local recurrence, surgical site infection (SSI), and implant failure. However, amputation may not be a viable option for some patients, such as large or giant breed dogs with severe osteoarthritis or neurological disease, or in some cases, the owner may not accept limb amputation.

Surgical site infection is the most commonly reported post-operative complication following limb salvage for OSA, with reported rates as high as 68% (5). Surgical site infections in cases of limb salvage can be challenging to treat effectively due to the limited soft tissue coverage in this area and the large implant which is likely colonized with bacterial biofilms and cannot be removed.

Surgical site infections can be caused by a range of pathogens, but methicillin-resistant *Staphylococcus pseudintermedius* (MRSP) is of particular concern in dogs because of its emergence and rapid spread. This multidrug resistant pathogen has been
documented to be the most common cause of SSI in some veterinary hospitals (6). Methicillin-resistant *S. pseudintermedius* has the ability to form a bacterial biofilm, making infection with this species of bacteria a particular concern for implant-related procedures (7). Bacterial biofilms are communities of bacteria that are coated in a self-produced carbohydrate layer, also termed extracellular polymeric substance (8). The bacteria within a biofilm are physically protected from the actions of exogenously administered antimicrobials and the host immune system (8). Bacteria within a biofilm are challenging to eradicate and can be a cause of intermittent clinical signs which may include inflammation, pain, and the development of draining tracts which can be attributed to the intermittent release of active planktonic bacteria from the biofilm (8). Because limb salvage requires permanent placement of large implants, the presence of a biofilm causing chronic infections can be catastrophic.

The material that makes up a surgical implant is one variable that could alter bacterial adherence to the implant and biofilm production. Most orthopedic implants are comprised of either stainless steel (SS) or tantalum (TA). Contradictory evidence can be found in the medical literature regarding the relative susceptibility of these 2 implant materials to bacterial adherence, with some studies reporting that TA has reduced bacterial adherence compared to SS and others reporting that there is no difference between the 2 metals (9,10). Tantalum (TA) is a rare and corrosion-resistant metal that is being used with increasing frequency for surgical implants based on its osteophilic properties (11). In a study comparing the bacterial adhesive properties of equal sized disks of various metals (including SS, TA, and TI), TA had the lowest amount of bacterial adhesion to its surface (11).

Another factor that has the potential to alter bacterial adherence is the implant structure and design. Tantalum implants are produced with a trabecular and porous design, which allows for increased bone in-growth and soft tissue attachment to the implant (12). Another major benefit to the porous implant design is that screws can be placed directly into the implant, allowing the surgeon to place more screws in the implant and to handle the endoprosthesis in a manner similar to bone (3). A potential drawback to having an implant with a porous design is an increased surface area that could lead to increased bacterial adhesion and subsequent biofilm formation with potential for increasing SSI risk.

It is not known if there is a difference in the propensity for bacterial adhesion between 2 distal radius endoprostheses comprised of different metals. The objective of this study was to compare the adhesion of MRSP on 2 commercially available limb salvage endoprostheses, one comprised of SS and the other TA.

**Materials and methods**

**Endoprostheses**

Two limb salvage endoprostheses were used: i) 98-mm Radius SS B limb sparing endoprosthesis (Veterinary Orthopedic Implants, Saint Augustine, Florida, USA), and ii) 99-mm TA distal radius oncology endoprosthesis (Biomedtrix LLC, Boonton, New Jersey, USA).

**MRSP isolates**

Ten, epidemiologically unrelated, MRSP isolates from canine infections that had previously been determined to be strong biofilm producers (7) were selected. Isolates had been identified as MRSP by species-specific polymerase chain reaction (PCR) and detection of mecA by PCR or PRP2a by latex agglutination test (13). Isolates were stored at −80°C on cryopreservation beads.

**MRSP adherence to endoprostheses**

Isolates were sub-cultured onto blood agar plates and incubated aerobically for 24 h at 37°C. Resulting colonies were used to generate 0.5 McFarland standard [10⁸ colony-forming units (CFU)/mL] suspensions in 400 mL Tryptone Soy Broth (TSB) + 1% glucose. Testing was done in triplicate for every MRSP isolate and prosthesis type combination. Endoprostheses were immersed in individual suspensions and incubated for 24 h at 37°C. One of each plate type was added to 400 mL TSB+1% glucose without bacteria to serve as a negative control.

After incubation, containers were drained of broth and plates were rinsed 3 times with 50 mL phosphate-buffered saline (PBS) to remove non-adherent bacteria. Following rinsing, plates were transferred into sterile vessels containing 400 mL PBS and sonicated (Ultrasonic cleaner model 2510; Branson Ultrasonic, Danbury, Connecticut, USA) for 10 min to remove adherent bacteria, followed by 1 min of vortexing to ensure even suspension. Resulting suspensions were used to create serial dilutions from 1:1 to 1:10³. A 100-μL aliquot of each dilution was inoculated onto blood agar and incubated for 24 h at 37°C. The following day, the CFUs were manually counted and recorded. Counts on plates containing between 20 and 200 distinct colonies were used to calculate mean CFUs/mL for each endoprosthesis type and MRSP isolate combination.

Endoprostheses were re-used for subsequent trials. Following the final sonication step of each trial, the plates were submerged in 70% alcohol until time of re-use, then allowed to air-dry before introduction into 0.5 McFarland standard suspension for the next trial. To confirm complete killing of all MRSP present, all post-ethanol plates were sonicated in sterile PBS, the resulting suspensions were plated on blood agar, and assessed for bacterial growth after 24 h of incubation at 37°C. To ensure that re-using the endoprostheses would not alter the results, 1 SS endoprosthesis was inoculated using a single isolate for 10 subsequent trials and the impact of re-use of an implant on CFU counts was assessed.

**Statistical analysis**

Data were organized and compared using commercially available statistical analysis software (JMP 11.0; SAS Institute, Cary, North Carolina, USA). Normality was assessed using the Shapiro-Wilk test. Data that were not normally distributed were compared using a Wilcoxon rank-sum test. The impact of implant re-use on CFU count was evaluated using linear regression. A P-value < 0.05 was considered significant.

**Results**

A Shapiro-Wilk test determined that the data were not normally distributed (P ≤ 0.001 for both endoprostheses) and therefore
A Wilcoxon rank-sum test was used to compare the endoprostheses. Adherent bacteria were identified on all plates following inoculation. The median of the mean log_{10} CFU/mL was 4.96 (range: 4.63 to 6.33) for the TA endoprosthesis and 4.31 (range: 3.86 to 5.05) for the SS endoprosthesis (P = 0.009) (Figure 1). Re-use of endoprostheses for subsequent trials did not significantly alter CFU counts (P = 0.92).

**Discussion**

The ability of bacteria to adhere to foreign materials and form on implants is important for the development of implant associated SSIs and, therefore, might be relevant when selecting implant materials. In this study, MRSP adherence to the SS endoprosthesis was lower than adherence to the TA endoprosthesis. This is in contrast to a previous study that reported lower bacterial adherence to TA compared to SS and TI using *Staphylococcus aureus* and *Staphylococcus epidermidis* (11). However, that study used equal-sized discs without porosity for comparison (11). While there may be a difference in adherence among staphylococcal species, it is plausible that the results noted here are an effect of porosity and material design, as opposed to inherent material properties. Furthermore, the TA endoprosthesis has a trabecular and porous design that allows for increased bone in-growth and soft tissue attachment, and perhaps also increased bacterial adherence because of greater surface area.

There are several benefits of the TA endoprosthesis compared with the SS endoprosthesis. The trabecular and porous design allows for superior bone and soft tissue attachment and screws can be placed directly through the TA endoprosthesis. This eliminates the need to compromise implant placement by having to align designated screw holes which allows for increased screw purchase in the prosthesis. These factors may in turn decrease the potential for implant failure and instability. The assessment of relative implant stability between these 2 implants would be useful, but is beyond the scope of this study.

The finding that TA endoprostheses allow for increased bacterial adherence, potentially increasing the risk of SSI development compared with SS endoprostheses may have clinical implications. However, this was an *in vitro* study and SSI risk is complex and multifactorial, and the clinical aspects of these findings need to be determined. Furthermore, SSI is only 1 relevant outcome for any surgical patient, and benefits and ease of use of individual implants must be considered.

In summary, this study provides information about inherent differences in MRSP attachment to 2 canine limb salvage endoprostheses and highlights the need to evaluate implant surface characteristics in addition to material properties. With the development of more biocompatible implants such as the TA endoprosthesis, new challenges may be discovered that hinder potential benefits. The promise of a silver-based coating for TA prostheses and tantalum limb-sparing prosthesis plates highlights the need to evaluate implant material differences in MRSP attachment to 2 canine limb salvage endoprostheses. A prospective clinical comparison of two different limb-sparing techniques. Vet Surg 2006;35:518–533.


Acknowledgments

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**References**


Prevalence of obesity in the equine population of Saskatoon and surrounding area

Hayley R. Kosolofski, Sheryl P. Gow, Katherine A. Robinson

Abstract — A retrospective study determined the prevalence of obesity and over-conditioning in horses in Saskatoon, Saskatchewan. Body condition score (BSC) was assessed for 290 horses from the Field Service practice at the Western College of Veterinary Medicine. The median BSC of horses was 6; however, 59 (20.3%) horses were classified as over-conditioned, and 24 (8.3%) as obese.

Résumé — Prévalence de l’obésité dans la population équine de Saskatoon et de la région. Une étude rétrospective a déterminé la prévalence de l’obésité et du surconditionnement des chevaux à Saskatoon, en Saskatchewan. La note d’état corporel (NEC) a été évaluée pour 290 chevaux à la pratique sur le terrain du Western College of Veterinary Medicine. La NEC médiane des chevaux était de 6, cependant 59 (20,3 %) chevaux étaient classés comme étant surconditionnés et 24 (8,3 %) comme obèses.

Equine obesity is an emerging health and welfare problem which may go unnoticed or under-reported. Horse owners commonly underestimate the condition of their horse, especially if their horse is overweight (1,2). Veterinarians need to be proactive in identifying overweight horses and educating clients about the risks and management of the overweight horse.

The conditions for which obesity is considered a risk factor include laminitis, insulin resistance, hyperlipemia, and equine metabolic syndrome (EMS) (3). Excessive deposition of fat may contribute to exercise intolerance, osteoarthritis, thermoregulatory inefficiency, abnormal reproductive performance, and the development of strangulating lipomas (1,4).

Body condition scoring offers a quick and objective assessment of a horse’s condition. It can easily be used by horse owners and veterinarians to determine if a horse is over- or under-weight, and to monitor weight loss or gain. The 9-point body condition scoring system described by Henneke et al (5), using Kohnke’s modification (6), is a relatively good predictor of body fat in horses (7). A body condition score (BCS) of 6.8 or greater (on the 9-point scale), estimates total body fat to be greater than 20%, thus identifying a horse in need of a weight loss program (7).

Studies in the United Kingdom have shown that 45% of riding horses were classified as fat or very fat, and prevalence of obesity varied from 27% at the end of winter to 35% at the end of summer (1,8). Similarly, in Denmark, 24% of mature Icelandic horses were considered overweight or obese, and in Australia 23% of horses were considered obese; ponies were more likely to be obese than were horse breeds (2,9). Prevalence of obesity and over-conditioning in the United States has been estimated at 51% in Virginia and 48% in North Carolina (10,11). The USDA APHIS NAHMS Equine Study (12) estimated the prevalence of obesity in horses in the United States at 1.7%, but this is likely an underestimate based on other reported work (10,11). Interestingly, a recent study using animal welfare control data in Sweden showed that premises were more likely to have under-conditioned, rather than over-conditioned horses (13). Little data are available in Canada; in Prince Edward Island, the mean BCS for non-racing horses was reported as 5.7 on a 9-point scale (14). To the authors’ knowledge, there are no studies investigating the prevalence of obesity in horses in western Canada. The primary objective of this study was to obtain prevalence estimates for obesity in the equine population of Saskatoon and surrounding area. A secondary objective was to evaluate potential risk factors associated with over-conditioning or obesity in this population. Age, gender, breed, and BCS were obtained from the medical records of 290 horses seen for routine examination from March to July 2014 by Equine Field Service at the Veterinary Medical Centre (VMC) at the Western College of Veterinary Medicine (WCVM) in Saskatoon, Saskatchewan. Breed, age, and gender distributions were representative of the population seen at the hospital.
The BCVs of horses were assessed by 7 trained equine clinicians using the Henneke 9-point scale in which a score of 1 is very poor condition and a score of 9 is extremely fat (5). Horses with a BCV of ≤ 3 were classified as thin, a BCV between 4 and 6 was classified as ideal, a BCV of 7 was classified as over-conditioned, and a BCV of 8 or 9 was classified as obese.

Breed category was defined by considering the breed, body type, and frame size (Table 1). Horses were considered as a light breed (14.2 to 16 hands high (hh), light build), a pony (under 14.2 hh, light build, known pony breed), a warmblood (> 16 hh, moderate to heavy build, known Warmblood breed), a draft (> 16 hh, heavy build, known draft breed), or unknown (for which there was no record or description of the breed/type allowing for categorization, or the horse did not fit into the other categories as per the description) breed type.

Owners of enrolled horses were contacted via e-mail and telephone to participate in a survey regarding the type, frequency, and intensity of their horses’ activity as well as their horses’ turnout and access to grass. Exercise was classified as none, light, moderate, or heavy/very heavy as defined per the US National Research Council’s Nutrient Requirements of Horses (15). The types of activity in which the horses participated were classified as none/retired, pleasure riding only, dressage/dressage plus another activity, hunter/jumper, lesson horse, trail horse, or other. Housing was classified as follows: stall with daily turnout, paddock, pasture, or stall only. Daily access to grass included no access (0 h/day), all day access (24 h/day), or partial day access.

Analyses were performed using commercial statistical software (IBM SPSS Statistics 23.0). For the risk factor analysis, body condition scores were dichotomized into normal/thin (BCV ≤ 6) and over-conditioned/obese (BCV ≥ 7) and logistic regression univariate analyses were used to examine each of the following variables as potential risk factors for horses being classified as over-conditioned/obese (BCV ≥ 7): age, gender, exercise intensity, activity type, breed type, housing and access to grass. Age was analyzed as a continuous variable whereas gender was divided into females, males, and geldings. The other factors were analyzed in the categorical variables described.

The median BCV of the 290 horses in the Saskatoon, Saskatchewan area was 6 (range: 3 to 9) on a 9-point scale. Most of the horses (204, 70.3%) had an ideal BCV, but a large proportion of the horses (83, 28.6%) had a BCV ≥ 7 and were

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<td>6 (4 to 8)</td>
<td>11 (3.8)</td>
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<td></td>
<td>Dressage</td>
<td>7 (4 to 9)</td>
<td>9 (3.1)</td>
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<td>Lesson</td>
<td>6 (5 to 7)</td>
<td>7 (2.4)</td>
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<td>Trial</td>
<td>6 (5 to 8)</td>
<td>6 (2.1)</td>
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<td>78 (26.8)</td>
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<td>2 (0.7)</td>
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<td>43 (14.8)</td>
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<td>Paddock (&lt; 2 acres only)</td>
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<td>23 (7.9)</td>
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<td>Daily turnout</td>
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<td>Grazing access</td>
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<td>24 (8.6)</td>
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<td>Part of day</td>
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<td>18 (6.1)</td>
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<tr>
<td></td>
<td>All day</td>
<td>6 (4 to 9)</td>
<td>42 (14.8)</td>
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</table>

a Reference 1.
over-conditioned or obese. This is consistent with findings in other regions of North America and Europe that indicate obesity is a significant issue in equine populations.

Neither age nor gender influenced the likelihood that a horse would be overweight (Table 1). The median BCS was lower in horses 5 y of age and younger, compared with horses more than 5 y of age. Horses 5 y or younger had a median BCS of 5, compared to a median BCS of 6 for all other horses (Table 1). This is consistent with the physiological differences in young animals. Body condition scoring systems are less accurate when used in young and geriatric horses because of changes in muscle mass associated with aging, but this did not prove to be true in this population.

Breed differences in BCS were not compared as there were too many breeds in this population of horses. Instead, breeds were categorized into pony, light, warmblood, draft, and unknown breed type (Table 1), based on the breed of horse, the height of the horse, and the build of the horse. Horses were classified as unknown when no record or breed or type had been made and that information was not available. Based on breed categorization, there was no association between breed category and likelihood of over-conditioning/obesity (Table 1).

The duration and intensity of exercise also did not appear to be related to the horse’s BCS in this population. However, exercise is an important part of weight management and weight loss programs for horses, and was expected to be associated with the condition of the horse (Table 1). The reason for not finding an association between BCS and exercise intensity might be due to factors such as misclassification of the intensity of the exercise, a relatively small sample size and the potential variability among clinicians scores leading to misclassification of the BCS.

Housing and management was the only statistically significant variable related to BCS in this study. Management survey results were obtained for 84 of the 290 horses (Table 1). Horses that were housed exclusively on pasture were 8.8 times (P = 0.05) more likely to be over-conditioned or obese than horses that were housed in stalls with daily turnout. Thirty-five percent (8/23) of horses housed exclusively on pasture were classified as over-conditioned or obese, whereas only 6% (1/17) of horses housed in stalls with daily turnout were classified as over-conditioned or obese. This finding is likely due to owners being able to regulate the quantity of intake when horses are not exclusively housed on pasture. Horses that were housed in paddocks or horses that were housed in stalls exclusively were not significantly more likely to be over-conditioned or obese than horses housed in stalls with daily turnout (Table 1).

Seasonal variation in weight has been demonstrated in horses living outdoor, with the largest variation seen in horses on pasture (11). In the earlier months of the current study pasture may not have been adequate to meet the horses’ nutritional needs, whereas in the later months of the study pasture may have provided excess energy. Seasonality is a limitation of this study.

Body condition is determined by a balance between feed intake and exercise. Comparing only one factor of the equation does not represent the whole picture. For example, a horse receiving heavy exercise but fed in excess of their energy requirements could still be overweight. On the other hand, a horse receiving no structured exercise and an adequate amount of feed could be an ideal BCS. This concept is illustrated well by Thatcher et al (10) as they identified the feeding of 0 to 1.4 kg of grain as a risk factor for obesity. This volume of grain most likely represented a “treat” in addition to the horse’s daily diet, thus increasing their energy intake above their expenditure. Feeding larger volumes of grain was not identified as a risk factor by this group; most likely, this practice is used in horses performing intense exercise as a way to meet energy demands. When assessing a horse’s risk for obesity it is important to consider diet and exercise together, rather than separately.

Our findings align with previous work and demonstrate that 28.6% of the Saskatoon area horse population was overweight or obese. Obesity is a disease that can easily be treated by owner education and changes in horse management practices. While susceptibility to obesity and EMS may vary between breeds, the American College of Veterinary Internal Medicine consensus statement on EMS emphasizes that EMS and obesity can be prevented through good management practices (15). The key to controlling obesity is recognition and client education on management changes, such as diet and exercise, to promote weight loss. Owners commonly underestimate their horses’ body condition score, particularly if their horse is fat (1,2). It is important for veterinarians to educate clients on proper body condition and weight management to reduce obesity and associated health risks.

Acknowledgments

We thank Dr. Fabienne Uehlinger for her advice on the manuscript and the Equine Field Service clinicians at the WCVM for collection of the data as part of their medical records.

References


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Intrahepatic cholelithiasis in dogs and cats: A case series

Hideyuki Kanemoto, Kenjiro Fukushima, Hajime Tsujimoto, Koichi Ohno

Abstract — A retrospective study of intrahepatic cholelithiasis (IC) in 9 dogs and 2 cats was conducted. Only 1 dog showed clinical signs related to hepatobiliary disease before referral and during the follow-up period. Intrahepatic cholelithiasis might be a subclinical finding in both dogs and cats.

Résumé — Cholelithiase intrahépatique chez les chiens et chats : une série de cas. Nous avons réalisé une étude rétrospective de la cholelithiase intrahépatique (CI) chez 9 chiens et 2 chats. Seulement un chien manifestait des signes cliniques en lien avec la maladie hépatobiliaire avant la recommandation et durant la période de suivi. La cholelithiase intrahépatique pourrait être un résultat subclinique chez les chiens et les chats.

(Traduit par Isabelle Vallières)

Can Vet J 2017;58:971–973

Only a small number of studies in dogs, cats, and humans describe intrahepatic bile duct mineralization or intrahepatic cholelithiasis (IC) (1–6). Intrahepatic cholelithiasis has been reported to be associated with cholecytoliths (3) and extrahepatic bile duct obstruction caused by choleliths (1) in dogs, although the clinical significance of IC itself is unknown.

In humans, intrahepatic cholelithiasis is a rare disease and its pathological mechanisms are unknown (4–6). It may be associated with recurrent bacterial cholangitis, leading to the formation of liver abscesses or intrahepatic cholangiocellular carcinoma in some patients (6). Because IC can be life-threatening, removal of the cholelith(s) is usually performed (4).

The aim of this research was to conduct a retrospective study of a case series of canine and feline IC associated with cholecytoliths to identify the clinical features of this rare condition. Case records and images of all dogs and cats presented to the Veterinary Medical Center of the University of Tokyo (VMC) from April 2011 to August 2016 were reviewed by a single veterinarian (HK), and IC cases were identified by following a systematic protocol. First, medical records of cases were searched against diagnostic terms “cholelith” or “mineralization.” Radiographic images were then reviewed using Osirix imaging software to confirm IC as radiopaque structures within the liver parenchyma. Cases that had cholelith only in the gallbladder were excluded from the study. Clinical and clinicopathological information was obtained from the medical records, and a follow-up survey with the owners and/or primary veterinarian was conducted via telephone. All the owners of the dogs and cats included in the present study provided written informed consent for the use of medical records for research purposes.

Nine dogs (3 Cavalier King Charles spaniels, 2 mixed breeds, and 1 each of Welsh corgi Pembroke, miniature dachshund, toy poodle, and Japanese chin) and 2 cats (American shorthair, chartreux) were identified as having IC during the study period. The dogs included 4 castrated males and 5 spayed females, with a median age of 10 y (range: 5 to 12 y). The cats were both castrated males, aged 7 and 14 y. All animals were fed commercial dry food, were regularly vaccinated, and received prophylaxis against filariosis. No information was available on the history of use of an anti-parasitic agent, and no animals had a history of travel. The primary reasons for presentation to the VMC were:

• recheck or investigation of concurrent diseases (4 dogs; multicentric low-grade lymphoma, atopic dermatitis, hepatic nodular hyperplasia, and gastrointestinal tumor);
• cholelithiasis incidentally identified by the referring veterinarian (2 dogs and both cats);
• increase in liver enzyme activity without any clinical signs (2 dogs; 1 of which had temporary elevation of serum bilirubin concentration); and
• acute onset of vomiting with temporary jaundice (1 dog).

Biochemistry showed elevation of alanine transaminase activity (ALT: median: 68 U/L, range: 38 to 599 U/L) in 4 animals and elevation of alkaline phosphatase activity (ALP: median 412 U/L, range: 55 to 3284) in 7 animals. Of these, 1 dog had concurrent uncontrolled hyperadrenocorticism and another dog was administered prednisolone for atopic dermatitis. None of the other animals had been administered drugs that are known to cause an increase in liver enzyme activity.

All animals underwent abdominal radiography and ultrasonography. Radiographic findings showed that 5 dogs and 1 cat...
had radiopacities in the right upper abdomen (cholecystolith). Eight dogs and 1 cat were confirmed to have branched radiopaque linear lesions within the liver (Figure 1), 1 dog had a single linear radiopaque structure within the liver, and 1 cat had a small round radiopacity in the liver. Mineralization of other tissues was not observed in any case. Ultrasonography showed evidence of a hyperechoic branched linear structure or multiple discrete hyperechoic foci ranging from 1 to 4 mm in size in 8 dogs and 1 cat (Figure 2), both of which were accompanied by acoustic shadowing. In the gallbladder, mineralized sludge and/or hyperechoic material with acoustic shadows was also observed in all animals, with the exception of 1 cat. Subjectively dilated intrahepatic bile ducts were noted in 3 dogs (2 mm in all 3 cases). A thickened (3 mm) (7) or irregular gallbladder wall was also noted in 1 dog and 6 dogs, respectively.

Cholecystocentesis was conducted in 1 dog. Microscopic examination of bile revealed rod-shaped bacteria that were identified as *Bacillus* spp. by bacterial culture. Liver histopathology in an additional dog in which a liver biopsy was performed identified as *Klebsiella* spp. by bacterial culture. Hepatic degeneration and cholestasis were noted in all animals, with the exception of 1 cat. Subjectively dilated intrahepatic bile ducts were noted in 3 dogs (2 mm in all 3 cases). A thickened (3 mm) (7) or irregular gallbladder wall was also noted in 1 dog and 6 dogs, respectively.

One dog was started on treatment with trilostane for concurrent adrenal dependent hyperadrenocorticism at the referral veterinary practice, but no medication was administered for the intrahepatic cholelithiasis. One cat with a round cholelith was not treated at all. Ursodeoxycholic acid administration was started or continued in 6 dogs and 1 cat, and ursodeoxycholic acid with antibiotics (metronidazole or amoxicillin/clavulanate) was administered to 2 dogs. One miniature dachshund had a history of acute vomiting and icterus 11 d before its first admission that had completely resolved at the time of initial presentation. This dog showed the same clinical signs 1 mo after the initial diagnosis. At that time, examination of blood showed elevated serum total bilirubin concentration [53.0 µmol/L, reference range (RR): 1.7 to 8.6 µmol/L], C-reactive protein concentration (1809.5 nmol/L, RR: < 66.7 nmol/L), and increased ALP activity (3175 U/L, RR: 47 to 254 U/L). An abdominal ultrasound showed a common bile duct dilation (diameter: 4.6 mm) with an obstruction by a hyperechoic round structure, so choledochoduodenostomy was performed. There were concurrent multiple IC and cholelitholiths, although these were not removed during the surgery. Chemical analysis of the removed choledocholith revealed that 98% of the stone consisted of calcium carbonate and *Klebsiella* spp. was identified in the bile culture. Hepatic degeneration and cholestasis were identified on histologic examination of a liver biopsy. However, calcification was not observed microscopically. The dog was discharged uneventfully with ursodeoxycholic acid prescription, but follow-up information was not available thereafter.

Follow-up information was obtained for 8 dogs. Physical examination and biochemistry analysis were performed during the follow-up period in these 8 cases. Six of the 8 cases had re-evaluation of IC by diagnostic imaging, with abdominal radiography performed in 5 cases and abdominal ultrasonography in 4. None of the dogs experienced clinical signs, biochemical changes, or imaging findings indicating bile duct obstruction and/or hepatic failure during the follow-up period (median: 12 mo, range: 2 to 82 mo), but the cholelithiasis did not resolve in any case. Follow-up was not available for either cat in this study.

In this study, the clinical features and outcome of IC in dogs and cats were described. Since most of the animals were asymptomatic at the time of diagnosis and during the follow-up period, IC may be subclinical in some dogs and cats. Only a small fraction of the cases (1/11 in this study) developed an extrahepatic bile duct obstruction that required surgical intervention. The pathogenesis of bile duct obstruction in this case was confirmed to be a choledocholith, but whether this represented a stone that had migrated from the liver and/or gallbladder or formed independently is unknown.

Elevation of ALP activity and mild dilation of the intrahepatic bile duct were found in 7 and 3 cases, respectively, suggesting that a certain number of IC cases had intrahepatic cholestasis. In humans, it has been reported that cholestasis promotes IC; however, IC can induce cholestasis by disturbing bile excretion from the liver into the bile ducts (5,6). A causal relationship could not be determined based on the present study. Additionally, since liver histopathology was not available in most cases, other concurrent hepatic disease contributing to these changes cannot be ruled out.

In the present study, IC was found in dogs of various breeds, with the highest prevalence in Cavalier King Charles spaniels. Because of the small sample size, we were unable to analyze breed predisposition. The mean age at presentation (9.9 y) was similar to that for cholecystolithiasis (8.5 to 12 y) (2,8–10).
In a single case that underwent gallbladder stone analysis, calcium carbonate was detected as the major component, as in previous studies on canine cholecystoliths (1,2,8,10).

Bacteria were identified in 2 cases, specifically Klebsiella spp. and Bacillus spp. A relationship between cholelithiasis and bacterial infection of the biliary system has been described previously (11,12), and most of the bacterial species isolated from the bile were bacteria present in the intestinal microbiota (12,13). It is possible that biliary bacterial infection contributes to the pathogenesis of canine intrahepatic choleliths, similar to that of cholecystoliths. Intrahepatic cholelithiasis has not been described in most animals with hepatobiliary system infection (5,11,12,14), however, indicating that infection may not be the only mechanism of IC in dogs and cats. Further studies are necessary to clarify the pathogenesis of IC in animals. The pathogenesis of IC in humans has not been fully investigated; however, a complex mechanism including ethnicity, environmental, bacterial, and parasitic factors has been proposed (4–6).

The imaging findings described were not confirmed to be intrahepatic bile duct stones since pathology investigations did not confirm the presence of IC. However, most of the animals described here had concurrent mineralized material inside the gallbladder, suggesting that mineralization also occurred inside the intrahepatic bile duct.

Limitations of the present study include a relatively small number of cases, a short follow-up period, and incomplete clinical data such as lack of liver histopathology, bile culture, and cytology for most of the cases. Additional studies with a larger number of cases using more complete diagnostic evaluations are necessary to further evaluate this condition in dogs and cats.

In conclusion, IC may occur asymptptomatically in middle-aged to older dogs and cats. These patients may not show clinical signs of hepatobiliary disease during the follow-up period, although extrahepatic bile duct obstruction and associated clinical signs (jaundice and vomiting) may occur. The clinical significance of IC is still unknown.

References
Blackwell’s Five-Minute Veterinary Consult: Canine and Feline, 6th edition


For general practitioners and veterinary students who have been saved by Blackwell’s Five-Minute Veterinary Consult in the past, the newest 6th edition will not disappoint. This tome keeps with the foolproof A-Z organization of many (many) disorders, 846 of them to be exact. And when the alphabet fails you, this guide-to-all-things-small-animal is also searchable with a table of contents by organ system and of course, a detailed index. You will find the ailment you seek or it does not exist!

Once you have located the specific condition, each 1- to 3-page write-up contains the broad headings: Basics, Diagnosis, Treatment, Medications, Follow-up, and Miscellaneous. As a busy practitioner, you can skip down to the pertinent information needed to enlighten that owner waiting anxiously in the examination room.

Improvements for this 6th edition include: increased international contributions, increased and updated topics, and expanded appendices. For their 130-odd pages of information, the appendices are notable. Personally, I am a big fan of organizing loads of comparable information into charts for easy reference. Blackwell’s utilizes this chart format to comprehensively display toxicology tables, endocrine testing protocols, dog and cat “normals,” pain management agents, and a drug formulary.

Most of the appendices are valuable. With others, such as the drug formulary, I would more likely reach for Plumb’s (or search my phone’s formulary app), when faced with a pharmaceutical question. However, with Blackwell’s already in hand for a recent diagnosis, the formulary gives a brief verification of dosing or adverse effects. Keep in mind that this edition is only as up-to-date as is possible with a print format. Recent additions to the drug arsenal, such as telmisartan (Semintra) for chronic renal disease, are not even mentioned.

To amend for one downside to the book — minimal diagrams or photos, there is an accompanying online website with access to videos, client education handouts, PowerPoint figures, and a list of additional resources. The 354 client handouts alone are numerous, comprehensive, visually appealing, and in an easily downloadable and modifiable document format. The rest of the online content is disappointing. Only 5 videos are available and the 17 PowerPoints with moderate-quality images must be downloaded to be viewed. Hopefully this section will continue to be expanded.

In summary, Blackwell’s continues to be a go-to for the busy general practitioner, new graduate, and veterinary student looking to affirm or refresh their knowledge. The price-point is a good value and although much of the 2011 5th edition will still be relevant, it is especially worth replacing those 3rd or 4th editions.

Reviewed by Kyla Johnson, DVM, BSc, Associate Veterinarian, Creekside Animal Clinic, Vernon, British Columbia.
Case Report  Rapport de cas

Single incision laparoscopic-assisted ovariohysterectomy for an ovarian tumor in a dog

Daniel Lopez, Ameet Singh, Tanya F. Wright, Cathy Gartley, Meagan Walker

Abstract — This report describes a single-incision, laparoscopic-assisted ovariohysterectomy in a 6-year-old, intact female Keeshond dog for the staging and treatment of a left-sided ovarian tumor. Abdominal access was obtained using a modified-Hasson technique allowing for placement of a multi-channel, single incision laparoscopic surgery port. Following carbon dioxide insufflation, superficial laparoscopic exploration of the abdominal cavity was performed and then both ovarian pedicles were sealed and divided using a vessel-sealing device. Laparoscopic-assisted ovariohysterectomy was performed with the aid of a wound retractor for exteriorization of the mass. There were no perioperative complications and the patient was discharged 1 day after surgery. Histopathology of the mass revealed an ovarian teratoma. Telephone follow-up 608 days after surgery revealed a good clinical outcome. Single-incision, laparoscopic-assisted ovariohysterectomy is technically feasible for the treatment of selected ovarian tumors in the dog.

Résumé — Ovariohystérectomie à incision unique assistée par laparascopie pour une tumeur ovarienne chez une chienne. Ce rapport décrit une ovariohystérectomie à incision unique assistée par laparascopie chez une chienne Keeshond intacte âgée de 6 ans pour l’évaluation et le traitement d’une tumeur ovarienne du côté gauche. L’accès abdominal a été obtenu en utilisant une technique modifiée de Hasson pour le placement d’un accès chirurgical laparascopique à incision unique. Après l’insufflation de gaz carbonique, l’exploration laparascopique superficielle de la cavité abdominale a été réalisée et ensuite les deux pédicules ovariens ont été scellés et divisés à l’aide d’un dispositif de scellement des vaisseaux. L’ovariohystérectomie assistée par laparascopie a été réalisée à l’aide d’un rétracteur de plaie pour l’extérieurisation de la masse. Il n’y a eu aucune complication péri-opératoire et la patiente a reçu son congé 1 jour après la chirurgie. L’histopathologie de la masse a révélé un tératome ovarien. Un suivi par téléphone 608 jours après la chirurgie a révélé un bon résultat clinique. L’ovariohystérectomie laparascopique à incision unique est techniquement réalisable pour le traitement de certaines tumeurs ovariennes chez les chiennes.

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Canine ovarian tumors are rare, likely due to early ovariohysterectomy, and represent 0.5% to 1.2% of all canine neoplasms (1). Primary canine ovarian tumors are histopathologically classified as either epithelial, sex cord-stromal, germ cell, or mesenchymal in origin, with epithelial and sex-cord stromal tumors being the most commonly diagnosed (2). The degree of malignancy varies widely among histopathological types with epithelial and germ cell, specifically teratomas, classified as having the highest reported metastatic rates in the canine species mainly due to peritoneal dissemination (1–3).

Canine ovarian neoplasia is often not diagnosed until clinical signs warrant investigation, which include non-specific signs (anorexia, weight loss, lethargy), abdominal distension, palpable abdominal mass, ascites, vulvovaginal discharge, dyspnea, or abnormal estrus behavior (4,5). Ovariohysterectomy is the treatment of choice for ovarian tumors, and has been curative in some cases of benign disease (1). However, long-term prognosis is difficult to predict due to the lack of long-term outcome data (1,3).

Laparoscopic and laparoscopic-assisted procedures are becoming increasingly popular in veterinary medicine as a result of improved visualization, reduced postoperative pain, suspected reduction in incidence of surgical site infection, and shorter hospital stays (6–9). Specifically, dogs receiving multiport laparoscopic-assisted ovariohysterectomy (LAOVH) required less postoperative analgesia and had significantly shorter durations...
of blood glucose and cortisol elevations after surgery than dogs undergoing open ovariohysterectomy (OVH) (8). In human medicine, laparoscopic surgery has become the gold standard in the management of benign ovarian adnexal masses (10). Specifically, laparoscopic treatment of benign ovarian tumors, either by cystectomy or oophorectomy, results in reduced operative morbidity, reduced postoperative pain and analgesic requirement, decreased hospitalization duration, and shorter recovery period (10).

Compared to conventional multiport laparoscopy, single port laparoscopic surgery (SPLS) has become more popular for use in humans due to several benefits, including lower rates of port-site infections and higher patient satisfaction scores following laparoscopic hysterectomy (10–12). A recent comparison in dogs demonstrated decreased surgical time and decreased complications when SPLS was used instead of multiport laparoscopy (13). Single port laparoscopic surgery has been described for ovarioectomy, ovarioectomy + gastropexy, ovariohysterectomy, and cryptorchidectomy in dogs with good outcomes (13–17). In addition, a SPLS approach has recently been described for ovariohysterectomy in dogs with pyometra (18). A SPLS approach for planned staging and treatment of ovarian neoplasia has yet to be described in dogs, and is the purpose of this report.

**Case description**

A 6-year-old, 14.6 kg, intact female Keeshond dog was presented to the Ontario Veterinary College Health Sciences Centre (OVC-HSC) for further evaluation of an ovarian mass that was discovered at the time of surgery for OVH by the family veterinarian. Upon discovery of the ovarian mass, the procedure was abandoned and the dog was recovered from anesthesia. Upon presentation, physical examination of the patient revealed a 6-cm, ventral midline incision and vital parameters were within normal limits.

Preoperative staging included a complete blood (cell) count (CBC), a serum biochemistry profile, 3-view thoracic radiographs, and an abdominal ultrasound of the genitourinary tract. Blood analysis was unremarkable and 3-view thoracic radiographs did not reveal any abnormalities. Abdominal ultrasound of the genitourinary tract revealed a partially mineralized ovarian mass measuring 7 cm at its largest diameter within the left ovary and mild dilation of the uterine tubules with trace uterine fluid (Figure 1). Single port laparoscopic surgery OVH was recommended for treatment of presumptive left ovarian neoplasia. Ovariectomy was not considered based on the age of the dog as it is generally performed in young, healthy dogs (9).

**Surgical technique**

The patient was premedicated with dexmedetomidine (0.5 mg/mL; Zoetis Canada, Kirkland, Quebec), 5 μg/kg body weight (BW), IM, and hydromorphone chloride (2 mg/mL; Sabex, Boucherville, Quebec), 0.1 mg/kg BW, IM, and general anesthesia was induced using a 1:1 ratio of 0.5 mL of ketamine hydrochloride (50 mg/mL; Sabex) and midazolam (1 mg/mL; Sabex) IV. The patient was maintained under general anesthesia using isoflurane (Abbott Laboratories, North Chicago, Illinois, USA) in 100% oxygen. Antimicrobial prophylaxis was administered 30 min before surgery and every 90 min during surgery. Following induction, the patient was positioned in dorsal recumbency and the ventral abdomen was clipped and aseptically prepared cranially from the xiphoid, caudally to the pubis, and laterally to the proximal third of the flank. Approximately 3 cm of the previous 6-cm ventral midline incision was opened using sharp dissection. The linea alba was incised to gain access to the abdominal cavity. Two stay sutures were placed into the rectus sheath at the incisional margins. Two adjacent incisions were made, staggered, Carmalt forceps were attached to a SPLS port (SILS port: Coviden, Mansfield, Massachusetts, USA) to allow for its insertion into the abdomen, as previously described (15). The SPLS port was inserted and three, 5-mm cannulas were placed into the SPLS port. The abdomen was insufflated with CO₂ to a maximum pressure range between 10 to 12 mmHg using a pressure regulating mechanical insufflator (Endoflator; Karl Storz Veterinary Endoscopy, Goleta, California, USA). A 5-mm, 30°, 29-cm laparoscope (Hopkins II 0° and 30° 5-mm 29-cm Telescope, Karl Storz Veterinary Endoscopy) was placed within the caudal most cannula, and the abdomen was superficially explored in a clockwise fashion. Exploration revealed a slightly mottled appearance diffusely throughout the liver, and the left ovary contained a moderately sized mass that was heterogeneous in appearance (Figure 2). No adhesions to the left ovary were noted. The visible gall bladder, diaphragm, peritoneum, spleen, kidneys, urinary bladder, gastrointestinal tract, omentum, and right ovary appeared within normal limits.

Multiple laparoscopic liver biopsies of the right lateral and quadrate lobe were performed using laparoscopic cup biopsy forceps (Laparoscopic biopsy forceps; Karl Storz Veterinary Endoscopy). Hemorrhage was controlled utilizing direct pressure from a blunt laparoscopic probe (Palpation probe; Karl Storz Veterinary Endoscopy).

The patient was tilted 45° towards left lateral, and the normal right ovary was visualized and exposed using a laparoscopic blunt probe. The proper ligament of the right ovary was visualized, grasped and retracted with laparoscopic Babcock forceps (Clickline, 5 mm, Straight Babcock Forceps; Karl Storz Veterinary Endoscopy) to visualize the suspensory ligament and

![Figure 1. Preoperative ultrasound image of the neoplastic left ovary (arrows). The ovarian mass measured 7 cm at its largest diameter and was partially mineralized.](image-url)
vascular pedicle. The suspensory ligament and vascular pedicle were transected using a vessel sealing device (5-mm Ligasure; Covidien). The broad ligament was sealed and transected using the vessel sealing device to a level just cranial to the uterine body. The Babcock forceps grasping the right proper ligament was released and instruments and laparoscope were removed from the abdomen. The patient was then tilted 45° towards right lateral recumbency, and the left ovary was visualized and exposed using a laparoscopic blunt probe. Retraction of the ovary via the proper ligament alone provided incomplete visualization of the suspensory ligament and vascular pedicle because of obstruction by the large ovarian mass. In order to improve visualization of the vascular pedicle the uterine horn was grasped with laparoscopic Babcock forceps for manipulation of the ovary. The suspensory ligament and vascular pedicle were sealed and transected using the vessel sealing device. The left broad ligament was ligated and transected using the vessel sealing device to a level just cranial to the uterine body.

The CO₂ was evacuated from the abdomen by removing the SILS port. The ventral midline incision was extended to 6 cm in length, along the previous laparotomy incision. A 5 to 9 cm wound retractor (Alexis Wound Retractor; Applied Medical Resources, Rancho Santa Margarita, California, USA) was placed into the abdominal incision as previously described (19). Briefly, the interior single ring was placed into the abdominal incision with care not to entrap any internal abdominal organs. Traction was placed on the ring intra-abdominally, and the exterior double ring was rolled down upon itself until contact was made with the external body wall. The right and left reproductive tract, including the ovarian tumor, were identified by hand and removed from the abdomen (Figure 3). The uterine body was crushed using a Carmalt forcep, and a single 2-0 PDS (Polydioxanone; Johnson and Johnson, Markham, Ontario) circumferential ligature was placed around the uterus. The uterus was transected and the uterine stump was returned to the abdomen while monitoring for hemorrhage.

The linea alba was closed using 2-0 polydioxanone in a simple continuous pattern. The subcutaneous tissues were lavaged and closed using 3-0 Monocryl (poliglecaprone 25; Johnson and Johnson) in a simple continuous pattern. The skin was closed with 3-0 Prolene (Polypropylene; Johnson and Johnson) in a simple continuous pattern. Surgical time was 75 min.

Histopathology results
The histopathology of the ovarian tumor revealed a well-differentiated mass with 3 germinal layers (ectoderm, mesoderm, neuroectoderm), which is consistent with the diagnosis of a teratoma. The histopathology from the liver and uterus was unremarkable.

Postoperative care
The dog recovered uneventfully following recovery from anesthesia. Analgesia was achieved using hydromorphone (Sabex), 0.025 mg/kg BW, SQ, q4-6h and Metacam (meloxicam; Boehringer Ingelheim, Burlington, Ontario), 0.1 mg/kg BW, PO, q24h. The patient was discharged 1 d after surgery with metacam for 5 d after surgery. The owner reported that the dog was clinically normal at follow-up by telephone 608 d after surgery.

Discussion
This report describes the successful application of SPLS OVH for the staging and treatment of canine ovarian neoplasia. Perioperative complications were not encountered, and the dog was without clinical signs at time of telephone follow-up 608 d after surgery. Minor challenges were encountered during vessel-sealing of the left ovarian pedicle as the tumor obstructed our view. Using retraction of the uterine horn to “sway” the mass lateral to the pedicle improved exposure of the vascular pedicle. Despite this technical challenge, surgical time of the SPLS technique was similar to the previously described reports for conventional LAOVH (7,8).
Preoperative staging of dogs with ovarian neoplasia is critical to assess for laparoscopic feasibility and to evaluate for metastatic disease. Preoperative screening should entail a CBC, serum biochemistry panel, 3-view thoracic radiographs, and abdominal ultrasound. An abdominal ultrasound is critical to localize the disease in the ovary (unilateral or bilateral) and to evaluate tumor size and ovarian internal architecture, to identify free abdominal fluid, and to assess for other abdominal organ involvement (4). The presence of free abdominal fluid and cytological evaluation may allow for a presurgical diagnosis of malignant ovarian neoplasia (20). The identification of preoperative ovarian size without evidence of metastatic disease may help decide if SPLS OVH is feasible.

Ovarian tumors vary widely in size, ranging from 2 to 15,000 cm³, with diameters up to 22 cm reported (2,4). The ovarian tumor in the dog herein measured 7.0 × 4.0 × 3.0 cm using ultrasonography. Large ovarian tumors are likely not ideal candidates for multiport or SPLS OVH. The access incision required to extract the ovarian tumor following sealing of the ovarian pedicles was approximately 6 cm. While further study is required, tumors that are > 7 cm at the largest dimension will require equivalently larger access incisions for tumor extraction. The upper limit of tumor size, in which the benefits of assisted laparoscopy are outweighed by increasing incision size and surgical trauma, remains unknown in veterinary medicine.

Additionally, large ovarian tumors pose an intraoperative challenge for the surgeon as visualization of the ovarian pedicle will be difficult. Larger ovarian tumors may be reduced in size with a morcellator intracorporeally after being placed in a specimen retrieval bag to decrease access incision size (21). Morcellators, however, are not commonly used in small animal veterinary medicine. This strategy has been used in the horse for removal of unilateral benign granulosa cell tumors via a hand-assisted laparoscopic approach through the paralumbar fossa for tumors as large as 20 cm in diameter (21).

The benefits of SPLS compared with multiport laparoscopy have yet to be determined in veterinary medicine. A recent study demonstrated that SPLS had decreased surgical times and decreased intraoperative hemorrhage compared with multiport laparoscopy for elective laparoscopic procedures (13). Another study by Case et al (22) demonstrated prolonged surgical times with no differences in complications with SPLS compared with multi-port laparoscopy for laparoscopic ovariohysterectomy in dogs. Surgical time likely relates to experience with SPLS and/or multiport laparoscopy. Access-related complications can be reduced with SPLS since a mini-laparotomy incision is created (~2 cm) with clear visualization of abdominal organs for SPLS port insertion (13). Veress needle insertion is blind and can result in splenic laceration and additional abdominal organ trauma (13). Regardless, SPLS requires proficiency in multiport laparoscopy and is associated with a steep learning curve. In laparoscopic cases in which careful dissection is required, multiport laparoscopy may be preferred to prevent instrument clashing and improve triangulation. In humans, multiport laparoscopy is typically performed for hysterectomy, however, SPLS is gaining popularity (10). A prospective study comparing single-port versus multiport laparoscopy for hysterectomy demonstrated longer surgical times, but lower rates of port site infection and higher patient satisfaction scores (10).

The ovarian tumor, the normal right ovary and uterine horns and body were extracted through a wound retraction device (Figure 3) which has previously been reported for use in veterinary laparoscopy (19,23,24). The wound retraction device exerts a radial force on the incisional edges, which not only provides increased wound opening and retraction for removal of abdominal viscerum/pathology but also provides incisional protection from both infection (25) and potential contamination by neoplastic cells (26). Portal site metastasis has been reported in the veterinary literature (27) and measures to reduce its incidence, such as the use of a wound retraction device in this case, are of paramount importance. Variable sized wound retraction devices are available for various incision sizes and purposes.

In conclusion, SPLS OVH can be used for the treatment of ovarian tumors in dogs. Appropriate pre-operative staging should be completed before surgery to determine candidacy for laparoscopy. Should challenges be encountered using SPLS for visualization of the ovarian pedicle, an additional port can be placed on the ventral midline to aid in retraction of the ovarian mass. Further study in a large number of dogs is required to determine the benefits of laparoscopy for the treatment of ovarian neoplasia.

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The CVMA MyVetStore: Delivering dietary convenience and compliance
MaVitrineVétérinaire de l’ACMV : observance et commodité en matière d’alimentation

Chris Doherty

As any retailer will attest to, online shopping and home delivery are rapidly changing the way that consumers purchase and receive goods. While Amazon is the highest profile purveyor, many businesses are taking advantage of the Internet and its capabilities to reach their clients. The MyVetStore, provided through the CVMA, allows veterinarians to embrace this new channel.

Given that sale of pet foods plays an important role in the revenue of practices across Canada, ensuring veterinarians keep up with evolving trends in the field is critical. From the 2016 CVMA Practice Owners Economic Surveys, sale of pet foods accounted for 14% to 20% of gross revenue generated in small animal hospitals. This equates to approximately $67,000 to $97,000 in revenue per full-time equivalent (FTE) DVM, depending on the province (Table 1).

The CVMA MyVetStore allows veterinarians to establish their own online retail store from which pet foods can be purchased by clients. The foods can be shipped to either the home or the veterinary hospital to be picked up.

One of the most powerful features of MyVetStore is the capability for clients to sign up for an auto-ship subscription. Once a client enrolls, they will automatically be shipped a bag of their pet’s food before the current bag is empty, ensuring they never

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find themselves out of dog food on a Sunday afternoon when their veterinary hospital is closed (Figure 1).

Data collected by My Vet Store and IDEXX demonstrate the increased compliance of clients who have subscribed to auto ship for their purchases of pet foods.

Conventional (in-clinic) pet food purchases rapidly fall off after the first purchase, with fewer than 50% of clients purchasing even a second bag of food; only 3% bought 12 or more consecutive bags of pet food from their veterinarian, when they purchased conventionally.

Comparatively, compliance remains significantly more robust when pet food is purchased through My Vet Store on an auto-ship subscription, whether delivered to the home or picked up from the veterinary hospital. After the first purchase, 74% to 85% of clients bought a second bag, while 25% to 28% continued to feed the veterinary diet after 12 or more consecutive bags — a great improvement from 3%.

Rerouting sales of pet foods through My Vet Store also has the potential to grow profit margins for the veterinary hospital, when purchases are shipped directly to the client’s home. The cost of goods sold (purchasing the pet food to be sold to clients) as well as overhead (space, utilities, etc.) and staff time (unpacking order, stocking shelves, cashing out clients, etc.), all eat into the profit margin of pet food sales made in-clinic. However, when the pet food purchased is shipped directly to the client, the overhead and staff time previously utilized can be repurposed for other tasks, resulting in lower expenses and a higher net income associated with selling pet food.

Perhaps the most compelling reason to embrace this new channel for pet food sales is that if we as veterinarians do not, there is no shortage of others who will. The best example of this is Chewy.com, an American online pet food retailer (including veterinary diets), who ship direct to consumers. Chewy also clearly recognizes the power of auto-ship subscriptions, and L’une des caractéristiques la plus puissante de MaVitrineVétérinaire est la capacité des clients de s’inscrire à l’expédition automatique. Une fois que le client s’est inscrit, on lui enverra automatiquement un sac de nourriture avant qu’il ait terminé le dernier sac, ce qui garantira ainsi qu’il ne manquera jamais de nourriture un dimanche après-midi lorsque la clinique vétérinaire est fermée (figure 1).

Les données recueillies auprès de MaVitrineVétérinaire et IDEXX démontrent l’observance accrue des clients qui se sont inscrits à l’expédition automatique pour l’achat de leurs aliments pour animaux.

Les achats conventionnels (à la clinique) d’aliments pour animaux de compagnie cessent rapidement après le premier achat et moins de 50 % des clients acheteront un deuxième sac d’aliments; seulement 3 % des clients achètent 12 sacs consécutifs d’aliments pour animaux auprès de leur vétérinaire, lorsqu’ils sont obtenus de manière conventionnelle.

L’observance demeure beaucoup plus robuste lorsque les aliments pour animaux sont achetés par l’entremise de MaVitrineVétérinaire dans le cadre d’un abonnement à l’expédition automatique, que les aliments soient livrés à la maison ou cueillis à la clinique vétérinaire. Après le premier achat, de 74 % à 85 % des clients ont acheté un deuxième sac, tandis que de 25 % à 28 % ont continué à commander les aliments vétérinaires après 12 sacs consécutifs ou plus — une excellente amélioration par rapport à 3 %.

Le réacheminement des ventes d’aliments pour animaux par l’entremise de MaVitrineVétérinaire présente aussi le potentiel d’améliorer les marges bénéficiaires pour la clinique vétérinaire lorsque les achats sont expédiés directement au domicile du client. Le coût des biens vendus (l’achat des aliments pour animaux qui seront vendus aux clients) ainsi que les frais généraux (espace, services publics, etc.) et le temps des employés (déballer la commande, remplir les étagères, traiter les transactions des clients, etc.), rongent la marge de profit de la vente d’aliments à la clinique. Cependant, lorsque les aliments vendus sont expédiés directement au client, les frais généraux et le temps du personnel peuvent être réutilisés pour d’autres tâches, ce qui permettra de réduire les dépenses et de dégager un bénéfice net supérieur associé à la vente d’aliments pour animaux.

Mais la raison la plus convaincante d’utiliser cette nouvelle méthode pour la vente d’aliments pour animaux est la suivante : si les vétérinaires ne le font pas, il y a une foule d’autres personnes qui sont disposées à le faire. Le meilleur exemple de cette situation est Chewy.com, un détaillant d’aliments pour animaux américain qui vend ses produits en ligne (y compris des aliments vétérinaires) et expédie directement aux consommateurs. Chewy reconnaît aussi clairement le pouvoir des abonnements automatiques et offre plusieurs incitatifs afin d’inviter les clients à s’inscrire à ce programme. Non seulement Chewy a-t-il généré plus de 900 millions $ en recettes l’an dernier, mais il fait actuellement l’objet d’une acquisition par PetSmart pour plus de 3,3 milliards $, c’est un acteur très important sur la scène des aliments pour animaux aux États-Unis.

Avant de nous consoler en disant : «C’est différent ici au Canada», et en prétendant que Chewy est uniquement un phénomène américain, signalons qu’il y a des entreprises...
offers numerous incentives to entice clients to sign up for this program. Not only did Chewy generate over $900 million in revenue last year, but they are currently being purchased by PetSmart for over $3.3 billion; they are a very large player in the US pet food space.

Before we console ourselves by saying that “it’s different up here in Canada,” and claiming that Chewy is an American phenomenon, there are businesses currently employing the same model north of the border. Companies such as TLC and PetOnly are offering home delivery and auto-ship subscription, taking pages out of Chewy’s playbook.

By employing the CVMA MyVetStore, veterinarians can improve dietary compliance, increase practice profitability, and ensure that patients receive an appropriate and safe food while their owners benefit from the convenience of online shopping and home delivery.
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History and clinical signs

A 9-year-old neutered male, Shetland sheepdog was referred to the ophthalmology service at the Western College of Veterinary Medicine with left enophthalmos, miosis, ptosis, and third eyelid prolapse, and anisocoria (Figure 1). The referring veterinarian had tentatively diagnosed anterior uveitis. The menace responses, and the direct and consensual pupillary light reflexes, palpebral, and oculocephalic reflexes were present in both eyes. The left pupil was smaller than the right and the anisocoria was substantially worse in scotopic conditions. Schirmer tear tests (Schirmer Tear Test Strips; Alcon Canada, Mississauga, Ontario) were 27 and 25 mm/min in the right and left eyes, respectively. The intraocular pressures were estimated with a rebound tonometer (Tonovet; Tiolat Oy, Helsinki, Finland), and were 13 and 8 mmHg in the right and left eyes, respectively. Topical ophthalmic tropicamide (Mydriacyl; Alcon Canada, Mississauga, Ontario) was applied to both corneas and the right pupil dilated completely within 20 min. The left pupil dilated minimally (1 to 2 mm) and remained at mid-sized at 30 min. Biomicroscopic (Osram 64222; Carl Zeiss Canada, Don Mills, Ontario) and indirect ophthalmoscopic (Heine Omega 200; Heine Instruments Canada, Kitchener, Ontario) examinations were completed. Abnormalities were limited to incipient nuclear cataracts and the anisocoria. Fluorescein stain (Fluorets; Bausch & Lomb Canada, Markham, Ontario) was applied and rinsed from the corneal surfaces and the eyes were examined under cobalt filtered light; staining was not evident.

What are your clinical diagnoses, diagnostic and therapeutic plans, and prognosis?

Discussion

Our tentative clinical diagnoses were left Horner’s syndrome and bilateral incipient nuclear cataracts. The latter are common incidental findings in many dog breeds. The cataracts do not progress and the prognosis for retention of vision is excellent. Horner’s syndrome should be considered in all animals with an anisocoria in which both pupils constrict after light stimulation, and the anisocoria worsens in scotopic conditions. However, ptosis, enophthalmos, and third eyelid prolapse are common non-specific accompanying signs that are also found when uveitis and keratitis are present.

To confirm the diagnosis of left Horner’s syndrome additional diagnostic tests are required. The gold standard test for diagnosing Horner’s syndrome in humans is lack of dilatation of the affected pupil in response to topical cocaine (1), with dilatation of the normal pupil. Cocaine blocks the norepinephrine reuptake at the neuromuscular junctions of the iris dilator muscle. With Horner’s syndrome norepinephrine is not released from the pre-synapse and therefore does not accumulate in the neuromuscular junction and does not stimulate mydriasis of the iris dilator muscle. In contrast, the normal pupil will dilate and the anisocoria worsens which confirms the diagnosis of Horner’s syndrome. Topical ophthalmic cocaine was not available at the time of presentation of this case and is seldom used in veterinary ophthalmology. Aproclonidine (weak α₁ agonist) will stimulate the iris dilator muscle in the Horner-affected eye that is adrenergic hypersensitive and it will reverse the anisocoria and also confirm some cases of Horner’s syndrome (2,3). Aproclonidine was not available at the time of examination of this dog so additional diagnostic testing was not completed.

The subtle dilation of the left pupil with tropicamide was considered typical of Horner’s syndrome based on our experience. This parasympatholytic agent blocks the parasympathetic portion of the oculomotor nerve and in Horner’s cases the
Horner's syndrome is the most common neuro-opthalmologic condition diagnosed in animals in our practice. Horner's syndrome was first reported by John Reid at Saint Andrews in 1839 approximately 3 decades before Johann Friedrich Horner reported the condition which bears his name (11). This neurologic syndrome develops secondary to a lack of sympathetic innervation to the eye (10). Inflammatory, traumatic, or neoplastic lesions can occur at any point in the long pathway from the hypothalamus through the cervical and thoracic spinal cord (first order neuron) to the spinal cord segments T1-T3 (12), through the mediastinum cranially with the vagus nerve up the ventral cervical area (second order neuron) where it separates and synapses with the cranial cervical ganglion near the tympanic bulla (8,13). Then the post-ganglionic fibers course on towards the globe (third order neuron) and lesions here induce the signs of post-ganglionic Horner's syndrome (6,14).

Although topical ocular cocaine is the topical diagnostic test of choice to confirm Horner's syndrome it is rarely reported or completed in domestic animals related to the availability, control, and regulations surrounding storage and use of this potent medication. We photograph the eyes and pupils of dogs with a tentative diagnosis of Horner's syndrome pre- and post-dilatation and during lesion localization. We recommend a thorough biomicroscopic and indirect ophthalmoscopic examination after attempted pupillary dilatation with topical tropicamide to exclude keratitis and uveitis as differential diagnoses. Finally, we recommend lesion localization and additional diagnostic tests a few days later. Horner localization should begin with a very dilute topical application of 0.1% phenylephrine to the affected and control eye. The dilute adrenergic will have no effect on the pupil of the normal eye and a peak effect on post-ganglionic Horner's of at least 3-weeks duration will be pupillary dilatation and loss of enophthalmos and third eyelid prolapse within 20 min. This response confirms post-ganglionic Horner's (third order) related to a denervation hypersensitivity in the post-synaptic neuromuscular junction. Post-ganglionic Horner's syndrome in dogs is often idiopathic and is hypothesized to develop secondary to inflammation in the region of the tympanic bullae (otitis media), while second order Horner's syndrome develops most commonly due to cervical trauma (needle sticks during jugular sampling or other cervical traumas or thoracic/mediastinal neoplasia or inflammatory conditions).

Second order Horner cases are localized by topical application of 10% phenylephrine and a response within 40 min will confirm this lesion. Rarely in our experience do we see first order Horner's syndrome which is associated with cervical and cranial neoplasms and inflammatory conditions (8,12). These lesions require sectional imaging and additional diagnostic evaluations to confirm and prognosticate.

Post-ganglionic Horner's syndrome usually requires no additional diagnostic tests and signs usually resolve within weeks; quite often only a mild residual ptosis will remain. In contrast, pre-ganglionic and central forms of Horner's syndrome require further diagnostic testing to establish the etiology and appropriate surgical or medical therapy. The prognosis varies greatly depending on the etiology.

References


Photographs for the covers of The CVJ are always in demand. We not only welcome, but encourage veterinarians, or family and friends of veterinarians, to send us photos of animals. While digital cameras make it easier to submit photos, certain guidelines must be met to make them useable for covers. Here are some specifications to remember:

- Photos for submission are required to be at least 300 dpi at 100% size which is 9 x 12 inches
- Cameras should be set to the highest resolution possible. An option is to shoot in RAW mode
- High resolution photos should be sent via CD (the files may be too large to e-mail)
- A landscape shot should be at least a 46 MB file; a portrait should be 27 MB
- Vertical shots and close-ups work best
- High quality large printed photos are still acceptable (photos will not be returned)
- Keep the photo simple!

E-mail photos to hbrachtton@cvma-acmv.org or send to the CVMA office or call 1-800-567-2862.

Nous sommes toujours à la recherche de photos pour la couverture de La RVC. Nous encourageons même la famille et les amis des vétérinaires à nous faire parvenir des photos d’animaux. Même si les caméras numériques facilitent la soumission de photos, il est nécessaire de respecter certains critères pour que nous puissions les utiliser pour les couvertures. Voici quelques paramètres à respecter :

- les photos doivent avoir une résolution d’au moins 300 ppp à une taille de 100 % qui est de 9 x 12 po;
- les caméras doivent être réglées à la plus haute résolution possible. Une option consiste à prendre la photo en mode brut.
- les photos à haute résolution devraient être envoyées sur un CD (les fichiers pourraient être trop gros pour la transmission par courriel);
- la photo d’un paysage devrait être un fichier d’au moins 46 MB; un portrait devrait être de 27 MB;
- des photos verticales et des gros plans sont préférables;
- les grandes photos imprimées de haute qualité sont toujours acceptables (les photos ne seront pas retournées);
- visez la simplicité pour la photo!

Acheminez les photos par courriel (hbrachtton@cvma-acmv.org), envoyez-les au bureau de l’ACMV ou appelez au 1-800-567-2862.
1. E) Valvular endocardiosis is an age-related, degenerative change in which there is accumulation of a myxomatous connective tissue matrix within the valve leaflets, causing nodular thickening. The suffix "-osis" implies a degenerative condition; bacterial infection of the heart valves would lead to valvular endocarditis, or inflammation of the valves. Since endocardiosis most commonly affects the atrioventricular valves (and the mitral valve more commonly than the tricuspid), the condition may be associated with a systolic heart murmur.

2. D) Gastrointestinal obstruction most commonly occurs at sites of marked change in diameter, or at sites of abrupt turn. The pelvic flexure qualifies on both counts.

3. D) The glucose within the lens overwhelms the hexokinase pathway, causing the excess glucose to be converted to sorbitol within the hexose-monophosphate shunt. The sorbitol is trapped within the lens, causing an increase in osmotic pressure that draws fluid into the lens and swells the lens fibers.

4. B) A, ivermectin, should be used cautiously in Shetland sheepdogs. C, D, and E are not effective therapies for demodicosis. B) L’ivermectin (A) doit être utilisé avec précaution chez le Berger des Shetland. Les réponses C, D, et E ne sont pas des traitements efficaces contre les démodicoses.

5. C) Papillomatous digital dermatitis (hairy heel warts) can be controlled by foot bathing (e.g., copper sulfate) or topical application of antiseptic or antibiotic solutions (e.g., tetracycline). Alley scraping and hygiene are important in preventing all bacterial digital dermatitides. This disease is contagious, so it is important to determine whether the disease was recently introduced by purchased cattle, or is endemic. New, coarse concrete can be a risk factor for sole disease, not interdigital or other dermatitides.
Temporomandibular joint luxation in the cat: Diagnosis and management

Dr. Graham Thatcher

**Clinical presentation**

Temporomandibular joint (TMJ) injuries in the cat frequently result in luxation and are commonly seen with other maxillofacial injuries (1–3). A luxation is a condition in which the articular surfaces of a joint are completely dislocated (2,4). Patients with TMJ luxation typically present with an inability to completely close the mouth due to mandibular drift resulting in maligned dental arches (3,4; Figure 1). Temporomandibular joint luxations are usually unilateral and rostroventral, with the mandibles shifted to the side opposite the luxation. Initial oral examination is often limited to observation of the malocclusion and the inability of the patient to completely close the mouth. Complete oral examination is necessary to rule out additional trauma to teeth and other maxillofacial structures; this requires anesthesia. A detailed preanesthetic evaluation is necessary due to the traumatic nature of TMJ luxation and this should include a physical examination, a neurologic examination, serum biochemistry profile, complete blood (cell) count (CBC), thoracic radiographs, abdominal ultrasound, and an electrocardiogram (2). After all other systems have been evaluated for additional injuries, anesthesia is induced and a thorough oral evaluation is performed. The mandibles and maxillae are carefully palpated while attempting to open and close the mouth. Indications of jaw fracture include crepitus on palpation and the ability to close the mouth with gentle pressure (2). If the TMJ is luxated, the malocclusion and the inability to close the mouth remain with increased forces (2). Gentle forces are recommended in an effort not to cause additional traumatic injuries such as mandibular fractures.

**Diagnostic imaging**

Diagnostic imaging is performed to confirm the diagnosis of TMJ luxation and to rule out other maxillofacial injuries such as condylar fractures, mandibular ramus fractures, caudoventral luxation of the TMJ, and bilateral luxation. Skull radiographs can be conducted with various projections; however, dorsoventral or ventrodorsal views provide excellent evaluation of asymmetry that is noted with TMJ luxation (5; Figure 2). Oblique views can be used on both sides to isolate the TMJ. This can be done with a standard radiograph machine or with dental film and/or sensors (3,4; Figure 3). Rostroventral luxation of the TMJ occurs when the mandibular condyle is completely displaced from the mandibular fossa, becoming entrapped above the articular eminence (1,3; Figure 4). Caudoventral TMJ luxation is much less common, owing to the large retroarticular process relative to the articular eminence (3). Caudoventral TMJ luxation comes with a relatively poor prognosis, as it often occurs when the retroarticular process is fractured, allowing the condyle to luxate in a caudoventral orientation. Computed tomography (CT) scan allows the clinician to detect subtle differences between the right and left TMJ in the same view (2; Figure 5). A CT scan is a convenient modality that allows for detection of other maxillofacial trauma at the same time as diagnosing TMJ luxation. Three-dimensional reconstructions of CT scan images can be very useful for treatment planning as well as diagnosis of trauma involving the TMJ and other maxillofacial structures (2).
Treatment

Once a diagnosis of rostro dorsally luxated TMJ is confirmed with imaging, closed reduction is attempted. This should be done as soon as safely possible, as reduction of chronic luxation can be challenging due to organized fibrous tissue that fills the joint space (1). The anesthetized patient is placed in sternal recumbency and a fulcrum is created by placing a wooden dowel (pencil) between the maxillary 4th premolar and the mandibular 1st molar. The rostral mandibles and maxillae are gently closed with manual pressure and the dowel can be gently turned to force the mandible rostrally, thereby releasing the mandibular condyle from the articular eminence (3). Next, the dowel can be gently rolled in the opposite direction to direct the mandibular condyle caudally into the mandibular fossa (3; Figure 6). Once the luxated TMJ is reduced, the mouth should be carefully opened and closed and observed for mandibular drift to the opposite side of the luxation. This would potentially indicate incomplete reduction of the mandibular condyle into the mandibular fossa and an increased risk of re-luxation. Radiographs should be taken to confirm that reduction of the luxated TMJ has been successful. Most commonly, the reduction is simple and there are no indications to suggest re-luxation. If this is the case, no restriction of jaw movement is necessary (1). A short course of a nonsteroidal anti-inflammatory drug (NSAID) (7 days) and

Figure 2. a – Dorsoventral view of normal temporomandibular joint (TMJ) articulation; b – Dorsoventral view of a rostro dorsally luxation of the right temporomandibular joint (TMJ). Note the mandibular drift to the left.

Figure 3. a – Photograph demonstrating right lateral oblique positioning used to isolate the right temporomandibular joint (TMJ); b – Radiograph of temporomandibular joint (TMJ) using a dental digital sensor to isolate the normal right TMJ; c – Radiograph using a dental digital sensor in a right lateral oblique position to isolate the luxated right temporomandibular joint (TMJ).
a soft diet for 2 wk is a reasonable recommendation to minimize masticatory efforts and to control swelling and inflammation in the region.

If the reduction of the TMJ was challenging and there remains mandibular drift or re-luxation occurs on manipulation of the jaws, restriction of oral movement is necessary. A TMJ reduction in these cases is maintained with a well-fitted tape muzzle (Figure 7) or maxillomandibular fixation with interarcade composite bonding (6; Figure 8). The use of a tape muzzle allows for a small amount of movement, whereas the interarcade bonding provides a rigid fixation. Intercarade composite bonding is a technique that is typically performed

**Figure 4.** a – Photograph of a feline skull with a normally positioned temporomandibular joint (TMJ) with the condylar process (red) seated in the mandibular fossa (blue), ventral to the articular eminence (black arrow) and dorsal to the retroarticular process (green arrow); b – Photograph of a feline skull with a rostrodorsal temporomandibular joint (TMJ) luxation. The condylar process is entrapped above the articular eminence (black arrow). Note the comparatively large size of the retroarticular process (green arrow).

**Figure 5.** a – Computed tomography scan of normal temporomandibular joints (TMJs) bilaterally (white ovals); b – Computed tomography scan of rostrodorsally luxated right temporomandibular joint (TMJ) (white oval).

**Figure 6.** a – Photograph of a feline patient with a wooden pencil used as a fulcrum between the maxillary 4th premolar and the mandibular 1st molar to release the condylar process from the articular eminence. b – Photographs of the feline patient from Figures 1 and 6a after the luxated right TMJ has been replaced.
Figure 7. The tape muzzle is applied to minimize the mandibular movements when instability is noted after reduction of the TMJ.

Figure 8. Computed tomography scan demonstrating a left rostrodorsally luxated temporomandibular joint (TMJ) (a) and photographs of interarcade bonding (b) and endotracheal tube placement after open reduction of the TMJ (c).
by a veterinary dentist and requires specialized materials, equipment, and training. The composite material used to rigidly fix the jaws in normal occlusion while the TMJ heals should be removed after 2 to 3 wk, as ankylosis of the joint can occur if the material is left in place too long (2,7). The maxillary and mandibular canine teeth are bonded together with the mouth open slightly, to encourage lapping of water and wet food. An esophageal feeding tube is placed in order to provide adequate nutrition. Placement of the esophageal feeding tube requires the operator to open the mouth widely and therefore this must be done before application of the bonding material (2,3).

If the TMJ has been luxated for an extended time, and closed reduction is unsuccessful, open reduction or condylectomy can be performed to return the patient to a functional occlusion (2). The anatomy in the region of the TMJ is complex with regard to neurologic, vascular, and musculoskeletal structures and it is recommended that these surgical procedures be referred to a dentist or surgeon.

The following link will take you to a video demonstration of how to correct the luxated TMJ in a cat with no additional trauma. Anesthesia has been induced intravenously; however, there is no endotracheal intubation in this case, for an improved visual demonstration.

https://www.instagram.com/p/BHcv-b4DGbL/

References

Animal Health Information Sources

Below is a list of several links to Canadian sources of information on animal health and disease. Our goal is to provide current information while not duplicating existing efforts. We hope that this contact information will be of assistance to veterinarians across the country.

1. Canadian Animal Health Coalition (CAHC/CCSA) newsletter
   http://service.meltwaternews.com/mnews-ws/resources/pastnewsletter/latestHtml?f=n=MTUwNTUz&r=MTUyNzQz

2. Alberta Animal Health Source (ABVMA) site:
   http://www.albertaanimalhealthsource.ca/

3. Animal Health Laboratory — University of Guelph
   http://www.guelphlabservices.com/ahl/

   http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/animal-health/animal-health-centre/newsletter

5. Prairie Diagnostic Services Inc. (Animal Health Perspectives newsletter)
   http://pdsinc.ca/


7. University of PEI — Diagnostic Services (Newsletter)
   http://www.upei.ca/avc/diagnostic-services/newsletters
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