Four Leg News

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Research News

A mind-expanding edition

This edition is dedicated to the reporting of a variety of journal articles and my take on their clinical relevance. I hope you enjoy the information!

I have been reading and summarizing a number of research articles over the last two months… and I'm excited to share them with all of you. I have to admit… this isn't a flashy LOOKING newsletter, but it is jam packed with information. There is a well-known physiotherapist in Canada by the name of Bahram Jam who creates a quarterly report on relevant human research papers. His APTEI report is my inspiration for this edition. Now, should you be a human physiotherapist – or a vet or tech with a keen sense of how to apply human research to animals - then you might be interested in his newsletter (and home study courses) as well! (www.aptei.com)

So, send me an e-mail to tell me what you think… what you'd like… or things that YOU have learned along the way! And until then, Happy Rehabbing!

Hey Gang!

Don't hesitate to print off this newsletter and leave it on the table in your staff room, or use it for marketing purposes. The information inside is good for all animal health care practitioners… and as you already know, rehab is beneficial for soooo many conditions!

Cheers! - Laurie

Krakauer JW, Carmichael, ST, Corbett D, Wittenberg GF. (2012) Getting neurorehabilitation right: What can be learned from animal models? Neurorehabilitation and Neural Repair 26(8): 923 – 931.

Animal models suggest that a month of heightened plasticity occurs in the brain after stroke, accompanied by most of the recovery from impairment. Dendritic spine morphogenesis, axonal sprouting, and neuronal growth factor induction occur both after stroke and as a result of behavioural experience (i.e. housing animals in enriched environments produced dentritic growth, new spine formation, and synaptogenesis). This occurs in both normal and brain damaged animals. Thus an enriched environment & rehabilitation may augment the brain's own intrinsic repair capacity.

Early intervention (1 – 3 days after stroke) was associated with increased cell death but improved long-term behavioural outcomes… and may reflect a 'pruning effect' of dysfunctional neurons. However, studies have also found a period of GABA-mediated tonic inhibition in the first few days following a stroke thought to limit expansion of the infarct size. Consensus from animal data therefore, is that rehabilitation initiated AFTER 5 or more days following stoke has no adverse effects.

Interestingly, behavioural responses & recovery were not seen when rehabilitation was delayed by 30 days in animal models. The rationale for this effect is that at this point in time, growth-promotion gene changes have peaked and are beginning to decline. However patients can be trained to walk faster and build strength and fitness at any time after stroke, which may improve daily functioning.

Clinical Relevance:
These findings, while specific to brain injury / stroke, could well have implications for animal spinal cord injury recovery as well. Seeing as rehabilitation and environmental stimulation have been found to augment spinal as well as brain, and are found concurrently in normal animals undergoing the same stimuli, is plausible and justifiable.

At the Canine Fitness Centre, we have found spinal cord injured dogs (post-operative and non-operative) to have a very extended recovery window. So, while I would agree that intensive therapy within the first month is valid - starting after the fifth day post-injury - I would also advise that therapy go beyond 30 days and can also be justified from clinical experience.

Johnson P, De Risio L, Sparkes A, McConnell F, Holloway A. (2012) Clinical, morphologic, and morphometric features of cranial thoracic spinal stenosis in large and giant breed dogs. Vet Radiol Ultrasound 53(5): 524 – 534.

79 MRI studies of the cranial thoracic spine were evaluated. 24 imaging studies in 23 dogs identified grades 1 and 2 stenosis lesions, most commonly occupying T2-3 and T3-4. 21 of the dogs with the identifiable lesions were male, with a median age of 9.5 months. Six of these dogs also had signs of concurrent caudal cervical spondylomyelopathy, and 5 of the dogs had other neurologic disease. Cranial thoracic spinal stenosis was the only finding in 12 dogs. In 9 of these 12 dogs (all grade 2), neurological evaluations allowed the examiners to localize the lesions to between T3 & L3. The remaining 3 dogs did not exhibit neurologic signs.

Clinical Relevance:
Cranial thoracic spinal stenosis should be a diagnostic consideration in young large & giant breed dogs that appear to have upper motor neuron lesion signs in the hind end (T3 – L3 neurolocalization).

De Decker S, Gielen IMVL, Duchateau L et al. Evolution of clinical signs and predictors of outcome after conservative medical treatment for disk-associated cervical spondylomyelopathy in dogs. J Am Vet Med Assoc 240(7): 848 – 857.

This prospective study sought to evaluate the evoluation of clinical signs during conservative medical treatment for disc-associated caudal cervical spondylomyelopathy. 21 client-owned dogs were examined and graded on their neurologic function, and subjected to an MRI as well as transcranial magnetic stimulation (a non-invasive, painless, sensitive technique for stimulating the cerebral cortex to evaluate the functional integrity of the fastest conducting descending motor pathways in the brain and spinal cord). Conservative medical treatment consisted of restricted activity (x 4weeks – followed by gradually increasing activity) and prednisolone administration.

Results: Of the 20 dogs presented at follow up, 6 had a lower (improved) neurologic grade; 7 had a higher grade, 7 remained the same grade (but had slight shifts of improvement (n=2) or deterioration (n=5) within the grade). The 12 dogs that had deteriorated went on to have unsuccessful outcomes. The dogs that showed improvement at 1-month went on to have successful outcomes. Prognosis was NOT associated with severity of clinical signs or results of transcranial magnetic stimulation or MRI findings.

Clinical Relevance: *To me, this study is telling us to not give up hope with these cases for 1-month minimum. However, in my estimation, not enough was being done for the conservatively-managed dogs to optimize their healing and functional recovery - including manual therapies, modalities, and neurologic rehabilitation. Future studies should include adjunctive therapies to medical management for caudal spondylomyelopathy*

Barnes K, Balzer W (2012) Incidence of cranial cruciate ligament rupture in dogs ovariohysterectomized at less than six-months of age. (abstract) Vet Orthop Soc Ann Meeting: 40.

A retrospective search was conducted via medical record review to determine a correlation between age of spay and risk for development of cranial cruciate ligament rupture as compared to dogs without cranial cruciate ligament rupture. The analysis found a 1.6x greater risk of cruciate rupture in dogs spayed at 6-months of age or younger compared with dogs spayed at later ages. This evidence tends to support that sterilization before 6-months of age, particularly in larger breeds prone to cruciate disease, may not be advisable.

Clinical Relevance
While determining the age at which to spay or neuter a dog rests on multiple factors, clinicians that are asked for opinion on the subject (and especially by knowledgeable, experienced dog-owners who want to be active with their dogs) should be promoting delay of surgical sterilization to after 6-months of age.

"If you don't own a dog, at least one, there is not necessarily anything wrong with you, but there may be something wrong with your life."

— Roger Caras

"You can always trust a dog that likes peanut butter."

— Kate DiCamillo

"A dog teaches a boy fidelity, perseverance, and to turn around three times before lying down."

— Robert Benchley

Tonks CA, Pozzi A, Ling HY, Lewis DD. (2010) The effects of extra-articular suture tension on contact mechanics of the lateral compartment of cadaveric stifles treated with TightRope CCL ® or lateral suture technique. Vet Surg 39: 343 - 349.

12 pelvic limbs from large-breed dogs were utilized in a cadaveric study. Results confirmed that over tightening an extra-articular prosthesis when performing either TightRope® or lateral suture stabilization technique increased lateral compartment pressures in this unloaded ex vivo model. However lateral compartment pressure normalized when an axial load was applied to the joint. Early weight bearing after extra-articular stabilization of the CCL deficient stifle may be important to resolve abnormalities in contact mechanics and kinematics, which were evident in this study (and a previous ex vivo investigation).

This finding is supported by a previous study that found that dogs that had satisfactory limb function after LS stabilization had more cranial drawer motion and a greater range of motion than dogs that did poorly.

Clinical Relevance
This is a great study for rehab and essentially plays right into our hand!
From a surgical perspective, tighter is not better. From a rehab perspective, get dogs weight bearing sooner, and work on ROM sooner as well!

De Andrade AR, Meireles A, Artifon EL et al. The effects of low-level laser therapy, 670nm, on epiphyseal growth in rats. Sci World J Vol. 2012.

The Study: Twenty-one 4-week old rats were divided into three groups to receive 670nm laser on the epiphyseal growth plate of the right tibia. The group either received laser at 4 J/cm2, 8 J/cm2, or 16 J/cm2 at one point on the medial epiphyseal growth region, once a day for 10 days consecutively. The laser utilized was a 30mW powered, 670nm wavelength, using continuous wave. The limb length was examine radiographically and growth plates histologically (post-study, upon euthanasia) at 14-weeks of age.

Results: Radiographic analysis revealed no significant differences in the length of the treated and untreated limbs with any laser dosage. Histological analysis revealed that there was no significant difference when comparing medial, lateral, and intermediate regions of the epiphysis (with regards to total thickness, they hypertrophic zones, and proliferative zones.)

Piesco de Oliveira S, Canevese Rahal S, Jamas Pereira E, et al. (2012) Low-level laser on femoral growth plate in rats. Acta Cirurgica Brasileira 27(2): 117 – 121.

The Study: Thirty 40-day old rats were divided into a treatment group or a control group. The treatment group received 10J/cm2 using a 40mW, 830nm laser to the lateral aspect of the distal femoral growth plate – single point for 21 days consecutively.

Results: The femoral length was higher in the untreated group at 21-days. Histologically, chondrocyte number were higher, cartilage zone was greater and angiogenesis was higher in the treated group as compared to the control group at 21-days.

Morein G, Gassner S, Kaplan I. (1978) Bone growth alterations resulting from application of CO2 laser bean to the epiphyseal growth plates. An experimental study in rabbits. Acta Orthop Scan 49(3): 244 – 248. (abstract)

The Study: A 7 – 10 Watt CO2 laser beam was utilized to create a 3mm depth defect in the distal growth plate of one femur in a group of 59 rabbits.

Results: In most of the treated rabbit legs, a destruction of the growth plate was noted. A marked shortening of the femur was noted in rabbits subjected to the laser on both the medial and lateral sides of the growth plate, and a valgus deformity and shortening of the femur was noted in rabbits treated with laser to just the lateral aspect of the distal femur.

Clinical Relevance (of these 3 laser studies):
When the results of all three studies are combined, it brings to light that not all laser treatment is equal. Dosaging can impact tissues differently, wavelength may impact tissues differently, and power may impact the tissues differently. The deAndrade study did cite two other papers that showed no / limited effect on growth plates using similar techniques but utilizing 820 – 830nm lasers at 5J/cm2 / 15J/cm2 dosages respectively.

So, what's a therapist to do? I think these studies tell us to at minimum be cautious with use of our therapeutic laser over growth plates. A 630nm laser does not penetrate much more than 1cm into the tissue, whereas the 820 – 830 nm lasers will penetrate deeper. The CO2 laser study purposely created defects at the growth plate. What would I do? If I have a juvenile animal in for therapy to a joint (or soft tissue structure) at or near a growth plate, I would likely try to be as targeted as possible to direct the laser at the lesioned structure and avoid the growth plate. I would also not laser daily. I would still use it as a tool, but just with more caution.

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