Managing DJD:

the NSAIDS

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Introduction

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Introduction

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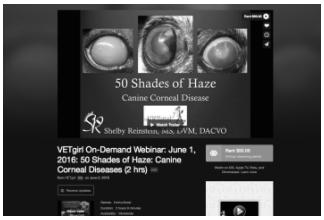

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  - ELITE members only
- Email / contact with ANY questions
  - garret@vetgirlontherun.com
  - justine@vetgirlontherun.com

Speaker introduction

- Matt Brunke, DVM, CCRP, CVPP, CVA
- ACVSMR Career Path Candidate

A little about me….. I like to keep busy

How many of you see DJD/OA?

- CCL Dz
- Hip Dysplasia
- Elbow Dysplasia
- OCD
- Trauma
- Athletic/Working Canines
- Obesity
- Conformation issues

Osteoarthritis is the #1 Cause of Chronic Pain in Dogs

Impact

- Chronic pain
- Decreased activity
- An overall negative impact on the patient
- Interferes with human-animal bond
- Decreased food intake
- Euthanasia for dogs that become non-responsive to treatment

Affects 20% of Dogs in U.S.

1. Gaynor J et al. The Essential Guide to Pain Management: A complete Resource for Veterinary Pain Management 2003.
2. Johnston SA. *Vet Clin N Am Small Anim Pract* 27:699-723; 1997.

When are you finding OA/DJD patients?

- Every exam you do! – DOGS and CATS
- Especially geriatrics – age is NOT a disease
- Know your normal – flex/extend every patient
- History ?'s – trouble with stairs? Less active?
- Feel for: joint thickening, muscle wasting, decreased elbow flexion, decreased hip extension
- Look for: scuff marks on nails, poor posture, swayback, uneven pad wear
- Cartilage damage occurs WAY before radiographic changes

Pathophysiology of OA/DJD involves the entire joint

Cartilage damage initiates OA/DJD

- Initial trauma = fibrillation of cartilage surface, damage to chondrocytes, release of:
  - Cartilage degradation products (CDPS)
  - Matrix metalloproteinases (MMPs)
  - Nitric oxide (NO) and inflammatory cytokines
- MMPs/CDPS are engulfed by synoviocytes, which release:
  - Inflammatory mediators: PGE2, TNF, IL1β and MMPs
- All contribute to cycle of inflammation, degradation and pain of osteoarthritis

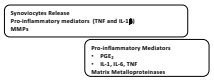
Initial Cartilage Degradation

End Stage Cartilage Degradation

Other Changes in OA/DJD

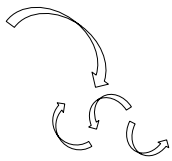
- Thickening of Joint Capsule
- Remodeling of subchondral bone → sclerosis
- Osteophyte formation
  - Synoviocytes release Bone Morphogenetic Proteins (BMPs)
  - Periosteum mesenchymal stem cell to differentiate into chondrocytes
  - Initiate osteophyte formation → joint mouse or impinge on periosteum
- Bottom line: OA becomes a vicious cycle
- Joint is less able to bear stress and forces:
  - Further joint damage
  - Clinical signs

Pro-inflammatory Mediators Cause Progressive Joint Damage



1.Pelletier JP et al. *A Textbook of Rheumatology*, Koopman W (ed). 14th Ed: 2195-2245. Lippincott, Williams and Wilkins; Baltimore, 2000.
2.Clegg PD et al. *Equine Vet J*. 29:335-342; 1997.
3.Martel-Pelletier et al. *Frontiers in Bioscience* 4: D694-D703; 1990.

Pro-inflammatory Mediators Cause Progressive Joint Damage



1. Pelletier JP et al. *A Textbook of Rheumatology*, Koopman W (ed). 14th Ed: 2195-2245. Lippincott, Williams and Wilkins; Baltimore, 2000.
2. Clegg PD et al. *Equine Vet J*. 29:335-342; 1997.
3. Martel-Pelletier et al. *Frontiers in Bioscience* 4: D694-D703; 1990.

Ongoing Inflammation is the Source of Both the Progressive Nature and Pain of Osteoarthritis

Joint Inflammation is One Source of Pain in OA/DJD

Johnston SA. *Vet Clin NA, SAP*, 31: 39-53 : 2001.

Joint Capsule	Synovium
Subchondral Bone	Periosteum

Neurogenic Inflammation

- Is an additional step in the nociceptive pathway
- Involve the antidromic release of neurotransmitters near the joint
- Neurotransmitters such as Substance P → inflammatory mediators within the joint
- Contributes to joint pain and inflammation

1.Johnston SA. *Vet Clin NA, SAP*, 31: 39-53; 2001.
2.Coutaux A, et al. *Joint Bone Spine*.,72: 359-371; 2005.

Pro-inflammatory mediators initiate pain and hyper-sensitize the CNS

1. Camu F, Shi I, Vanlersberghe C. *Drugs*. 63 Suppl 1:1-7; 2003.
2. Johnston S. Vet Clinics of NA: *Small Animal Practice*, 31:39-53; 2001.

Summary of Inflammatory Process of OA

1. Johnston, SA. *Vet Clin N Am Small Anim Pract* 27:699-723; 1997.
2. Camu F, et al. *Drugs*. 63 Suppl 1:1-7; 2003.
3. Muir WW. *Veterinary Pain Management*, Gaynor, J and Muir WW. (Eds), Mosby, Columbus 2003.

Multimodal approach

NSAID is the cornerstone of therapy

- Quick action
- Anti- "itis"

- But what happens when:
  - Owner declines it?
  - Patient can't take it?
  - It's not working?
  - We have lost the pharmacy?

Nutrition Options/Goals

- Minimize obesity
- Keep up protein in senior pets – keep muscle mass
- Fortified with Omega-3's

Obesity – a heavy issue

Vet Clin North Am Small Anim Pract. 2016 Sep;46(5):831-41. doi: 10.1016/j.cvsm.2016.04.006. Epub 2016 Jun 9.

Obesity, Exercise and Orthopedic Disease.

Frye CW[1], Shmalberg JW[2], Wakshlag JJ[3].

Author information

Abstract

Osteoarthritis is common among aging canine and feline patients. The incidence and severity of clinical lameness are closely correlated to body condition in overweight and obese patients. Excessive adiposity may result in incongruous and excessive mechanical loading that worsens clinical signs in affected patients. Data suggest a potential link between adipokines, obesity-related inflammation, and a worsening of the underlying pathology. Similarly, abnormal physical stress and generalized systemic inflammation propagated by obesity contribute to neurologic signs associated with intervertebral disc disease. Weight loss and exercise are critical to ameliorating the pain and impaired mobility of affected animals.

Obesity Effects - Two-fold

- Biomechanical stress contributes to clinical signs and progression of disease
- Adipokines secreted by white fat cells contribute to the progressive inflammation of osteoarthritis
  - Leptin levels are elevated in obese dogs
    - In humans with osteoarthritis, increase leptin levels correlate with elevated MMPs and NO in synovial fluid
  - Adiponectin is anti-inflammatory, but levels are low in obese dogs
    - In human patients with knee osteoarthritis there is a significant correlation with adiponectin:leptin ratios

Effects of weight loss on OA

Preventing Obesity Decreases Incidence of OA

Weight Loss Reduces Signs of OA

1. Cicuttini FM, et al. *J Rheumatol*. 1996; 23: 1221-1226.
2. Toda Y, et al. *Rheumatol*. 1998; 25: 2181-2186.
3. Marshall et al. *Vet Comp Ortho Traumatol* 2009; 5: 339-345.

Omega-3 diets in dogs

Can J Vet Res. 2013 Jan;77(1):66-74.

Effect of a diet enriched with green-lipped mussel on pain behavior and functioning in dogs with clinical osteoarthritis.

Rialland P[1], Bichot S, Lussier B, Moreau M, Beaudry F, del Castillo JR, Gauvin D, Troncy E.

⊕ Author information

Abstract in **English**, French

This study aimed to establish the effect of a diet enriched with green-lipped mussel (GLM) on pain and functional outcomes in osteoarthritic dogs. Twenty-three client-owned dogs with osteoarthritis (OA) were fed a balanced control diet for 30 d and then a GLM-enriched balanced diet for the next 60 d. We assessed peak vertical force (PVF), which is considered to be the gold standard method, at Day (D)0 (start), D30 (end of control diet), and D90 (end of GLM-enriched diet). The owners completed a client-specific outcome measure (CSOM), which is a pain questionnaire, once a week. Motor activity (MA) was continuously recorded in 7 dogs for 12 wk. Concentrations of plasma omega-3 fatty acids were quantified as indicative of diet change. Statistical analyses were linear-mixed models and multinomial logistic regression for repeated measures. The GLM diet (from D30 to D90) resulted in an increase in concentrations of plasma omega-3 fatty acids ($P < 0.016$) and improvement of PVF ($P = 0.003$). From D0 to D30, PVF did not significantly change ($P = 0.06$), which suggests that the GLM diet had a beneficial effect on gait function. Moreover, PVF ($P = 0.0004$), CSOM ($P = 0.006$), and MA ($P = 0.02$) improved significantly from D0 to D90. In general, the balanced control diet could have contributed to reduced OA symptoms, an effect that was subsequently amplified by the GLM diet.

And cats!

J Vet Intern Med. 2010 May-Jun;24(3):487-95. doi: 10.1111/j.1939-1676.2010.0495.x. Epub 2010 Mar 22.

Evaluation of a therapeutic diet for feline degenerative joint disease.

Lascelles BD[1], DePuy V, Thomson A, Hansen B, Marcellin-Little DJ, Bourge V, Bauer JE.

⊕ Author information

Abstract

BACKGROUND: Feline degenerative joint disease (DJD) is common and there are no approved therapies for the alleviation of the associated pain.

OBJECTIVE: To test a diet high in eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) content and supplemented with green-lipped mussel extract and glucosamine/chondroitin sulfate (test-diet) for its pain-relieving and activity-enhancing effects in cats with painful, mobility-impairing DJD over a 9-week period.

ANIMALS: Forty client-owned cats.

METHODS: Randomized, controlled, blinded, parallel group, prospective clinical study. Cats with no detectable systemic disease, and with at least 1 appendicular joint with radiographic evidence of DJD where manipulation elicited an aversive response were included. Cats were randomly allocated to the test-diet or control diet (C-diet). Outcome measures were subjective owner and veterinarian assessments, and objective activity monitoring (accelerometry). Nonparametric statistics were used to evaluate changes within and between groups for both subjective and objective data, and locally weighted scatterplot smoothing regression analysis was used to predict activity changes.

RESULTS: The primary objective outcome measures indicated that activity declined significantly ($P < .001$) in the C-diet group, significantly increased ($P < .001$) in the test-diet group and there was a significant difference between the groups ($P < .001$).

CONCLUSION AND CLINICAL IMPORTANCE: A diet high in EPA and DHA and supplemented with green-lipped mussel extract and glucosamine/chondroitin sulfate improved objective measures of mobility. Dietary modulation might be 1 method to use to improve mobility in cats with DJD-associated pain.

Nutritional supplements

- Glucosamine
- Chondroitin
- MSM
- ASU
- More?
- A talk for another day

Rehabilitation (Physical Therapy)

Physical Modalities

Manual Therapies

Therapeutic Exercise – Core of PT

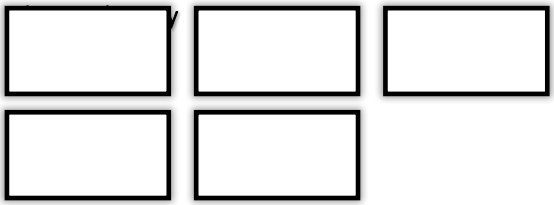
Goal of Rehabilitation with OA

- Maintain/Improve Muscle Mass
- Build Muscle Support Around Joint
- Reduce Pain
- Weight Loss when Indicated

Reaching Goals with Rehab

- Determining Goal
- Program Can Then Be Tailored to Individual Patient

[illegible]y



Be creative.
DON'T USE ELECTRIC HEATING PADS.

Light Amplification by Stimulated Emission of Radiation

- Photobiomodulation
- Activate cytokines and other tissue factors
- Decrease pain and inflammation
- Increase wound healing
- Always use goggles
- Can use in acupuncture
- Not on cancer or pregnancy
- Another lecture ☺

Manual Therapy

- Skilled hand movement techniques intended to:
  - Improve issue extensibility
  - Increase ROM
  - Induce relaxation
  - Mobilize or manipulate soft tissues and joints
  - Modulate pain
  - Reduce swelling and inflammation

Therapeutic Exercises

- The occupational therapy aspect of rehab
- Build on going from down to up, and then mimicking the functions needed to be in a normal environment
- Return to function

Cavaletti Rails

Peanuts

Balance Board and Rolls

- Core strength - Yoga
- Make sure good traction
- Use your weight to help shift
- Can do just front limbs or hind limbs
- Rhythmic stabilization

Core Strengthening

Walking

- A great exercise
- On leash, continuous movement – flat non-slip surfaces
- At a pace appropriate for the patient, not the owner
- Start with 10-12 minutes twice a day, increase each week by 3-5 minutes
- Add in hills, varying traction (sand, snow, high grass)

Hydrotherapy – another presentation

Treadmills

- Diagnostic tool also
- Safe and contained
- Feet always touching ground
- Buoyancy
- Takes a few seconds/minute to get them used to it

Polysulfated Glycosaminoglycan

- FDA approved, disease modifying osteoarthritis drugs; for dogs and horses; water-based, for intramuscular Injection
- Dosage: 2 mg/lb body weight, IM, twice weekly for up to 4 weeks (maximum of 8 injections)
- MOA: specific is not known; *in vitro* studies show;
  - Inhibit serine proteinases; PGE2 synthesis; metalloproteases, hyaluronidases and others
  - Stimulate synthesis of protein, collagen, proteoglycans, and hyaluronic acid
- Anecdotally "maintenance" injections monthly
- Off label SQ usage
- Off label feline SQ usage

1. Adequan prescribing information. *NADA* 141038, Novartis Animal Health, US, INC.

Polysulfated Glycosaminoglycan – Clinical Studies

- Do not use in dogs showing hypersensitivity to PSGAG, or in dogs with known or suspected bleeding disorders
- Use with caution in dogs with renal or hepatic impairment

Other Disease Modifying OA Drugs (DMOAD)

- Zydax – Pentosan
- Parnell product, available in Australia, may be coming to the US
- Potential benefit for horses
- No evidence in dogs currently

Am J Vet Res. 2012 May;73(5):628-33. doi: 10.2460/ajvr.73.5.628.

Evaluation of intramuscularly administered sodium pentosan polysulfate for treatment of experimentally induced osteoarthritis in horses.

McIlwraith CW[1], Frisbie DD, Kawcak CE.

Adjunct Analgesics

- Use in addition to or as a replacement for NSAIDS
- Amantadine – only drug studied to treat canine osteoarthritis
  - In dogs with osteoarthritic pain refractory to an NSAIDs, addition of amantadine improved physical activity
  - Might be a useful adjunct therapy for the clinical management of canine osteoarthritic pain.
  - 3-5mg/kg SID, cats too
- Gabapentin – Calcium channel modulator – cats and dogs
  - 5-10mg/kg SID-TID
- Amitriptyline – SSRI – norepinephrine - cats and dogs
  - 0.5-1.0mg/kg SID-BID

1. Lascelles BDX, et al. *J Vet Intern Med*. 22(1):53-9, 2008.

More Adjunct Analgesics

- Acetaminophen – dogs not cats.
  - 10-15mg/kg TID (bridge drug)
- Local anesthetics – Lidocaine, bupivacaine, mepivacaine
- Opioids – morphine, meperidine, methadone, oxymorphone, hydromorphone, fentanyl, fentanyl patches, butorphanol, pentazocine, nalbuphine, buprenorphine, codeine

Tramadol

- Metabolism and elimination is rapid and variable among dogs
- When administered orally or intravenously to the dog, metabolism of tramadol and all metabolites is rapid
- There is much variability between dogs, possibly breeds
- Pain control did not necessarily correlate with plasma levels of the active metabolite (O-desmethyltramadol)
  - Affects on α-adrenergic or serotonin receptors may contribute to analgesic effects in the dog
- Regardless of mechanism of action, studies suggest oral dose should be 5 mg/kg q 6 hours or 2.5 mg/kg q 4 hours
- Additionally studies for affects in canine OA are needed

- 1. Kukanich B, Papich MG. *J Vet Pharmacol Therap.* 27, 239-246:2004.
- 2. Giorgi M et al. *Vet Res Commun* 33, 875-885: 2008.
- 3. Kukanich B, Papich MG. *AJVR.* 72, 256-262; 2011.

What is GALLIPRANT® (grapiprant tablets)?

- Galliprant is a first-in-class non-cyclooxygenase (COX) inhibiting, non-steroidal anti-inflammatory drug (NSAID) in the piprant class.
- Piprants are a newly recognized drug class, established and defined by the World Health Organization in 2013 as prostaglandin receptor antagonists (PRA).
- Unique mechanism of action by antagonizing the prostaglandin E2 (PGE2) EP4 receptor.
- PGE2 its physiologic effects through binding of four different receptors, EP1, EP2, EP3 and EP4.
- EP4 receptor has been identified as the primary receptor responsible for mediating pain and inflammation associated with osteoarthritis. GALLIPRANT selectively blocks the EP4 receptor, thus blocking PGE2 elicited pain.

Aratana - Galliprant®

ESWT – Extracorporeal Shock Wave Therapy

- Short duration acoustic waves at low frequency and high pressure
- 100x atmospheric pressure in microseconds
- Mechanisms lacking – but reported
  - reduced inflam/short term analgesia
  - improved vascularity, neovascularization
  - increase bone formation
  - realignment of tendon fibers
  - enhanced wound healing
- Improved weight bearing and comfortable ROM similar to NSAIDs
- Heavy sedation or anesthesia usually required
- Repeating treatment q 2-3 weeks for 3-4 treatments
- No concurrent NSAIDS

ESWT Research

Vet Comp Orthop Traumatol. 2005;18(3):147-52.

The evaluation of extracorporeal shockwave therapy in naturally occurring osteoarthritis of the stifle joint in dogs.

Dahlberg J[1], Fitch G, Evans RB, McClure SR, Conzemius M.

Author information

Abstract

Extracorporeal shockwave therapy (ESWT) has expanded from the original uses of human urinary calculi treatment to veterinary orthopaedic applications. This paper investigates the feasibility and efficacy of treating dogs with osteoarthritis of the stifle joint with ESWT. In this study, dogs with persistent stifle lameness despite previous surgical or medical treatment were either treated with ESWT or served as untreated controls. The more lame rear limb of each dog was determined by force platform analysis. The range of motion (ROM) of the stifle joints was assessed by goniometry. Force platform gait analysis and goniometry were performed on both groups for four visits at three-week intervals and a final examination four weeks later. Shock wave therapy was performed three times on the treated dogs, once at each of the first three examinations. A placebo treatment consisting of clipping and wetting the hair was performed on the control dogs. The vertical forces were evaluated for objective analysis of treatment response. For peak vertical force (PVF), four of seven treated dogs improved, while only one of five of control dogs improved. The PVF for the within group analysis did not show any significant change for the treated group, however, the control group has a significant decrease ($p = 0.05$) in PVF consistent with an increase in lameness. The range of motion (ROM) of the stifle joint improved in five of seven treated dogs and three of five controls. Dogs in the treated group had a trend toward increased ROM ($p = 0.07$) and a 'positive slope' when compared to dogs in the control group which did not have a significant change ($p = 0.78$) and had a negative slope indicating the dogs were developing a decrease in ROM. The subjective data provided by client questionnaire did not show significant difference between groups.

ESWT Research

Extracorporeal Shockwave Therapy for Shoulder Lameness in Dogs

Willem Becker, DVM, DACVS*, Michael P. Kowaleski, DVM, DACVS, Robert J. McCarthy, DVM, DACVS, Cara A. Blake, DVM, DACVS†

ABSTRACT

The purpose of this article was to describe the outcome of dogs with instability, calcifying, and inflammatory conditions of the shoulder treated with extracorporeal shockwave therapy (ESWT). Medical records for 15 dogs with lameness attributable to the shoulder that failed previous conservative management were retrospectively reviewed. ESWT was delivered to those dogs q 3–4 wk for a total of three treatments. Short-term, in-hospital subjective lameness evaluation revealed resolution of lameness in three of nine dogs and improved lameness in six of nine dogs available for evaluation 3–4 wk following the final treatment. Long-term lameness score via telephone interview was either improved or normal in 7 of 11 dogs (64%). ESWT may result in improved function based on subjective patient evaluation and did not have any negative side effects in dogs with lameness attributable to instability, calcifying, and inflammatory conditions of the shoulder. *J Am Anim Hosp Assoc* 2015; 51:000–000. DOI 10.5326/JAAHA-MS-6175)

PEMF - Pulsed Electromagnetic Field Therapy

PEMF - Pulsed Electromagnetic Field Therapy

PEMF Research - Human

Rheumatology (Oxford). 2016 Apr;55(4):755-62. doi: 10.1093/rheumatology/kev426. Epub 2015 Dec 24.

Pulsed electromagnetic fields in knee osteoarthritis: a double blind, placebo-controlled, randomized clinical trial.

Bagnato GL[1], Miceli G[2], Marino N[2], Sciortino D[2], Bagnato GF[2].

Author information

Abstract

OBJECTIVES: This trial aimed to test the effectiveness of a wearable pulsed electromagnetic fields (PEMF) device in the management of pain in knee OA patients.

METHODS: In this randomized [with equal randomization (1:1)], double-blind, placebo-controlled clinical trial, patients with radiographic evidence of knee OA and persistent pain higher than 40 mm on the visual analog scale (VAS) were recruited. The trial consisted of 12 h daily treatment for 1 month in 60 knee OA patients. The primary outcome measure was the reduction in pain intensity, assessed through VAS and WOMAC scores. Secondary outcomes included quality of life assessment through the 36-item Medical Outcomes Study Short-Form version 2 (SF-36 v2), pressure pain threshold (PPT) and changes in intake of NSAIDs/analgesics.

RESULTS: Sixty-six patients were included, and 60 completed the study. After 1 month, PEMF induced a significant reduction in VAS pain and WOMAC scores compared with placebo. Additionally, pain tolerance, as expressed by PPT changes, and physical health improved in PEMF-treated patients. A mean treatment effect of -0.73 (95% CI −1.24 to −0.19) was seen in VAS score, while the effect size was -0.34 (95% CI −0.85 to 0.17) for WOMAC score. Twenty-six per cent of patients in the PEMF group stopped NSAID/analgesic therapy. No adverse events were detected.

CONCLUSION: These results suggest that PEMF therapy is effective for pain management in knee OA patients and also affects pain threshold and physical functioning. Future larger studies, including head-to-head studies comparing PEMF therapy with standard pharmacological approaches in OA, are warranted.

PEMF Research - Human

Review Article

Evidence-Based Use of Pulsed Electromagnetic Field Therapy in Clinical Plastic Surgery

Berish Strauch, MD; Charles Herman, MD; Richard Dabb, MD; Louis J. Ignarro, PhD; and Arthur A. Pilla, PhD

Background: The initial development of pulsed electromagnetic field (PEMF) therapy and its evolution over the last century for use in clinical surgery has been slow, primarily because of lack of scientifically-derived, evidence-based knowledge of the mechanism of action.

Objective: Our objective was to review the major scientific breakthroughs and current understanding of the mechanism of action of PEMF therapy, providing clinicians with a sound basis for optimal use.

Methods: A literature review was conducted, including mechanism of action and biologic and clinical studies of PEMF. Using case illustrations, a holistic exposition on the clinical use of PEMF in plastic surgery was performed.

Results: PEMF therapy has been used successfully in the management of postsurgical pain and edema, the treatment of chronic wounds, and in facilitating vasodilatation and angiogenesis. Using scientific support, the authors present the currently accepted mechanism of action of PEMF therapy.

Conclusions: This review shows that plastic surgeons have at hand a powerful tool with no known side effects for the adjunctive, noninvasive, nonpharmacologic management of postoperative pain and edema. Given the recent rapid advances in development of portable and economical PEMF devices, what has been of most significance to the plastic surgeon is the laboratory and clinical confirmation of decreased pain and swelling following injury or surgery. (*Aesthetic Surg J 2009;29:155–163.*)

TCVM – Traditional Chinese Veterinary Medicine

- Acupuncture
  - Electro – most published data
- Herbal Therapy
- Food Therapy

Electroacupuncture for pain

Acta Cir Bras. 2012 Jan;27(1):43-8.

Electroanalgesia for the postoperative control pain in dogs.

Cassu RN[1], Silva DA, Genari Filho T, Stevanin H.

Author information

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PURPOSE: To evaluate the analgesic and neuroendocrine effects of electroanalgesia in dogs undergoing ovariohysterectomy.

METHODS: Eighteen dogs were randomly distributed to three groups of six animals each and received either electrical stimuli at acupuncture points (EA), at peri-incisional dermatomes (DER) and at both acupuncture points and peri-incisional dermatomes (EAD). Pre-anesthetic medication was acepromazine (0.05mg kg-1, IV). Anesthesia was induced with propofol (4 to 5mg kg-1, IV) and maintained with isoflurane. Postoperatively pain degree was measured using a numerical rating scale. Dogs were scored at 1, 3, 6, 12 and 24 hours postoperative. If the pain score was ≥6, supplemental morphine (0.5mg kg-1, IM) was administered. Serum cortisol concentration was measured before pre-anesthetic medication (basal), and at 1, 12 and 24 hours postoperative.

RESULTS: EA and EAD- treated dogs had lower pain scores than DER treated dogs one hour postoperatively. Fewer EA and EAD-treated dogs required rescue analgesia. Serum cortisol did not differ among treatments.

CONCLUSION: Preoperative application of electrical stimuli to acupuncture points isolated or in combination with peri-incisional dermatomes provides a reduced postoperative opioid requirement and promotes an effective analgesia in dogs undergoing ovariohysterectomy.

Kinesiology Taping

- Works on lifting
- Improve blood flow, lymphatic return
- Pain mitigation
- Inflammation
- Neurosensory awareness

Kinesiology Taping – Pain of OA/DJD

J Phys Ther Sci. 2016 Jan;28(1):63-6. doi: 10.1589/jpts.28.63. Epub 2016 Jan 30.

The effects of kinesiology taping therapy on degenerative knee arthritis patients' pain, function, and joint range of motion.

Lee K[1], Yi CW[2], Lee S[3].

Author information

Abstract

[Purpose] The purpose of the present study was to examine the effects of kinesiology taping therapy on degenerative knee arthritis patients' pain, function, and joint range of motion. [Subjects] To conduct the experiment in the present study, 30 patients with degenerative knee arthritis were divided into a control group (the conservative treatment group) of 15 patients, who received conservative physical therapy, and an experimental group (the kinesiology taping group) of 15 patients, who received kinesiology taping therapy. [Methods] All patients received treatment three times per week for four weeks. The kinesiology taping group had elastic tapes applied to the hamstring muscles, anterior tibialis, quadriceps femoris, and gastrocnemius. The range of motion was measured using joint goniometers, pain was measured using visual analog scales, and functional evaluation was conducted using the Korean Western Ontario and McMaster Universities Osteoarthritis Index. [Results] In intragroup comparisons of the kinesiology taping group and the conservative treatment group, the visual analog scale and Korean Western Ontario and McMaster Universities Osteoarthritis Index scores significantly decreased, and the range of motion increased more than significantly. In intergroup comparisons, the kinesiology taping group showed significantly lower visual analog scale and Korean Western Ontario and McMaster Universities Osteoarthritis Index scores and significantly larger ranges of motion than the conservative treatment group. [Conclusion] Kinesiology taping therapy is considered to be an effective nonsurgical intervention method for pain relief, daily living activities, and range of motion of degenerative knee arthritis patients.

More Research

Physiother Theory Pract. 2014 Aug;30(6):375-83. doi: 10.3109/09593985.2014.896963. Epub 2014 Mar 11.

Efficacy of kinesio taping on isokinetic quadriceps torque in knee osteoarthritis: a double blinded randomized controlled study.

Anandkumar S[1], Sudarshan S, Nagpal P.

Author information

Abstract

STUDY DESIGN: Double blind pre-test post-test control group design.

OBJECTIVES: To compare the isokinetic quadriceps torque, standardized stair-climbing task (SSCT) and pain during SSCT between subjects diagnosed with knee osteoarthritis pre and post kinesio tape (KT) application with and without tension.

BACKGROUND: Strength of the quadriceps and torque producing capability is frequently found to be compromised in knee osteoarthritis. The efficacy of KT in improving isokinetic quadriceps torque in knee osteoarthritis is unknown, forming the basis for this study.

METHODS AND MEASURES: Forty subjects were randomly allocated to either the experimental (therapeutic KT with tension) or control group (sham KT without tension) with the allocation being concealed. Pre and post test measurements of isokinetic quadriceps torque, SSCT and pain during SSCT were carried out by a blinded assessor.

RESULTS: A large effect size with significant improvements in the peak quadriceps torque (concentric and eccentric at angular velocities of 90° per second and 120° per second), SSCT and pain were obtained in the experimental group when compared to the control group.

CONCLUSION: Application of therapeutic KT is effective in improving isokinetic quadriceps torque, SSCT and reducing pain in knee osteoarthritis.

Intraarticular injections – Targeted Therapy

- Easy to learn
- Sedated
- Radiographs – verify the disease
- Sterile Prep

IA Injections - Options

- Corticosteroids
- Hyaluronic Acid
- Regenerative Medicine
  - Platelet Rich Plasma (PRP)
  - Stem Cell Therapy

IA Injections - Corticosteroids

- (20 mg) of methyl-prednisolone acetate
- Triamcinolone – 0.22mg/kg total
- Less systemic effects with triamcinolone

IA Injections - Hyaluronic Acid

- Increase viscosity of joint fluid
- Anti-inflammatory
- Analgesic
- Induce production of synovial fluid
- Many different options
  - Molecular weight
- Combine with steroid?

HA -article

J Orthop Res. 2016 Feb 11. doi: 10.1002/jor.23191. [Epub ahead of print]

Hyaluronic acid versus Saline intra-articular injections for amelioration of chronic knee osteoarthritis: A canine model.

Pashuck TD[1], Kuroki K[2], Cook CR[2], Stoker AM[2], Cook JL[1,2].

Author information

Abstract

The objective of this study was to assess the safety and efficacy of intra-articular injections of hyaluronic acid (HA) versus saline for symptomatic treatment of osteoarthritis (OA). Twenty-five adult purpose-bred dogs underwent meniscal release of one knee. Clinical, arthroscopic and radiographic signs of OA were confirmed in all dogs prior to treatment. Dogs were randomized into 5 groups: HA-1 (n = 5), HA-3 (n = 5), HA-5 (n = 5), Saline-1 (n = 5) and Saline-3 (n = 5). Each dog received intra-articular injections of the respective substance into the affected knee at the pre-determined time points. Dogs were assessed for heat, swelling, and erythema after each injection and for lameness, pain, effusion, range of motion, kinetics, radiographic OA scoring, and arthroscopic scoring prior to treatment and for 6 months after injection. Dogs were then humanely euthanized and the knees assessed grossly and histologically. Only mild heat, swelling and/or erythema were noted in some dogs following injection and resolved within 1 week. Dogs treated with HA-1, HA-3 and HA-5 were significantly ($p < 0.05$) better than dogs treated with Saline-1 and Saline-3 at the 4, 8 and 12 week time points based on at least one outcome measure. OA severity was not significantly different among groups at any time point, but increased in severity over time in all groups. Gross and histologic OA scores were not significantly different among groups.

IA Injections – Regenerative Medicine

- In-clinic and outside options
- In-clinic – same day harvest and treatment, single anesthesia
- Outside – culture, banking.
  - But two anesthesia episodes

IA Injections – Regenerative Medicine - PRP

- Platelet Rich Plasma
- 60cc of blood – 4 cc of platelets
- Positive effects on angiogenesis and extracellular matrix remodeling
- Fibrin for matrix
- Growth factors –VEGF, TGFB, IL8
- Cell proliferation and differentiation
- Stem cell recruitment and chemotaxis

Which do we use?

Can Vet J. 2013 Sep;54(9):881-4.

Prospective trial of autologous conditioned plasma versus hyaluronan plus corticosteroid for elbow osteoarthritis in dogs.

Franklin SP[1], Cook JL.

Author information

Abstract in **English**, French

This prospective, randomized, double-blinded trial compared outcomes in dogs with bilateral elbow osteoarthritis (OA) treated with hyaluronan plus methylprednisolone (HA + S) or autologous conditioned plasma (ACP(®); Arthrex). An investigator blinded to the treatments graded lameness (0-4) before and 6 months after a single injection with either HA + S or ACP. Clients were blinded to treatment and completed a validated survey before and 1, 6, 12, and 24 weeks after injection. Ten dogs (5 per group) completed all parts of the study. Pre-treatment lameness grades were 1.2 ± 0.97 for HA + S and 1.8 ± 1.1 for ACP and were not different between groups. Post-treatment lameness grades were 0.4 ± 0.55 for HA + S and 0.8 ± 0.84 for ACP with significant ($P < 0.05$) improvement with either treatment but without differences between groups. Client-based assessments demonstrated improvements in activity, lameness, and pain with HA + S and ACP. These data suggest that both treatments have beneficial effects for dogs with bilateral elbow OA.

IA Injections – Regen Med – Stem Cells

- Bone Marrow vs. Adipose?
- Contribute to generating new tissue
- Chemotactic for progenitor cells
- Supply growth factors
- Make extracellular matrix
- Angiogenesis
- Anti-apoptosis
- Anti-inflammatory
- Anti-fibrotic

Stem Cell Research

BMC Vet Res. 2014 Jul 1;10:143. doi: 10.1186/1746-6148-10-143.

Assessment of the effect of intraarticular injection of autologous adipose-derived mesenchymal stem cells in osteoarthritic dogs using a double blinded force platform analysis.

Vilar JM[1], Batista M, Morales M, Santana A, Cuervo B, Rubio M, Cugat R, Sopena J, Carrillo JM.

Author information

Abstract

BACKGROUND: Regenerative medicine using Mesenchymal Stem Cells (MSC) alone or combined with Plasma Rich in Growth Factors (PRGF) is a rapidly growing area of clinical research and is currently also being used to treat osteoarthritis (OA). Force platform analysis has been consistently used to verify and quantify the efficacy of different therapeutic strategies for the treatment of OA in dogs including MSC associated to PRGF, but never with AD-MSC alone. The aim of this study was to use a force platform to measure the efficacy of intraarticular ADMSC administration for limb function improvement in dogs with severe OA.

RESULTS: Ten lame dogs with severe hip OA and a control group of 5 sound dogs were used for this study. Results were statistically analyzed to detect a significant increase in peak vertical force (PVF) and vertical impulse (VI) in treated dogs. Mean values of PVF and VI were significantly improved within the first three months post-treatment in the OA group, increasing 9% and 2.5% body weight, respectively, at day 30. After this, the effect seems to decrease reaching initial values.

CONCLUSION: Intraarticular ADMSC therapy objectively improved limb function in dogs with hip OA. The duration of maximal effect was less than 3 months.

Recent Research

Partial Cranial Cruciate Ligament Tears Treated with Stem Cell and Platelet-Rich Plasma Combination Therapy in 36 Dogs: A Retrospective Study

Sherman O. Canapp Jr.[1], Christopher S. Leasure[1], Catherine Cox[1], Victor Ibrahim[2] and Brittany J. Carr[1]*

Citation:
Canapp SO Jr, Leasure CS, Cox C, Ibrahim V and Carr BJ (2016) Partial Cranial Cruciate Ligament Tears Treated with Stem Cell and Platelet-Rich Plasma Combination Therapy in 36 Dogs: A Retrospective Study. Front. Vet. Sci. 3:112. doi: 10.3389/fvets.2016.00112

Promising Results

Results: Stifle arthroscopy findings at 90 days posttreatment were available on 13 of the 36 dogs. In nine dogs, a fully intact CCL with marked neovascularization and a normal fiber pattern was found with all previous regions of disruption healed. One dog revealed significant improvement and received an additional injection. The remaining three dogs had a >50% CCL tear, and a TPLO was performed. Four additional dogs were known to have had a TPLO performed elsewhere. Baseline and day 90 posttreatment objective gait analyses were available on 11 of the 36 dogs. A significant difference was found between the treated limb total pressure index percent (TPI%) at day 0 and day 90 ($p = 0.0124$), and between the treated limb and contralateral limb TPI% at day 0 ($p = 0.0003$). No significant difference was found between the treated limb and contralateral limb TPI%

Treatment IA

- Mild OA and synovitis
  - HA weekly x3 weeks or single PRP injection
  - No response to HA, single PRP injection
- Acute post-op (8-12 weeks)
  - HA weekly x3 weeks or single PRP
  - If no response to HA, single PRP injection
- Moderate OA
  - PRP injection weekly x2 injections (repeat if needed)
  - If no response combination MSC/PRP
- Severe OA
  - PRP every other week for 2-3 treatments

  Or
  - MSC/PRP combination followed by booster injection in 9-12 months

  Or
  - IA steroid
    - 1 injection followed by a 2nd if needed in 3-4 weeks (max of 4 injections per year)

Treatment IA

- Expected duration of treatment:
  - HA- 6 months of relief
    - 80% respond well
      - 10% respond fair
      - 10% don't respond
  - PRP- 9-12 months of relief
  - PRP/MSC- 18-24 months of relief
- Post regenerative medicine treatment
  - No shock wave tx
  - **No lasers** (4 weeks for cells, 2 wks PRP)
  - No cold or warm packs
  - No ultrasound therapy
  - **No NSAIDS**
    - 8 weeks with MSC or PRP/MSC
    - 2 weeks with PRP tx

What techniques do I use?

- All of the ones we just mentioned!
- I adjust to my patient's needs, client's needs/wants
- I offer what I would do if it was my pet!

Even more options

- Botulinum toxin
- Monoclonal antibody for nerve growth factor – dogs AND cats
- Undenatured Type II Collagen
- Radiation Therapy

Summary

- Treat early – be proactive, not reactive
- Don't wait until severe cartilage damage
- Weight loss and exercise are crucial in all stages
- Multimodal approach
- Include pain management

Updated Guidelines

2015 AAHA/AAFP Pain Management Guidelines for Dogs and Cats*

Mark Epstein, DVM, DABVP, CVPP (co-chairperson), Ilona Rodan, DVM, DABVP (co-chairperson), Gregg Griffenhagen, DVM, MS, Jamie Kadrlik, CVT, Michael Petty, DVM, MAV, CCRT, CVPP, DAAPM, Sheilah Robertson, BVMS, PhD, DACVAA, MRCVS, DECVAA, Wendy Simpson, DVM

- https://www.aaha.org/public_documents/professional/guidelines/2015_aaha_aafp_pain_management_guidelines_for_dogs_and_cats.pdf

Thank you

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