



Veterinary Orthopedic Society 43rd Annual Conference Abstracts

February 27 – March 5, 2016
Big Sky, Montana, USA

Part I

PODIUM ABSTRACTS

1 RADIOGRAPHIC OUTCOME AND SYNOVIAL INFLAMMATORY MARKERS FOLLOWING TPLO IN DOGS ENROLLED IN A PROSPECTIVE, RANDOMIZED CLINICAL TRIAL COMPARING THE EFFECTS OF DIET AND PHYSICAL REHABILITATION

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Introduction: Our objective was to determine the effect of an omega-3 fatty acid rich diet (JM) with and without rehabilitation therapy (R) postoperatively on radiographic bone healing, radiographic osteoarthritis (OA) progression, synovial prostaglandin E₂ (PGE₂) and interleukin-1 (IL-1) concentrations, and patellar desmitis in dogs with cranial cruciate ligament rupture following tibial plateau levelling osteotomy and arthroscopic surgery (TPLO).

Materials and Methods: Dogs were randomly assigned to one of 4 treatment groups (n=12/group): Purina JM diet (JM), maintenance diet (M), JM and rehabilitation (JM-R), M and rehabilitation (M-R). Outcome assessments included synovial fluid PGE₂ and IL-1, radiographic OA scores, tibia osteotomy healing, and patellar tendon thickening preoperatively and at 0, 8, and 24 weeks postoperatively.

Results: PGE₂ concentration significantly declined over time in all dogs. M groups had significantly higher PGE₂ (p<0.01) than JM groups whereas R had no effect. OA progressed slower in JM groups compared to M groups and in R groups compared to controls (p=0.012 and p<0.05, respectively). There was no change in IL-1 over time in any group. JM groups had less tibial osteotomy healing at 8 and 24 weeks postoperatively compared to M groups, regardless of R (p<0.0001).

Discussion/Conclusion: JM may benefit dogs following TPLO by lowering synovial PGE₂ and reducing progression of OA in the 6 months following surgery, however JM may slow tibial osteotomy healing. R can also slow progression of OA in dogs following TPLO.

Acknowledgement: Funding was provided by the Nestle Purina Corp. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the presentation/manuscripts.

2 FELINE ANTI-NERVE GROWTH FACTOR ANTIBODY IMPROVES MOBILITY IN CATS WITH DEGENERATIVE JOINT DISEASE-ASSOCIATED PAIN AND MOBILITY IMPAIRMENT

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Introduction: There is a critical need for proven drugs for treatment of degenerative joint disease (DJD) pain in cats. Antibodies against Nerve Growth Factor (NGF) are analgesic in rodent models and in humans with chronic pain. This pilot study evaluated the efficacy of a felinized anti-NGF antibody (NV-02) for the treatment of DJD pain and mobility impairment in cats.

Materials and Methods: In a placebo-controlled, pilot, masked clinical study, 34 cats with DJD-associated pain and mobility impairment were randomized to a single treatment with NV-02 (400 mcg/kg SC [n=11] or 800mcg/kg SC [n=12]) or placebo (saline, SC [n=11]). In addition to objective accelerometry, owners completed the Client-Specific Outcome Measures [CSOM] and Feline Musculoskeletal Pain Index [FMPI] on days 0 (screening), 14 (baseline/treatment), 35, 56 and 77. Data were evaluated within and between groups.

Results: All groups showed significantly improved owner assessments at all time points (P <0.01). CSOM scores (P=0.035) and pain over the last 3 weeks (P=0.024) were significantly improved in the combined treatment group compared to the placebo group 3 weeks following treatment; similar for the FMPI data (P=0.061). Objectively measured activity significantly increased in the NV-02 group compared to the placebo group between 2 and 6 weeks following the single treatment with NV-02 (P= 0.017 overall).

Discussion/Conclusion: These pilot data demonstrate a positive analgesic effect of anti-NGF antibody in cats suffering from chronic pain. The magnitude of the effect was greater than that seen with an NSAID.

Acknowledgement: Funded by Nexvet Biopharma Pty Ltd

3 EVALUATION OF A CANINE STANCE ANALYZER FOR DETECTION OF LAMENESS IN DOGS

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Introduction: Objective evaluation of weight bearing is vital for research and clinical decisions. To date no comparison of commercially available static stance analyzers (SA) to other forms of objective gait analysis has been performed. Aims of this study were to report SA for normal dogs and compare SA in lame/sound dogs with pressure sensitive walkway (PSW) data.

Materials and Methods: Gait analysis was performed in a heterogeneous population of subjectively lame (SL; n=40) and normal (SN; n=43) dogs using SA, and previously validated PSW. SN dogs were used to establish reference values for SA data for percentage of body weight (%BW) distributed by limb. Dogs with PSW maximum force (%BW) outside normal values were classified as objectively lame (OL).

Results: SN group PSW maximum force (%BW) reported was consistent with previous studies. SN group SA %BW showed an approximate 30/30/20/20 distribution with a SD of approximately 5% (RFL 30.9±6.4; LFL 30.8±5.0; RHL 19.8±4.4; LHL 18.7±4.5). OL dogs were assigned correctly by

VOS would like to thank Nexvet Biopharma PLC for their sponsorship support which made publication of these abstracts possible.





SA in 6/12 dogs (n=1/2 for bilateral pelvic limb lameness, n=2/2 LFL lameness, n=1/2 LHL lameness, n=1/4 RFL lameness, and n=1/2 RHL lameness).

Discussion/Conclusion: Normal dog SA data appears to follow previously established patterns with a SD of approximately five percent. Correctly identifying lameness in OL dogs using established reference values was only accomplished in 50% of cases, requiring further investigation into confounding factors.

Acknowledgement: We thank the Eldred foundation for generous contribution to this research. LiteCure LLC provided the SA; no other proprietary interests/funding were provided for this research study.

4 PREOPERATIVE LOW LEVEL LASER THERAPY IN DOGS UNDERGOING TIBIAL PLATEAU LEVELLING OSTEOTOMY: A BLINDED, PROSPECTIVE, RANDOMIZED CANINE CLINICAL TRIAL

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Introduction: Low-level laser therapy (LLLT) is a safe adjunctive therapy used for the treatment of various injuries in human and veterinary medicine. The purpose of this study was to evaluate outcomes of preoperative LLLT in dogs undergoing tibial plateau levelling osteotomy (TPLO) in a blinded, prospective, randomized clinical trial. Our null hypothesis was that a preoperative dose of LLLT would not produce significant effects on the gait and radiographic bone healing of dogs following TPLO.

Materials and Methods: Dogs (n=27) that underwent TPLO were randomly assigned to receive either LLLT (group LLLT) with a gallium-aluminum-arsenium laser (800–900 nm dual wavelength, 6W, 3.5J/cm², 100cm² area) or sham (group C). Treatment or sham was administered to the proximomedial tibia immediately preoperatively. Lameness, response to manipulation, and force plate analysis was performed preoperatively, 24 hours, 2 weeks, and 8 weeks post operatively. Radiographic healing of the osteotomy site was assessed 8 weeks postoperatively.

Results: At 8 weeks postoperatively, a significant difference in peak vertical force was found between group LLLT (39.6% ± 4.7%) and group C (28.9% ± 2.6%) (P < 0.01 Time, P < 0.01 L). There was no significant difference noted for all other parameters.

Discussion/Conclusion: A single dose of preoperative LLLT resulted in a significant improvement in peak vertical force for dogs undergoing TPLO on the operated limb 8 weeks postoperatively. Further studies are necessary to determine the ideal treatment protocol and elucidate the pathophysiology.

Acknowledgement: There was no proprietary interest or funding provided for this project.

5 EXTENDED TROT DISTAL FORELIMB KINEMATICS ON MEASURED DIRT AND SYNTHETIC ARENA SURFACES

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Introduction: Dressage horses are susceptible to suspensory ligament injuries. Risk can be lowered by minimizing limb loads and by design of arena surfaces. Fetlock and hoof kinematics in dressage horses at the extended trot, and surface properties, were compared between dirt and synthetic arena surfaces.

Materials and Methods: Six dressage horses (8–13 years) were studied with owner consent. Video cameras captured fetlock and hoof movements, during extended trot trials, alternating between dirt and synthetic surfaces over 4 days. Slide, support, and break over phases of stance were examined. Surface mechanics were measured using an impact device. The effect of surface type on variables was assessed using mixed model analyses of covariance with

fixed effect covariates and random horse effects. Normality of model residuals was verified.

Results: Horses spent more time in slide phase, less time in support during stance on the synthetic surface compared to the dirt surface. The synthetic surface had 2% greater mean maximum fetlock angle, greater backward hoof translation, and 41% greater mean maximum impact force.

Discussion/Conclusion: Arena surfaces had different mechanical behaviors than racetrack surfaces. The synthetic dressage surface, but the dirt racetrack surface, had greater peak impact force. Consequently, the type of surface material is insufficient to characterize mechanical properties of surfaces. However, fetlock extension is associated with greater surface impact force for racehorse and dressage horses. Therefore surface design could affect suspensory ligament injury.

Acknowledgement: Supported by the Center for Equine Health with funds provided by the State of California pari-mutuel fund and contributions by private donors.

6 RANDOMIZED, PROSPECTIVE CLINICAL TRIAL COMPARING THE EFFECTS OF DIET AND PHYSICAL REHABILITATION IN DOGS FOLLOWING TIBIAL PLATEAU LEVELLING OSTEOTOMY

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Introduction: The objective was to determine the effect of an omega-3 fatty acid and protein rich diet with and without rehabilitation postoperatively in dogs with cranial cruciate ligament rupture following TPLO and arthroscopic surgery.

Materials and Methods: Dogs were randomly assigned to one of 4 treatment groups (n=12/group): Purina JM diet (JM), adult maintenance diet (M), JM diet and rehabilitation (JM-R), adult maintenance diet and rehabilitation (M-R). Outcome assessments for 6 months included gait analysis, surgeon and owner assessment of lameness, thigh and proximal tibial circumference, and daily accelerometer activity.

Results: Dogs receiving JM-R had persistently greater peak vertical force (PVF) and vertical impulse (VI) from 8 to 24 weeks postoperatively (p<0.00001) than any other group. PVF (% body weight, mean ± standard deviation) at 8 weeks: M (36.1 ± 11), M-R (31.9 ± 11.6), JM-R (44.4 ± 11.6), JM (40.5 ± 21.2). Surgeon evaluation of lameness and thigh circumference were not significantly different between groups, however owners reported significantly less lameness in JM and rehabilitation groups compared to M (control). Average sedentary time decreased and vigorous activity increased in all groups. Rehabilitation significantly increased time spent in light/moderate activity regardless of diet (P=0.013).

Discussion/Conclusion: Postoperative management following tibial plateau levelling osteotomy with an omega-3 fatty acid and protein rich diet and rehabilitation improves PVF, and VI while rehabilitation increases daily activity in dogs in the short term of 6 months.

Acknowledgement: Funding was provided by the Nestle Purina Corp. The funders had no role in study design, data collection and analysis, or preparation of manuscripts.

7 EFFECT OF TIBIAL TUBEROSITY ADVANCEMENT ON CRANIAL TIBIAL LUXATION IN THE FELINE CRANIAL CRUCIATE DEFICIENT STIFLE JOINT" AN IN-VITRO EXPERIMENTAL STUDY.

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Introduction: The effect of Tibial Tuberosity Advancement (TTA) on the cranial cruciate ligament (CrCL)-deficient stifle joint has been validated by



ex-vivo studies in the dog but not in the cat. Our objective was to evaluate the effect of TTA on Cranial Tibial Subluxation (CTS) and Tibial Rotation Angle (TRA) in a model of feline CrCL-deficient stifle joint.

Materials and Methods: The hind limbs of ten adult cats were freed of soft tissues except from the stifle and talocrural joint capsules. Quadriceps and gastrocnemius muscles were simulated using cables, turnbuckles and a spring. An axial load of 30% body weight was applied. The stifle and hock joint angles were adjusted to 120°. Patellar tendon angle (PTA), CTS and TRA were measured radiographically with the cranial cruciate ligament intact, after CrCL transection, after TTA and after additional advancement of 1 and 2mm.

Results: CrCL section resulted in a CTS of 8.1 ± 1.5 mm and a TRA of $18.4 \pm 5.7^\circ$. After TTA, PTA was significantly decreased from $99.1 \pm 1.7^\circ$ to $89.1 \pm 0.7^\circ$; CTS and TRA did not change significantly (7.8 ± 1.0 mm and $15.9 \pm 5.7^\circ$ respectively). Additional advancement of the tibial tuberosity by 2 mm significantly reduced the PTA to $82.9 \pm 0.9^\circ$. A significant decrease of CTS (6.9 ± 1.3 mm) and TRA ($14.7 \pm 3.6^\circ$) was also observed.

Discussion/Conclusion: In this model, TTA failed to eliminate cranial tibial subluxation. Further studies are warranted to evaluate the effect of TPLO on the CrCL-deficient feline stifle.

Acknowledgement: There was no proprietary interest or funding for this project.

8 CASE REPORT - EVALUATION OF A CANINE TALOCRURAL ARTHROPLASTY IN THREE CLINICAL CASES

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Introduction: Canine end stage talocrural arthritis is often treated with arthrodesis. Unfortunately, this can have a high rate of surgical complications and can result in long-term functional lameness. A custom tibiotarsal arthroplasty procedure was performed in three clinical cases as an alternative to arthrodesis.

Materials and Methods: Tibiotarsal arthroplasty was performed on three (3) client owned dogs. These patients were selected based on severe talocrural arthritis that failed to respond to conventional treatments. The cases were monitored for surgical complications, radiographic evidence of implant instability, gait analysis to evaluate lameness and functional outcome.

Results: The three dogs received implants from November 2014 to June 2015. No intraoperative surgical complications occurred and all had successful implantations. Case #1 died of unrelated causes approximately four (4) weeks post-operatively but was reported to be bearing weight well. Case #2 reported abrupt lameness 5 days post-operatively requiring a second surgery. This led to the retrieval of a detached osteophyte from the flexor hallucis tendon sheath. The patient recovered quickly and the 6-month radiographs showed stable implants and subjective function was excellent. Case #3 has had no complications post-operatively and, as of the 2-month evaluation, shows no radiolucency around the implants and subjective functional outcome is also excellent.

Discussion/Conclusion: Early results justify continued use and development of the talocrural arthroplasty system. However, long-term evaluation and further research needed.

Acknowledgement: Implants and instrumentation developed with BioMed-trix, LLC.

9 SIX MONTH OUTCOME OF AN INTRA-ARTICULAR ALLOGRAFT TECHNIQUE FOR TREATMENT OF CRANIAL CRUCIATE LIGAMENT RUPTURE IN THE DOG

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Introduction: Although outcomes for current cranial cruciate ligament (CCL) repairs are reported to be good to excellent, no repair neutralizes all forces encountered by the native CCL. This can contribute to osteoarthritis. Intra-articular reconstructive techniques have been attempted in dogs with poor results, but such results may be due to inappropriate graft selection, weak fixation, and/or biological rejection. Previous work has shown that a medial femoral Transfix reconstruction using a decellularized deep digital flexor tendon (DDFT) allograft and spiked washers can mimic the mechanical properties of the native CCL.

Materials and Methods: Ten client-owned dogs had placement of intra-articular decellularized DDFT grafts. Outcome measures included owner questionnaire, orthopedic exam, and force plate analysis.

Results: At 6-month follow-up, all owners graded their dogs as significantly improved. Veterinary exam reported 7 dogs as excellent, 1 as good, and 2 as fair. An orthopedic exam revealed cranial drawer, subjectively assessed, in 3 dogs. Medial buttress was minimal in all patients. Force plate analysis revealed improvement in peak vertical force and vertical impulse versus prior to surgery. Looking at the asymmetry index, 2 dogs were considered normal (<6%), 7 dogs were not visibly lame (<20%) and 1 dog was visibly lame (>20%).

Discussion/Conclusion: Intra-articular repair has the potential to provide improved clinical outcome, although cranial drawer might not be completely eliminated at 6 months.

Acknowledgement: We would like to thank Arthrex and Veterinary Transplant Services for their product donation.

10 RETROSPECTIVE EVALUATION OF LUMBOSACRAL DISEASE TREATED WITH REHABILITATION, DISCECTOMY OR DISCECTOMY WITH SURGICAL STABILIZATION

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Introduction: The purpose of this retrospective evaluation was to determine neurologic function in dogs with lumbosacral disease following either: rehabilitation and medical management (RM), discectomy (D) or discectomy with surgical stabilization using pins and polymethyl methacrylate (DS).

Materials and Methods: Medical records from Oregon State University were reviewed between June 2005-June 2015 identifying 116 dogs with lumbosacral disease via imaging. Modified Frankel score (MF) and patellar and cranial tibial reflexes were determined pre and 4–6 months post-treatment.

Results: 65 of 116 dogs met the inclusion criteria (no concurrent joint or other disc disease). 38.1% of RM dogs, 66.7% of D and 77.3% of DS dogs improved neurologically whereas 42.9% of RM, 0% of D, and 4.2% of DS worsened in 6 months post-treatment. Eight RM dogs had major complications (surgery, euthanasia). Two DS dogs had major complications (hemorrhage, death) while two D and DS dogs each had minor complications (infection, radiographic implant loosening). MF scores improved in dogs receiving DS surgery ($P < 0.01$, two-way ANOVA). RM dogs that did not worsen, go to surgery or get euthanized within 6 months had significant improvement ($P < 0.01$). Reflexes improved in DS dogs postoperatively ($P = 0.049$), however preoperative reflexes in DS were significantly worse than other groups.

Discussion/Conclusion: DS improved neurological function in the greatest number of dogs in the first 6 months post-treatment. The complication rate was higher with DS. RM improved neurologic function in some dogs, however, the majority worsened despite therapy.

Acknowledgement: There was no proprietary interest or funding provided for this project.



11 RETROSPECTIVE EVALUATION OF HEMIEPIPHYSIODESIS FOR DOGS WITH PROXIMAL TIBIAL VALGUS DEFORMITIES

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Introduction: Angular limb deformities of the proximal tibia are frequently treated with hemiepiphysectomy in children. To date, hemiepiphysectomy has been reported in the veterinary literature in only five dogs. The objectives of this study were to describe the use of hemiepiphysectomy for the treatment of proximal tibial deformities in immature dogs, evaluate the effect of hemiepiphysectomy on the mechanical medial proximal tibial angle (mMPTA), and report a series of cases treated with this method.

Materials and Methods: Skeletally immature dogs with proximal tibial deformities from three institutions were included in the study. Dogs were required to have adequate imaging for mMPTA measurements performed preoperatively and at least eight weeks postoperatively. Paired t-test was used to compare preoperative and recheck mMPTA measurements. Statistical significance was set at $p \leq 0.05$.

Results: A total of 19 dogs ($n = 31$ limbs) fulfilled the inclusion criteria. The mean mMPTA was 102.5° preoperatively and 92.4° at the final recheck. The mean difference in mMPTA was $-10 \pm 5.1^\circ$ (range, -1 to -19° ; $p \leq 0.001$). Postoperative complications included implant migration, requiring implant removal in one dog. One dog developed bilateral seroma formation. Overall, all cases had a successful clinical outcome based on orthopedic examination at the final follow-up visit.

Discussion/Conclusion: Hemiepiphysectomy for the treatment of proximal tibial valgus is a technique that allows for a statistically significant reduction in mMPTA and should be considered as an early treatment for immature animals presenting with proximal tibial deformities.

Acknowledgement: There was no proprietary interest or funding provided for this project.

12 COMPARISON OF JIGS AND OSTEOTOMY TYPES USED IN THE CORRECTION OF DISTAL FEMORAL DEFORMITIES IN THE DOG: AN IN VITRO STUDY

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Introduction: Distal femoral osteotomies (DFO) are indicated to address malalignment and frequently require the assistance of a surgical jig. We hypothesized that no difference in post-correctional alignment would occur when executing a DFO with a Slocum jig versus a novel deformity reduction device (DRD) and that no difference would exist using a closing wedge (CWO) versus opening wedge osteotomy (OWO).

Materials and Methods: Models of various iterations of deformity were fashioned to represent three types of distal angulation: external torsion only, distal varus only, and torsion with varus. Five replications of each model underwent correction with transverse osteotomy, CWO or OWO, with all groups utilizing one of two jig types; Slocum or DRD. Osteotomies were secured using locking plates (Fixin, Traumavet, Rivoli, Italy): Each model was radiographed and residual varus and torsion were measured and compared between groups utilizing a Kruskal-Wallis test and Wilcoxon post-hoc test with Bonferroni correction with significance set at $p < 0.05$.

Results: The varus-only model corrected via CWO + Slocum jig resulted in overcorrection in the frontal plane and excessive internal torsion. The femoral-varus-with-torsion model corrected with OWO + Slocum jig also resulted in overcorrection in the frontal plane.

Discussion/Conclusion: When contemplating correction of femoral angulation, both osteotomy type and jig selection can affect post-correctional alignment. Generally, the DRD normalized femoral alignment with more accuracy in both angulation and torsion-angulation deformities. Further, OWO

tended to result in more appropriate frontal plane alignment regardless of jig type.

Acknowledgement: Implants supplied by Traumavet.

13 RANDOMIZED, BLINDED, PLACEBO-CONTROLLED CLINICAL TRIAL OF RESVERATROL SUPPLEMENTATION FOR EQUINE HOCK LAMENESS

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Objective: Joint supplements have been used for many years in horses. To date, there is little evidence to document efficacy for improved joint health or reduced lameness. Our objective was to determine the effect of resveratrol supplementation in horses with lameness originating from the hock.

Design: Randomized, blinded, placebo-controlled clinical trial.

Animals: 45 client-owned horses.

Procedures: Horses with distal tarsal joint-associated lameness were included. All horses received triamcinolone injection to both centrodial and tarsometatarsal joints. Placebo or resveratrol supplement was fed twice daily by owners until the recheck exam at 4 months. Lameness was recorded at the enrollment and recheck exams. Rider response to a questionnaire was recorded at 2 and 4 months post-enrollment. The primary outcomes were clinical status as determined by rider opinion (better, worse, same) and change in lameness from the enrollment exam.

Results: Complete data were obtained on 41 horses (resveratrol, $n=21$; placebo, $n=20$). The proportion of rider-reported success (rider score of better) was significantly higher among the resveratrol group at both questionnaires (2 month, 95% resveratrol vs 70% placebo; 4 month, 86% resveratrol vs 50% placebo). Lameness at the exit exam was significantly improved in the resveratrol group.

Conclusions and Clinical Relevance: Oral supplementation of resveratrol compared to placebo resulted in reduced lameness 4 months after intra-articular administration of triamcinolone to the distal tarsal joints in horses with tarsal-associated lameness. This is the first randomized, blinded and placebo-controlled study to document reduced lameness after administration of a joint supplement in horses with naturally occurring tarsal-associated lameness.

14 INTRA-ARTICULAR POLYACRYLAMIDE HYDROGEL FOR THE TREATMENT OF 20 HORSES WITH NON-RESPONSIVE OSTEOARTHRITIS OF THE INTERPHALANGEAL JOINTS: A PROSPECTIVE STUDY

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Introduction: Polyacrylamide hydrogel (PAAG) is a novel treatment for osteoarthritis (OA), but many previous case series have poorly defined clinical inclusion criteria. The aim of this study was to determine the efficacy of PAAG in equine arthritic interphalangeal joints, which had not responded to previous intra-articular treatment with corticosteroids.

Materials and Methods: Lameness was localized to the proximal/distal interphalangeal joint by diagnostic analgesia; radiography/standing MRI was consistent with OA. After treatment with 1ml of PAAG (Arthramid Vet, Contura International) intra-articularly horses had 4 weeks of exercise restriction before a progressive return to ridden exercise. Follow-up was by re-examination and telephone survey.

Results: 20 horses met the inclusion criteria. All were adult sport horses with persistent lameness after previous treatment with corticosteroids. The average lameness duration was 15mo and average lameness score was 3/10. 10 had arthritic changes evident radiologically. 18 underwent MRI examination and all had osteoarthritic changes. One horse was treated twice, and had a



transient adverse reaction. Long term follow-up was available on 18 cases; with median follow-up of 12mo. 12/18 returned to full function; 3/18 to lower level and 3/18 failed to improve.

Discussion/Conclusion: The success rate and long-term duration is encouraging given the case severity. A control group would have been preferable, but each case could act as its own control, as conventional treatments had already failed. The only significant difference in the management of each case was the PAAG treatment. The method of action of PAAG is uncertain, and further work is required to study this.

Acknowledgement: Contura International for supplying the PAAG.

15 MULTI-FREQUENCY HIGH POWER LASER THERAPY IN EQUINE TENDON AND LIGAMENT INJURIES: A PROSPECTIVE PILOT STUDY

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Introduction: High power multi-frequency lasers were developed for equine orthopedic injuries to address inefficacies of low power units. This study aimed to evaluate laser therapy in tendon/ligament injuries, and determine if ultrasonographic appearance and outcome are better than expected without.

Materials and Methods: 1 clinician examined and diagnosed horses with tendon/ligament injuries by ultrasound, and treated using the high power FP4 laser. Protocols were based on lesion location/type/chronicity. Individual exercise plans were implemented. 9 horses underwent additional treatments: SCL desmotomy, SportVis[®], IRAP[®] and ECSWT. Horses were re-examined and had repeat ultrasonography following treatment. Outcome was measured on ultrasound, and return to previous function.

Results: 21 sport horses aged 9–19y, were treated using the FP4, median treatment length=14d. There were 13 SDFT, 7 SLB, 1 mid-body and 1 PSL lesion. 6/21 are working at previous level, 3/21 failed (2 retired; 1 lower level work), and 12/21 horses are at various stages of rehabilitation. Subjective assessment of ultrasound revealed better than expected improvement in all but 2. Some returned to work in weeks: 1 returned and stayed jumping at 5* 5w after SDFT treatment; a 4* eventer with a SDFT injury returned to full work at 4w; though 1 eventer did not stand up to early introduction to work at 4.5w and reinjured.

Discussion/Conclusion: Preliminary results are encouraging; horses appear clinically improved, some with a speedy and maintained return to function. We're limited by subjective assessment of ultrasound improvement, lack of controls, and combined therapies; further work is required.

Acknowledgement: There was no proprietary interest or funding provided for this project.

16 CLINICAL METROLOGY INSTRUMENT ADMINISTRATION: EVALUATION OF BASELINE VARIABILITY AND THE EFFECT OF INDEPENDENT VERSUS DEPENDENT INTERVIEWING ON PAIN AND MOBILITY SCORES IN DOGS WITH OSTEOARTHRITIS

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Introduction: In veterinary clinical pain studies, it is unknown whether Clinical Metrology Instruments (CMI) should be administered using independent (respondents not shown previous answers) or dependent (respondents shown previous answers) interviewing techniques. Objectives of this study were to compare baseline variability of CMIs designed to assess pain in dogs and to compare CMI scores using independent and dependent interviewing techniques for the Canine Brief Pain Inventory (CBPI) and the Client Specific Outcome Measures (CSOM).

Materials and Methods: Fifty-one dogs with radiographic osteoarthritis and associated pain were enrolled in two randomized, double-masked, placebo-controlled, proof of principle pilot studies with parallel treatment groups and received either placebo or anti-nerve growth factor antibody. CBPI, CSOM, LOAD, HCBI were administered at Day 0 and Day -7 for baseline stability. CBPI and CSOM were administered at Day 7, 14, and 28 using dependent and independent interviewing techniques.

Results: Agreement between baseline CMI scores was good, being best for the LOAD (ICC 0.89). CMI responses collected during independent and dependent interviewing were not statistically different. Dependent interviewing responses resulted in increased treatment effect sizes.

Discussion/Conclusion: There is little difference between independent and dependent interviewing techniques, however dependent interviewing resulted in increased treatment effect sizes. By using dependent interviewing, investigators may be able to increase clinical trial power through minimal change to study design. Further research is warranted to investigate the use of dependent interviewing.

Acknowledgement: Authors would like to thank Janet Bogan, Dave Gearing and Lyndy Harden. Initial NV-01 study funded by Nexvet Biopharma, Lascelles is a paid consultant for Nexvet Biopharma.

17 COMPARISON OF THREE DIFFERENT COVERS FOR USE IN OBJECTIVE CANINE GAIT EVALUATION WITH A PRESSURE SENSITIVE WALKWAY

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Introduction: Gait analysis using pressure sensitive walkways (PSW) is typically performed with the sensors covered to protect the system per manufacturer's recommendation. The aim of this study was to compare canine ground reaction forces acquired with three different mats covering a PSW. We hypothesized that there would be no difference in kinetic data among the different covers.

Materials and Methods: Gait analysis data from a population of 35 adult dogs was collected using a previously validated PSW. The order in which the covers were used was randomly assigned. The covers utilized included a corrugated vinyl mat (black), and two different types of yoga mats, one ¼" thick and the other 1/8" thick. Pairwise correlations, with confidence intervals, were used to measure the linear agreement among covers for the ground reaction forces. The amount of translational agreement was measured by testing the average difference against zero using paired t-tests.

Results: Type of cover utilized had a statistically significant effect on several variables including Maximum Peak Pressure, Maximum Force %BW, and Impulse %BW*sec. There was a very strong correlation between the covers for maximum peak pressure, moderate to strong correlation for impulse %BW*sec, and strong to very strong correlation for maximum force %BW.

Discussion/Conclusion: Investigators should be careful to make direct comparisons between studies if the covers utilized are different. Future studies should specify the type of cover used.

Acknowledgement: We would like to thank the Eldred foundation for their contribution to this research. There was no proprietary interest in this project.

18 EVALUATION OF FACTORS INFLUENCING ACCELEROMETRY ACTIVITY DATA IN DOGS

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Introduction: Accelerometry-based activity monitoring (AM) is a promising new tool in veterinary medicine used to objectively assess activity in com-



panion animals. It is unknown whether device orientation and attachment of a leash to the collar holding an accelerometer will affect AM. It was our goal to evaluate whether attachment methods of accelerometers affect AM.

Materials and Methods: Eight healthy, client-owned dogs were individually fitted with two identical neck collars to which two identical activity monitors were attached using six different MOAs. For trials where the effect of leash attachment to the collar was not being studied, the leash was attached to a harness. Activity data obtained from separate monitors within a given experiment were compared using Pearson correlation coefficients. The correlation between sensors was compared across all experiments using a Kruskal-Wallis Test with post-hoc pairwise comparisons. Significance levels were adjusted using the Bonferroni correction.

Results: There were poor correlations between sensors in three experiments: when the leash was fastened to the collar that held an activity monitor, when one activity monitor was housed in the manufacturer-provided protective casing, and when one activity monitor was loosely zip-tied to the collar rather than threaded on using the provided metal loop.

Discussion/Conclusion: While accelerometer-based activity monitors are useful tools to objectively assess physical activity in dogs, care must be taken when choosing a method to attach the device. The attachment of the Actical to the collar should be standardized and remain consistent throughout a study period.

Acknowledgement: There was no proprietary interest or funding provided for this project.

19 EVALUATION OF THE ENVIRONMENTAL BIAS ON ACCELEROMETER-MEASURED TOTAL DAILY ACTIVITY COUNTS IN DOGS WITH OSTEOARTHRITIS

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Introduction: Activity monitors have been shown to be a valid outcome assessment tool for the evaluation of a treatment of osteoarthritis (OA) in dogs. In humans, the daily total daylight hours, average temperature, and rainfall are significantly associated with total activity counts (ACs). The objective of this study was to determine whether daily average temperature (AT), high temperature (HT), low temperature (LT), average humidity (AH), total precipitation (TP), average barometric pressure (ABP), and total daylight hours (TDH) have an effect on the average daily ACs of dogs with OA.

Materials and Methods: 62 client-owned dogs with radiographically confirmed OA that received the placebo from 2 randomized, blinded, placebo-controlled nutraceutical clinical trials were included in this study. All dogs resided in Minnesota from April 2013 to September 2015 and wore Actical Accelerometers continuously for an average of 69 days (32–109 days). Daily environmental variables were measured at nearby weather stations. Pearson product correlations were calculated to measure the relationship between total daily ACs and environmental variables.

Results: No statistically significant relationship was found between total daily ACs and daily AT, HT, LT, AH, TP, ABP, TDH. No relationship was found between total weekday and weekend daily ACs and the environmental variables.

Discussion/Conclusion: Accelerometer-measured total daily ACs are not biased by environmental variables and are a valid tool to evaluate a treatment of canine OA.

Acknowledgement: Study funding was provided by the Garmon Corporation of Temecula, CA and Vétuquinol S.A. of Magny-Vernois, France.

20 ORTHOPEDIC INJURIES DURING MARATHON SLED DOG RACING

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Introduction: Orthopedic injuries (OI) during the 1600km long Iditarod Sled Dog Race can result in race discontinuation (dropped dogs; DD), but are rarely career ending. Although OI are anecdotally reported as the most common reason for DD, data are scarce. This prospective study was conducted during the Iditarod 2011 to identify OI and describe risk factors for DD.

Materials and Methods: Signed informed consent was obtained. Data on all racing dogs (n=989) were collated from a confidential questionnaire, medical records, and GPS-based speed/distance calculations. Trail conditions were recorded. OI risk factors and DD incidence were analyzed using Poisson-regression and Frailty-analysis (P<0.05).

Results: 40.3% of mushers participated. DD incidence was 38.3%. Of these, OI incidence was 50.6%. Veteran (“experienced”) dogs were less frequently dropped (HR:0.92[0.87–0.97],P=0.03). Increased speed was associated with fewer shoulder injuries (Ratio:0.69[95%,CI:0.47–1.05],P=0.03). Carpal injuries were more frequent with increased training distance (HR:1.61[95%,CI:1.09–2.38],P=0.02). There was a significant difference between numbers of DD at specific checkpoints (P<0.0001) and most of the trail was hard packed (mean%[SD]:77.1[9.4]), and soft (16.9[7.4]) snow, all without significant correlation to every other factor evaluated.

Discussion/Conclusion: OI (specifically of the shoulder and carpus) are common in marathon sled dogs. In this study, shoulder injury incidence decreased at greater average race speeds and OI incidence decreased with increasing age/“experience” of the racing dogs. Applying this information may decrease OI in future competitions.

Acknowledgement: There are no disclosures for this work. This all volunteer paper wishes to acknowledge all mushers that generously donated their time to cooperate with and contribute to this landmark study.

21 CASE REPORT – RECONSTRUCTION OF A COMPLICATED ORBITAL DEPRESSION FRACTURE WITH MEDIAL WALL AND GLOBE REPOSITIONING IN A HORSE

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A 6-year-old Irish Sport Horse gelding presented with acute, severe orbital trauma. Radiographic and CT evaluation revealed multiple fractures of the right nasal, frontal and maxillary bones, zygomatic arch and temporal condyle of the right TMJ. The right globe was displaced axially and ventrally, secondary to a displaced fracture of the medial wall and floor of the orbit. After initial surgical elevation of the depression fractures of the facial bones and reconstruction of the orbit, the globe remained recessed secondary to displacement of the medial wall and floor of the orbit within the conchofrontal sinus. A 3D printer was utilized to construct a model of the fracture configuration for presurgical planning to reposition the globe. During a subsequent surgical procedure, a resorbable plate was placed in the floor of the orbit and the medial orbital wall and globe were repositioned via a sinusoscopic approach and stabilized with the placement of tissue expanders within the conchofrontal sinus. Tissue expanders were subsequently removed after 3 weeks during standing sedation. The right globe was successfully repositioned in a more correct anatomical orientation and the horse resumed work 3 months



postoperatively, and successfully competed at its previous level 5 months postoperatively. No visual deficits were reported by the owners. Efforts to restore the medial wall and/or floor of the orbit with concurrent globe repositioning should be considered in horses with severe orbital depression fractures that result in abnormal globe position.

Acknowledgement: There was no proprietary interest or funding provided for this project.

22 CLINICAL OUTCOME FOLLOWING TENOSCOPIC ACCESSORY LIGAMENT OF THE DEEP DIGITAL FLEXOR TENDON DESMOTOMY IN 17 HORSES

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Introduction: Desmotomy of the accessory ligament of the deep digital flexor tendon (AL-DDFT) is a commonly performed surgical procedure in horses requiring correction of flexural deformity of the distal interphalangeal joint.

Materials and Methods: A minimally invasive tenoscopic approach for desmotomy of the AL-DDFT was performed in 20 forelimbs of 17 horses with flexural deformity of the distal interphalangeal joint. Mean age of horses was 6.7 months (range 4–16 months). Tenoscopic desmotomy was performed as previously described.

Results: Surgery time from incision to suture placement was approximately 30 minutes per limb and no surgical complications occurred. On follow up, the flexural deformity of the distal phalangeal joint was completely corrected or greatly improved in all horses.

Discussion/Conclusion: The tenoscopic desmotomy of the AL-DDFT results in less surgical dissection and tissue trauma compared to the traditional open surgical approach, and provides better visualization to ensure complete transection of the AL-DDFT. Disadvantages compared to the traditional open approach include prerequisite experience with arthroscopic/tenoscopic procedures, need for advanced instrumentation and therefore increased cost of the procedure, and the potential for iatrogenic damage to surrounding tissues. The surgical sites in this group of horses were considered more cosmetically acceptable compared to the authors' experience with the traditional open surgical approach, and all owners were pleased with the result. It is the authors' opinion that this technique should be considered when an optimal cosmetic result is desired in cases requiring surgical correction of flexural deformity of the distal interphalangeal joint.

Acknowledgement: There was no proprietary interest or funding provided for this project.

23 RADIOLOGICAL, CLINICIAN AND OWNER ASSESSMENT OF THE BIOMEDTRIX TATE® ELBOW ARTHROPLASTY

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Introduction: The aim of this study was to report the long-term radiological and clinical outcome of the BioMedtrix TATE elbow arthroplasty system via radiographs, a surgeon-based questionnaire and client assessment of outcome using the Liverpool Osteoarthritis in dogs (LOAD) and Canine Brief Pain Inventory (CBPI) questionnaires.

Materials and Methods: Questionnaires were distributed to surgeons in the U.K. performing TATE arthroplasty and to the owners of dogs having undergone this surgery. Completed questionnaires and radiographs from cases were subsequently obtained and analyzed.

Results: Surgeon and radiographic data was obtained for 33 elbows, owner questionnaires were obtained for 19 dogs. Intraoperative and postoperative complication rates were 24% and 54%, respectively. Assessment of component position revealed 62% of cartridges to be valgus/varus malaligned and 56% of cartridges to be medially/laterally translated relative to the ulnar long axis. However, there was no significant correlation between component position and final clinical outcome. Clinician assessment revealed 25% of dogs to have excellent, 47% satisfactory and 28% poor outcome. Significant reductions in pain severity and pain interference were obtained between pre-surgical and final status but not for mobility scores.

Discussion/Conclusion: This study revealed a high complication rate and variability in TATE component placement however component alignment did not appear to influence clinical outcome. Final clinical outcome was favorable in the majority of cases with significant improvement in pain severity and interference scores following this surgical procedure.

Acknowledgement: There was no proprietary interest or funding provided for this project.

24 SYNTHES 1.5MM LOCKING PLATES FOR REPAIR OF DISTAL RADIUS/ULNA FRACTURES IN 11 DOGS WEIGHING <4KG

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Introduction: Distal radius/ulna fractures are common in small and toy breeds. Currently, there are no reports of a clinical series of dogs using the 1.5 mm Synthes locking plates for repair.

Materials and Methods: The electronic medical records were reviewed from January 1, 2013 to October 9, 2015 for patients that met the inclusion criteria. Either the Synthes 1.5mm LCP or 1.5mm LCP Adaption plates were used at the discretion of the surgeon in a routine repair of the fracture. The ratio of locking to cortical screws was determined by surgeon preference.

Results: Eleven small/toy breed dogs weighing less than 4 kg were treated for distal radius/ulna fractures. The mean age was 1.95 years, mean weight 2.57 kg, mean distal segment length 1.74 cm, and mean distal segment to total radius length ratio was 25%. Five LCP and six Adaption plates were used. One patient developed ulnar resorption and failure of fixation via plate fracture 3 months post-operatively. A second patient with all cortical screws in an Adaption plate suffered screw pullout and failure of fixation 1 month post-operatively. The other nine had acceptable outcome to date.

Discussion/Conclusion: The success rate of internal fixation of small/toy breed radial fractures has been reported as 70–85%. One of the failures in this case series may have been avoided if locking screws had been used. Despite subjective outcome measurements and limited follow-up in this case series, distal radius/ulna fractures in small/toy breed dogs can be successfully repaired using the 1.5mm Synthes locking plates.

Acknowledgement: There was no proprietary interest or funding provided for this project.

25 OBLIQUE PLANE INCLINED OSTEOTOMIES FOR TREATMENT OF ANTEBRACHIAL ANGLUATION-ROTATION DEFORMITIES IN DOGS

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Introduction: Canine antebrachial deformities often include angular and rotational components. One option for treating angulation-rotation deformities that has not been described in veterinary medicine is use of an oblique plane inclined osteotomy. The objective of this retrospective study was to report initial results with use of this technique in 6 cases.



Materials and Methods: Records were reviewed retrospectively for all cases of antebrachial angulation-rotation deformities treated with an oblique plane inclined osteotomy in order to record complications which were classified as minor, major, or catastrophic. Similarly, outcomes were assessed based upon owner and veterinarian evaluation and were classified as full, acceptable, and unacceptable function. Post-operative frontal and sagittal plane alignment was quantified based upon radiographic assessment in all cases.

Results: Six antebrachii in 5 dogs were treated; each limb was considered a separate case. The major complication rate was 50% as surgical implants were removed from three cases for confirmed infection (2) or apparent irritation (1). No minor or catastrophic complications were noted. Complete osseous union was achieved in all cases. Outcomes were assessed as successful, obtaining adequate or full function, in all cases with a minimum follow up of 7 months. Limb alignment was subjectively considered excellent in 1 case and good in 5 cases.

Discussion/Conclusion: This case series demonstrates that successful outcomes can be obtained when treating antebrachial angulation-rotation deformities using an oblique plane inclined osteotomy. Consequently, this technique could be considered for clinical application.

Acknowledgement: Thanks to Ellen Davis for figure production.

26 UTILITY OF MRI FOR CHARACTERIZING ARTICULAR CARTILAGE PATHOLOGY IN DOGS WITH MEDIAL CORONOID DISEASE

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Introduction: MRI has not been validated for depicting the severity of articular cartilage pathology in dogs with medial compartment pathology of the elbow. The purpose of this study was to determine whether MRI assessments correlate with arthroscopic evaluation in dogs with medial compartment pathology of the elbow.

Materials and Methods: Dogs diagnosed with medial coronoid disease had MRI evaluation of their affected elbows using a 3T scanner prior to arthroscopy. Cartilage of the medial coronoid process (MCP) and humeral trochlea were each graded by a blinded reviewer based upon MRI images and scored on a 0–3 scale. Cartilage pathology was graded arthroscopically using the Outerbridge scheme by a surgeon blinded to MRI assessment. Correlations between the MRI and arthroscopic assessments of cartilage pathology were performed.

Results: Twenty-nine elbows in 16 dogs were evaluated. There were significant but small correlations between the MRI scores and Outerbridge scores for both the humeral trochlea ($R^2=0.29$, $p<0.05$) and MCP ($R^2=0.13$, $p<0.05$). Fewer than 50% of elbows with Outerbridge grade IV or V changes were identified as having full thickness cartilage loss with MRI.

Discussion/Conclusion: Correlations between arthroscopy and the MRI sequences were small and MRI did not consistently enable identification of elbows with full thickness cartilage loss on the humeral trochlea. As a result, MRI cannot be substituted for arthroscopic assessment and further optimization of MRI protocols are needed.

Acknowledgement: Funded by the American Kennel Club Canine Health Foundation

27 CANINE ELBOW REALIGNMENT OSTEOTOMY (CERO): VALIDATION OF THE ACCURACY OF ACUTE RADIAL LENGTHENING IN A CADAVERIC INCONGRUENCY MODEL

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Introduction: This study presents a novel Canine Elbow Realignment Osteotomy (CERO) system applicable for either acute axial radial or ulnar lengthening and validation of the accuracy of this system in restoring normal elbow congruency in a shortened radius cadaver model, as assessed via computed tomography (CT).

Materials and Methods: Five pairs of greyhound forelimbs from animals euthanized for reasons unrelated to the study were obtained. CT of each elbow was performed i) preoperatively, ii) following placement of a linear motor IMEX™ fixator on the radius with diaphyseal ostectomy and radial shortening of 1 to 5mms, and iii) following CERO surgery to lengthen the radius by an amount equal to the degree of radial shortening employed. Seven loci on dorsal plane reconstruction and six loci on sagittal plan reconstruction were measured to assess for change in congruity. Descriptive statistical analysis repeated measures ANOVA were performed to compare measurements from each locus.

Results: Mean measurements in the dorsal and sagittal plans differed significantly between preoperative and post radial shortening with the ESF but did not differ significantly between preoperative and post CERO surgery. **Discussion/Conclusion:** CERO surgery accurately restored humeroradioulnar congruency in this cadaver model. Clinically the CERO system may permit accurate acute correction for axial radial or ulnar congruency mismatch in the canine elbow secondary to elbow dysplasia.

Acknowledgement: Implants were manufactured and donated for this study by Orthomed UK Ltd and were co-designed by the authors.

28 USE OF ELASTIC TRANSARTICULAR EXTERNAL FIXATOR CONSTRUCT FOR IMMOBILIZATION OF THE ELBOW JOINT: 4 CASES OF ELBOW LUXATION AND 1 CASE OF AVULSION OF THE TRICEPS TENDON

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Introduction: Transarticular external skeletal fixation was considered to be a simple and effective method of maintaining short-term joint stability to allow healing of injured soft tissue structures. The external fixator is usually connected by rigid bars that results in a stable but stiff joint. This study describes the technique and the outcome of an Elastic Transarticular External Fixator (ETEF) applied to the elbow joint for the management of elbow luxation and triceps tendon avulsion.

Materials and Methods: 4 cases of elbow luxation with collateral ligaments injuries were managed with close reduction and application of an ETEF to maintain the reduction. A triceps tendon avulsion was surgically managed with modified three-loop-pulley pattern before applying an ETEF.

Results: The clinical outcome was considered excellent in 2 cats, good in 2 dogs (1 elbow luxation and the avulsion of the triceps tendon) and poor in one dog presented for elbow luxation with a permanent neurologic defect secondary to a dog bite. The only complication seen with the ETEF application was cutaneous irritation by the blood sampling tube stoppers used to maintain the elastic bands.

Discussion/Conclusion: The procedure was rapid, easy to perform and not expensive. All the animals except the one with nervous defect had an early re-



turn to weight bearing. ETEF maintains extension of the joint while permitting its motion and therefore promoting rehabilitation.

Acknowledgement: There was no proprietary interest or funding provided for this project.

29 DIFFICULTIES PERFORMING ULTRASOUND GUIDED INJECTION OF THE PODOTROCHLEAR BURSA

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Introduction: Parasagittal injection of the podotrochlear bursa under ultrasonographic control to avoid puncturing of the deep digital flexor tendon is an increasingly used technique. The aim of this paper is to describe the procedure and complications associated with it.

Materials and Methods: Clinical cases diagnosed with pain localized to the foot were examined with ultrasound. Circular anechogenic areas dorsal and parasagittal to the DDFT lobes, thought to represent the podotrochlear bursa, were identified. The probe was placed transverse to the long axis of distal palmar pastern. Injection was performed with an 8 cm 20g spinal needle. The technique included sedation, local anesthesia, aseptic preparation of the area, draping, retracted placement of the foot on the ground and aseptic injection procedure. The needle was directed in the ultrasound beam towards the anechogenic area, from the lateral or medial aspect of the pastern, aiming dorsad and axiad, either parallel to the ground or slightly proximodistally, at an angle dictated by ultrasound imaging, trying to avoid the DDFT lobe.

Results: Of fourteen injections, six were seen inside the podotrochlear bursa, two inside and outside, three into connective tissue and three in the DIPJ.

Discussion/Conclusion: Anechoic areas dorsal to DDFT can represent the proximal recess of the podotrochlear bursa, but also the proximal palmar recess of the DIPJ, especially if the last is fluid-distended. Using the technique described, it is possible to inject the podotrochlear bursa, but also connective tissue and other synovial structures.

Acknowledgement: Jaime Goyoaga, DVM, Luz Cort DVM, Andy Bathe MRCVS

30 DIAGNOSTIC UTILITY OF THREE DIMENSIONAL IMAGING IN THE MANAGEMENT OF EQUINE DISTAL LIMB FRACTURES: A RETROSPECTIVE STUDY OF 36 CASES

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Introduction: 3D imaging is increasingly used in equine orthopedics. The aim of this study is to describe the use of different 3D imaging modalities in a series of multiple fracture types in a practice setting, and how this influenced the subsequent method of surgical repair or management.

Materials and Methods: Cases were selected retrospectively from a primary/referral case load at a private practice. Horses underwent standing MRI (Hallmark) or GA CT (GE light scan) because of suspected or uncertain configuration of a distal limb. Following imaging, horses either underwent surgical repair or were euthanized.

Results: 36 horses underwent pre-operative 3D imaging from 2008–2015. Most were young thoroughbreds. There were 18-P1, 9-carpal, 6-cannon, 2-tarsal, and 2-proximal sesamoid fractures. 29 horses underwent CT under the same GA as the operation was performed. 7 standing MRI were performed, in most cases followed by standing repair. 2 horses were euthanized post imaging. Surgeons considered 3D imaging to have positively influenced case management, aided in decision making, an enabled more accurate implant placement in fracture repair. 3D imaging of these fractures led to: confirmed simple repair (2/36), occult/early fracture (7/36), additional fracture line (7/36), revealing comminution/fragmentation (8/36), or accurate implant mapping (10/36). Some allowed for simpler repair and better

prognosis offered to owners. Conversely, when repair was not possible, e.g. fractures with fragments in surgically inaccessible locations, expensive/ill-fated surgery was avoided.

Discussion/Conclusion: Although not always altering management, 3D imaging of a distal limb fracture was valuable all cases. It allowed for quicker and better informed decisions.

Acknowledgement: T.R.C.Greet, R.J.Payne, L.C.R.Smith, Rosssdales Imaging Department

31 CASE REPORT – BILATERAL CARPAL SYNOVIAL OSTEOCHONDROMATOSIS IN AN AGED QUARTERHORSE MARE...AVOIDING THE 'PROCRUSTEAN BED' OF EQUINE ARTHROPATHY DIAGNOSIS

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Introduction: Osteoarthritis is common in horses and is almost ubiquitous in aged horses. In this report, a case with presenting signs that resembled carpal OA but which reflected another unrelated disease process is presented.

Case Details: A 26-year-old Quarterhorse mare was presented with severe bilateral carpal swelling and lameness of 6 months duration. There were no known premonitory traumatic events. The rDVM's presumptive diagnosis was severe osteoarthritis. At presentation, the mare was severely lame and both carpi were markedly swollen. The range of flexion was markedly reduced and the mare resented attempts to flex the joints. Radiographs showed extensive peri-articular bone formation that originated from the joint capsule insertions and bridged the joint spaces. In light of the severe lameness and pathology, the mare was subjected to euthanasia. High resolution radiographs of 'slabbed' carpal sections showed 'cauliflower-like' bony callus originating from the dorsal surfaces of the carpal bones. Histological sections showed peri- and trans-articular osteonal bone containing remnant 'islands' and margins of cartilage, reflecting endochondral bone formation in the lesions. Articular cartilage surfaces were recognizable but, in several places, had been eroded back to the prominent calcified interface.

Discussion: Although the findings in this case are, in many respects, consistent with severe osteoarthritis, the history and distribution of joint pathology do not support this diagnosis. This case more closely reflects synovial osteochondromatosis, as described in people, dogs and cats, where synovial cells trans-differentiate into osteoblastic cells and synthesis heterotopic bone within the peri-articular soft tissues.

Acknowledgment: There was no proprietary interest or funding provided for this project.

32 IMPACT OF BISPHOSPHONATE ADMINISTRATION ON CORTICAL BONE REPAIR

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Introduction: Bisphosphonates (BP) are used in horses where bone resorption contributes to clinical signs. Osteo-progenitor cells (OPC) are located directly on bone surfaces and are likely exposed to BPs immediately after administration and during bone turnover. Previous work indicates that BPs inhibit equine OPC motility, raising concerns that BPs could compromise bone repair where OPC migration is required. This study tested the hypothesis that BPs delay bone repair where OPC migration is a requirement for repair.

Materials and Methods: Twelve adult goats received two injections of tiludronate, (Tildren; 6 goats) or saline (Control; 6 goats), a week apart. Six-mm defects were created in the lateral cortices of the forelimb cannon bones. In one forelimb, the periosteum was left intact. In the contralateral forelimb, periosteum was stripped from the cannon bone. Eight weeks later, the cannon bones were collected and explants containing the defects were processed for histology. Cortical bone repair, as determined by the 'bone volume: total



volume' ratio across the mid-plane of the defects were measured. Outcomes were analyzed by T tests.

Results: In both the saline Control and Tildren groups, periosteal stripping significantly reduced cortical bone healing, as expected. Tildren administration also significantly reduced cortical bone repair in the periosteum-intact limbs, but had no effect defect repair in cannon bones lacking periosteum.

Discussion/Conclusion: Our results indicate that prior BP administration impacts cortical bone repair with intact periosteum, but this effect is lost when periosteum is removed from the defect site. This should be considered when using BPs to treat horses.

Acknowledgement: This study was funded by the USDA.

33 STAGING AND ANALYSIS OF MICROSTRUCTURAL CHANGES IN NAVICULAR DISEASE

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Introduction: Navicular disease is one component of chronic heel pain syndrome. MRI has expanded our understanding of this syndrome but the etio-pathogenesis is poorly understood. The aims of this study were to conduct high resolution imaging to investigate the pathophysiology of this disease process.

Materials and Methods: Of 58 cadaveric equine feet 16 were chosen for more detailed study based on radiographic scoring (0–3 where 0 is normal). Dissection and macroscopic evaluation were followed by microCT imaging at 45 micron resolution. Standard 2D radiographic projections and more detailed 3D reconstructions were created. Three independent observers scored the radiographic projections. Morphometric analyses of the microCT images were conducted.

Results: Based on standard radiographic projections 58 navicular bones 18 were considered normal, 13 had minor abnormalities, 13 had moderate but easily detected abnormalities and 14 had severe bony changes. Mineral content and bone volume declined slightly between normal and early disease but rose sharply in end stage disease. This coincided with a reduction in trabecular surface area as sclerosis ensued.

Discussion/Conclusion: We concluded that 20% of horses may have severe bony abnormalities in the navicular bone. Radiographic projections underestimated bony abnormalities. Detailed analyses revealed subgroups at least two pathoetiologies creating classical navicular disease.

Acknowledgement: There was no proprietary interest or funding provided for this project.

34 EVIDENCE FOR PRE-EXISTING PATHOLOGY IN RETROSPECTIVE POSTMORTEM STUDY OF NON-CONDYLAR METACARPAL FRACTURES IN 14 RACEHORSES

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Introduction: Catastrophic third metacarpal bone (MC3) fractures caused 3–20% of Thoroughbred and Quarter Horse exercise related musculoskeletal fatalities. Incomplete stress fractures also occur in MC3s of racehorses. Post-mortem specimens with complete non-condylar MC3 fractures were examined for evidence of pre-existing injury.

Materials and Methods: Bilateral MC3 from 14 racehorses (13 Thoroughbred, 1 Quarter Horse; 2–5 years old; 7 female, 7 male) that died because of a unilateral (13 horses) or bilateral (1 horse) non-condylar MC3 fracture were examined visually and radiographically for cortical abnormalities, and periosteal and endosteal bone proliferation. Abnormality locations were com-

pared between fractured and intact contralateral bones using a correlation statistic, with $P \leq 0.05$ for statistical significance.

Results: Supracondylar fractures were comminuted transverse or short oblique fractures that had bridging periosteal callus, that correlated well ($R^2 = 0.92$) with lesions in the contralateral bones. Mid-diaphyseal fractures were short or long oblique, highly comminuted fractures with evidence of periosteal bridging callus or intracortical radiolucency. Most horses (79%) had abnormalities in the contralateral, intact bones that mirrored pre-existing changes in the fractured bones.

Discussion/Conclusion: All supracondylar fractures had findings consistent with a pre-existing stress fracture. Mid-diaphyseal fractures appeared to occur subsequent to either a mid-diaphyseal stress fracture or dorsal metacarpal disease. Bilateral findings are consistent with repetitive overuse injuries, where catastrophic fracture affects the most severely affected limb. Clinical and radiographic signs may be helpful for identifying racehorses with increased risk for catastrophic MC3 fracture.

Acknowledgement: There was no proprietary interest or funding provided for this project.

35 DISLOCATION OF A DUAL MOBILITY TOTAL HIP REPLACEMENT FOLLOWING FRACTURE OF THE POLYETHYLENE LINER

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Introduction: Dual mobility Total Hip Replacement (THR) consists of a combination of two apparent joints, and was developed in humans to reduce the risk of prosthesis dislocation.

Complication: An English Setter was referred for assessment of a dual mobility THR dislocation. Surgical revision revealed that the dislocation had been made possible by a fracture of the polyethylene liner, which was found in place, in the metal cup. A new liner was constrained onto the femoral head and the dislocation was reduced.

Results: Follow-up at 3 and 5 months revealed correct improvement. Analysis of the explanted implants revealed that the rupture of the UHMWPE appeared secondary to fretting and abrasive wear that lead to progressive delamination of the outer surface of the liner until its perforation.

Discussion/Conclusion: Possible explanations of the liner rupture should be the loss of coaptation between the liner and the metal back after impingement between the acetabular component and femoral neck, the possibility of squeezing forces between the two metallic parts of the prosthesis in extreme positions that may participate to the liner rupture, and the acetabular cup position with a measured angle of lateral opening of 55° which may predispose to a lack of dorsal coverage of the liner by the metal back during motion and may have contributed to excessive forces on an unsupported liner. The case presented reports the first description of a rupture of the UHMWPE liner of a dual mobility THR with a secondary dislocation of the prosthesis which is a novel failure mode in this model of acetabular cup in the dog.

Acknowledgement: There was no proprietary interest or funding provided for this project.

36 TECHNIQUE RELATED RISK FACTORS FOR STEM COMPLICATIONS WITH THE CANINE PRESS FIT CEMENTLESS TOTAL HIP ARTHROPLASTY

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Introduction: Our objective was to investigate the relationship between canal fill and stem alignment with subsidence and occurrence of compli-



cations with cementless (BFXTM) total hip arthroplasty (THA). We hypothesized that low canal fill and varus or cranial stem angulation of $\geq 5^\circ$ would be associated with complication development.

Materials and Methods: Radiographs and records of 55 dogs with 58 THA were reviewed. Implant size, positioning, and complications were recorded. Canal flare, canal fill, stem angle and subsidence at 3 months were measured. Appropriateness of stem size was assessed with digital stem templates. Pearson's coefficient and odds ratios were calculated.

Results: Mean canal fill of 76% (± 7) and subsidence of 1.71mm (± 2.62) was identified. Stem angulation ranged from 7° varus to 3° valgus, and 6° cranial to 7° caudal. Appropriately sized stem canal fill ranged from 68–84% (n=44). Major stem complication rate was 14%. Femora with stem subsidence of >3 mm were 15 times more likely to have major post-operative stem complication (p=0.03). Femora with a varus angulation of $\geq 5^\circ$ were 12.5 times more likely to have intraoperative fissuring (p=0.03). No other risk factors were found to be significant.

Discussion/Conclusion: Percentage of canal fill is a poor indicator of appropriateness of stem size and the recommended canal fill of $>85\%$ may be unnecessarily high. There is a high risk of major complications with stem subsidence of >3 mm. Particular attention should be paid to stem positioning due to its association with intra-operative fissuring.

Acknowledgement: There was no proprietary interest or funding provided for this project.

37 COMPARISON OF IATROGENIC ARTICULAR CARTILAGE INJURY IN CANINE STIFLE ARTHROSCOPY VERSUS MEDIAL PARAPATELLAR MINI-ARTHROTOMY

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Introduction: The purpose of this study was to assess iatrogenic articular cartilage injury (IACI) and soft tissue trauma to the stifle joint resulting from 2.3mm arthroscopy versus medial parapatellar mini-arthrotomies. We hypothesized that there would be no difference in soft tissue trauma, IACI, or structures visualized between both techniques.

Materials and Methods: Canine cadaver (≥ 20 kg) stifles (n=28) were randomized to arthroscopy or arthrotomy. Full exploration of the stifle joints and meniscal probing were performed. Joints were disarticulated and India Ink assay performed. IACI was defined as sharply delineated lesions with India Ink uptake. Number of lesions and lesion area to cartilage and menisci, soft tissue trauma as defined by incision length, surgery duration, and joint structures visualized, were recorded.

Results: IACI was identified in 93% of arthroscopy stifles and in 29% of mini-arthrotomy stifles (P=0.003). Soft tissue joint trauma was greater in the mini-arthrotomy stifles (5.6cm) versus arthroscopy stifles (1.4cm, P \leq 0.0001). The number of lesions, lesion area, meniscal damage (none occurred) and surgical duration were not significantly different between groups. The medial meniscus body, medial and lateral meniscus caudal horn, lateral femoral condyle, lateral tibial plateau, lateral meniscus body, lateral trochlear ridge, lateral gutter, and suprapatellar pouch were significantly more visible in arthroscopy stifles (all P $<$ 0.005).

Discussion/Conclusion: Arthroscopy produced an unsatisfactorily high rate of cartilage IACI versus mini arthrotomy; mini arthrotomy created more joint capsule trauma and provided incomplete joint visualization. Methods of preventing IACI warrant further investigation.

Acknowledgement: There was no proprietary interest or funding provided for this project.

38 THE EVALUATION OF ULTRAVIOLET LIGHT C FOR REDUCTION OF METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS IN A CANINE SKIN AND MUSCLE MODEL: A POTENTIAL ALTERNATIVE FOR SURGICAL SITE INFECTION PREVENTION AND TREATMENT

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Introduction: Surgical site infections (SSI) associated with orthopedic surgery are a source of morbidity and cost. Ultraviolet light C (UVC) damages DNA, rendering bacteria nonviable. UVC does not discriminate between drug sensitive organisms and multidrug-resistant organisms. Our hypothesis is that UVC will result in a similar reduction of methicillin-resistant *Staphylococcus aureus* (MRSA) as compared to 0.05% or 2% chlorhexidine, and be synergistic when used in combination with 0.05% chlorhexidine.

Materials and Methods: Sterile skin and muscle specimens were inoculated with MRSA. Samples were then treated with either a 254nm UVC mercury lamp or a 270nm UVC LED lamp at 15 mJ/cm², 30 mJ/cm², or 40 mJ/cm² doses. 0.05% and 2% chlorhexidine were used as positive controls. To evaluate synergism, 0.05% chlorhexidine was used in combination with 15 mJ/cm² of UVC. Samples were cultured and colony-forming units (CFU) counted and compared against a negative control.

Results: No statistical significance was identified between UVC sources or total dose. UVC exposure to skin significantly outperformed 0.05% chlorhexidine (p $<$ 0.02). UVC exposure to muscle was not significantly better than 0.05% chlorhexidine. UVC combined with 0.05% chlorhexidine outperformed 0.05% chlorhexidine (p $<$ 0.02) and had a trend toward significance when compared against UVC alone. 2% chlorhexidine significantly outperformed UVC for all exposures (p $<$ 0.05).

Discussion/Conclusion: UVC shows promise as a rapid, effective and synergistic means of reducing bacterial burdens, which may in turn decrease the incidence of SSIs. It should be further evaluated for use when 2% chlorhexidine would be contraindicated, such as open wounds or surgical sites.

Acknowledgement: Study was funded by an intramural grant.

39 EQUINE ALLOGENEIC BONE MARROW-DERIVED MESENCHYMAL STROMAL CELLS ELICIT ANTIBODY RESPONSES IN VIVO

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Introduction: This study tested the hypothesis that Major Histocompatibility Complex (MHC) incompatible equine mesenchymal stromal cells (MSCs) would induce cytotoxic antibodies to donor MHC antigens in recipient horses after injection.

Materials and Methods: Six horses were identified as non-equine leukocyte antigen (ELA)-A2 haplotype and used as allogeneic MHC-mismatched MSC recipients. MHC homozygote horses of known ELA-A2 haplotype were used as MSC and peripheral blood leukocyte (PBL) donors. One ELA-A2 homozygote horse was the recipient of ELA-A2 donor MSCs as a control. Donor MSCs were culture expanded to achieve approximately 50×10^6 cells for intradermal injection into the recipient's neck. Recipient serum was tested for the presence of anti-donor antibodies prior to and every 7 days after MSC injection for the duration of the 8-week study using the standard lymphocyte microcytotoxicity assay. Recipient serum was also examined for the presence of cross-reactive antibodies.

Results: All MHC-mismatched recipients produced anti-ELA-A2 antibodies and developed a wheal at the injection site. Anti-ELA-A2 antibody responses were varied both in terms of strength and timing. Four recipient horses had



high-titered anti-ELA-A2 antibody responses resulting in greater than 80% donor PBL death in the microcytotoxicity assays and one of these horses also developed antibodies that cross-reacted with PBLs from an ELA-A3 horse.

Discussion/Conclusion: In conclusion, allogeneic MSCs are capable of eliciting antibody responses in vivo that can be strong and also cross-reactive with MHC types other than that of the donor. Such responses could limit the effectiveness of repeated allogeneic MSC use and result in untoward inflammatory responses in recipients.

Acknowledgement: There was no proprietary interest or funding provided for this project.

40 EFFECT OF EXTRACORPOREAL SHOCKWAVE THERAPY ON GROWTH FACTOR EXPRESSION FROM EQUINE PLATELET RICH PLASMA

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Introduction: Platelet rich plasma (PRP) and extracorporeal shockwave therapy (ESWT) are frequently used for treatment of musculoskeletal injuries in horses. The hypothesis of this study was that application of ESWT to PRP would increase the concentration of platelet-derived growth factor, isoform BB (PDGF-BB) and transforming growth factor b, isoform 1 (TGFb1) released from the platelets.

Materials and Methods: Platelet rich plasma from six horses was subjected to four treatment conditions (positive control (single freeze/thaw cycle), negative control (resting), ESWT-S (standard probe), ESWT-P (power probe)). Each PRP sample was contained within a silicon gel pad and treatments were administered. ESWT-S and ESWT-P samples received 300 pulses at 23kV and 2Hz. The standard and power probe delivered 8.5 mJ and 4.4 mJ per pulse, respectively. The samples were centrifuged and supernatant was collected. Growth factor concentrations were quantified by use of ELISAs.

Results: Growth factor concentrations of the positive controls were significantly higher than all other treatments for TGF-b1 and PDGF-BB. Growth factor concentrations for both ESWT treatment groups were significantly higher than the negative controls for TGF-b1 and PDGF-BB. There was no significant difference in TGF-b1 concentrations between the two ESWT treatment groups for TGF-b1 and PDGF-BB.

Discussion/Conclusion: Release of growth factors from PRP was significantly increased following treatment with ESWT when compared to resting growth factor concentrations. The data supports the use of ESWT immediately following therapeutic injection of PRP into injured soft tissue structures in the horse to increase the concentrations of growth factors released from the platelets.

Acknowledgement: Nucleus Regenerative Therapies provided funding for this study.

41 LEUKOCYTE, GROWTH FACTOR, AND CYTOKINE CONCENTRATIONS IN CANINE PLATELET-RICH PLASMAS PREPARED WITH 5 COMMERCIALY AVAILABLE SYSTEMS

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Introduction: Recent study has demonstrated that canine platelet-rich plasmas (PRP) vary dramatically in their cellular composition. However, specific characterization of leukocyte populations and the possible association between cellular composition and growth factor and catabolic cytokine concentrations in different canine PRPs have not been reported.

Materials and Methods: PRP was made using each of 5 different systems in a 15-dog crossover study. Leukocyte concentrations were quantified and PRP samples were subsequently activated or not activated according to manufacturer instructions. TGF- β 1, TNF- α , PDGF-BB, and VEG-F were quantified using validated ELISAs. Differences in the leukocyte, growth factor, and cyto-

kine concentrations among PRP systems were compared using a repeated measures ANOVA. Correlation between platelet and TGF- β 1 and PDGF-BB concentrations were assessed using a Pearson's correlation.

Results: The leukocyte, TGF- β 1, and PDGF-BB concentrations varied significantly among the different PRP preparations ($p < 0.05$). Positive correlations between the platelet concentrations and TGF- β 1 and PDGF-BB concentrations were identified ($p < 0.05$). The greatest difference in growth factor concentrations was between those PRPs that were activated in comparison to those that were not activated.

Discussion/Conclusion: These data demonstrate significant variability among the platelet, leukocyte, and growth factor concentrations of different PRPs. Further, the data suggest that platelets may not be activated during PRP preparation and that platelet activation likely has a substantial effect on growth factor concentrations.

Acknowledgement: All equipment was donated by industry sponsors and financial support was provided from the company distributing system 5.

42 AUTOLOGOUS BONE MARROW-DERIVED MESENCHYMAL STROMAL CELLS ELICIT AN ANTI-INFLAMMATORY RESPONSE IN A CANINE PARTIAL CRCL RUPTURE MODEL

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Introduction: Incipient or stable partial cranial cruciate ligament (CrCL) tears are a common treatment challenge. Mesenchymal stromal cells (MSCs) possess immunomodulatory functions and may have the ability to impact joint inflammation and CrCL survival. The purpose of this study was to evaluate the effect of autologous expanded bone marrow (BM)-MSC treatment on stifle joint inflammation in client-owned dogs with stable partial CrCL rupture.

Materials and Methods: Twelve client-owned dogs with unilateral CrCL rupture and a stable contralateral stifle joint were prospectively recruited with IACUC approval. A bone marrow aspirate was obtained at the time of TPLO treatment of the unstable stifle. BM-MSCs were isolated and culture expanded. Autologous BM-MSCs were injected IV (2×10^6 cells/kg in saline) and IA (5×10^6) into the stable stifle joint. Blood and joint fluid were collected for analysis of circulating T lymphocyte subsets by flow cytometry and C-reactive protein (CRP) by ELISA.

Results: No adverse events were detected with treatment. Circulating CD4⁺ and CD4⁺CD8⁺T lymphocyte subsets were lower at 4 weeks and similar to baseline at 8 weeks, although none reach statistical significance. Serum CRP was significantly reduced after treatment. Three of 12 dogs (27%) developed CrCL rupture in treated limbs. Severity of osteophytosis and synovial effusion were correlated with rupture. Synovial/serum CRP ratio at trial entry correlated with CrCL rupture.

Discussion/Conclusion: Autologous BM-MSC injections can elicit a sustained anti-inflammatory effect in dogs with CrCL damage. Markers predictive of CrCL rupture include CRP in synovium and radiographic arthritis.

Acknowledgement: This study was supported by a Hohn-Johnson award from VOS.



43 RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED TRIAL TO INVESTIGATE THE EFFICACY OF A DASUQUIN® FOR THE TREATMENT OF OSTEOARTHRITIS IN DOGS

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Introduction: Studies evaluating the use of nutraceuticals while utilizing subjective and objective outcome measures have been completed with varying results. The objective of this study was to evaluate the efficacy of a commercially available nutraceutical as compared to placebo in dogs with osteoarthritis over a 90 day treatment period.

Materials and Methods: Sixty client-owned dogs with confirmed osteoarthritis were enrolled into 2 groups (Dasuquin® and placebo; n = 30/group). Baseline CBPI's were completed on day -7 and repeated on days 30, 60, and 90. Each dog had an accelerometer placed on a collar at the level of the ventral neck on day -7 and data was collected on days 0, 30, 60, and 90. Treatment failures resulting in withdrawal from the study were also used as an outcome measure.

Results: A total of 60 dogs were enrolled in the study. For all outcome measures there were no differences between treatment groups. Treatment failures occurred in 7/30 placebo treated dogs and 6/30 Dasuquin® treated dogs.

Discussion/Conclusion: Results of the present study revealed no difference in the owner survey data, patient activity, or probability of a treatment failure between groups. Therefore, we rejected our hypothesis that dogs with OA treated with Dasuquin® will have an increase in total daily activity counts.

Acknowledgement: There was no proprietary interest or funding provided for this project.

44 CLINICAL FACTORS AFFECTING SUCCESS OF PATIENT CELL CULTURE TOWARDS AUTOLOGOUS SYNOVIOCYTE-BASED MENISCAL TISSUE ENGINEERING

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Introduction: Meniscal injury is a common cause of lameness in the dog; autologous tissue engineering is an alternative approach for treating canine meniscal loss. The objective of this study was to identify patient characteristics that are associated with cell culture failure.

Materials and Methods: Dogs were presented for treatment of naturally occurring primary cranial cruciate ligament disease. Age, breed, weight, sex, body condition score, and complete medical history were recorded for each dog. Preoperative radiographic osteoarthritis scores were determined for each dog. Unilateral stifle arthroscopy was performed on each dog and meniscal, ligamentous, cartilage, and synovial pathology scored. Synovial villi were arthroscopically harvested, cultured, and synthesized into tensioned synovioyte neotissues (TSN). TSN were analyzed for dsDNA and meniscal like matrix: glycosaminoglycans and collagen. Data were analyzed with a 2-sided Fisher's exact or Student's t-test with significance set at $P \leq 0.05$.

Results: Synovioyte cultures from 39 dogs were started, 25% of which failed, and 75% were successfully cultured into TSN. Cells from dogs with meniscal tears and complete CCL tear were less likely to have successful monolayer culture (odds ratio: 7.6; 95% CI: 1.3–42.8; $P = 0.03$).

Discussion/Conclusion: Patients that are in greatest need for autologous tissue engineering strategies – i.e. those with ligamentous and meniscal injury – are at greatest risk for failed cell culture. Further investigation to determine the cellular mechanisms for these findings is warranted to find a solution to this problem.

Acknowledgement: This study was funded by Oregon State University College of Veterinary Medicine. There are no conflicts of interest to disclose.

45 IN VITRO BIOMECHANICAL TESTING OF THE 3.5 MM LCP IN TORSION: A COMPARISON OF UNICORTICAL LOCKING TO BICORTICAL NONLOCKING SCREWS PLACED NEAREST THE FRACTURE GAP IN A SYNTHETIC BONE MODEL

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Introduction: To compare the torsional strength and stiffness of the 3.5 mm locking compression plate (LCP) with all locking versus non-locking screws and the effect of placing a locking unicortical or non-locking bicortical screw in a diaphyseal fracture gap model.

Materials and Methods: Six-hole 3.5 mm LCP were applied to forty synthetic bone models simulating a diaphyseal fracture without anatomic reduction, using four different screw configurations: all bicortical locking construct (ABL), all bicortical non-locking construct (ABN), a hybrid construct with a bicortical non-locking screw placed nearest the fracture gap (BN), and a construct with a unicortical locking screw placed nearest the fracture gap (UL). Torsional stiffness and rotation and torque at failure were compared via ANOVA and post-hoc pairwise comparisons ($p < 0.05$).

Results: ABN and BN had the highest stiffness with ABL greater than UL (the least). Rotation at failure was greatest for ABL with UL greater than ABN (the least). Torque at failure was highest for ABL with BN greater than ABN (the least).

Discussion/Conclusion: Bicortical non-locking screws nearest the fracture gap in a hybrid construct increased stiffness without affecting torque or rotation at failure. Unicortical locking screws nearest the fracture gap decrease stiffness, without significantly effecting torque or rotation at failure. Adding non-locking screws to locking constructs may be desirable to increase the torsional stiffness of a construct.

Acknowledgement: We thank Virginia Commonwealth University Orthopedic Research Laboratory, Richmond, VA, for their expertise and use of materials testing equipment. We also thank Synthes Vet®, West Chester, PA, for donating a portion of the implants in this study.

46 THIRD CARPAL BONE FRACTURE IS ASSOCIATED WITH FOCAL SUBCHONDRAL BONE POROSITY IN RACEHORSES

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Introduction: Third carpal bone (C3) osteochondral disease is believed to predispose racehorses to fracture, and focal subchondral porosities occur in C3s with advanced osteoarthritis. We hypothesized that C3 fractures of racehorses occur in association with focal subchondral bone porosity.

Materials and Methods: Thirty C3s, collected bilaterally from 6 Thoroughbred and 4 Quarter Horse racehorses with unilateral, complete fracture and unilaterally from 10 age, breed matched control racehorses without C3 fracture, were assessed with gross, radiographic, CT, and microCT evaluations. Subchondral densification, cartilage degeneration, observable dorsal lucency and fracture surface lesions were quantified. Bone volume fraction (BV/TV) was assessed in 2 volumes of interest (VOIs) from the radial (VOIr) and intermediate facets (VOIi) of all bones. Data was analyzed with ANOVA, chi-square, Fisher's exact and Jonckheere-Terpstra tests, with $p < 0.05$ for statistical significance.

Results: Fractured surfaces had visible evidence of pre-existing lesions. Contralateral and control cartilage degenerative scores were not different ($p = 0.436$), while radiographic and CT bone density scores were different ($p < 0.001$, $p < 0.001$). Dorsal lucencies were detected using CT ($p < 0.001$), but not radiography ($p = 0.245$). BV/TV of the VOIr of fractured C3s was lower



than all other VOIs, and the VOIr of contralateral bones was significantly lower than all other VOIs except fractured C3 VOIr.

Discussion/Conclusion: C3 fractures occur in association with focal subchondral porosity, and a similar process occurs within contralateral bones. Subchondral, but not articular cartilage, pathology was associated with C3 fracture.

Acknowledgement: Support was provided through an Oregon State University DCS Resident Research Grant.

47 EFFECT OF TIBIAL PLATEAU LEVELING OSTEOTOMY ON STABILITY OF THE FELINE CRANIAL CRUCIATE-DEFICIENT STIFLE JOINT: AN IN-VITRO EXPERIMENTAL STUDY

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Introduction: The effect of Tibial Plateau Leveling Osteotomy (TPLO) on the cranial cruciate ligament (CrCL)-deficient stifle joint has been validated by ex-vivo studies in the dog but not in the cat. Our objective was to evaluate the effect of TPLO on Cranial Tibial Subluxation (CTS) and the Tibial Rotation Angle (TRA) in a model of the feline CrCL-deficient stifle joint.

Materials and Methods: The hind limbs of ten adult cats were freed of soft tissues except from the stifle and talocrural joint capsules. Quadriceps and gastrocnemius muscles were simulated using cables, turnbuckles and a spring. An axial load of 30% body weight was applied. The stifle and hock joint angles were adjusted to 120°. CTS and TRA were radiographically measured with the cranial cruciate ligament intact, after CrCL transection, and after TPLO with a postoperative Tibial Plateau Angle (TPA) of +5°, 0° and -5°.

Results: CrCL section resulted in a CTS of 8.8 ± 1.6 mm and a TRA of $14.8 \pm 3.8^\circ$. After TPLO at +5°, CTS (7.9 ± 1.0 mm) and TRA ($11.4 \pm 5.2^\circ$) values were not significantly different from those obtained after CrCL section. CTS and TRA with TPLO at 0° and -5° were not significantly different either.

Discussion/Conclusion: In this model, TPLO with a postoperative TPA of 5° failed to eliminate cranial tibial subluxation. Further studies are warranted to evaluate the effect of TPLO on the CrCL-deficient feline stifle.

Acknowledgement: There was no proprietary interest or funding provided for this project.

48 A NOVEL TECHNIQUE FOR CERVICAL FUSION IN HORSES

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Introduction: Cervical vertebral stenotic myelopathy (CVSM) is a common cause of neurologic deficits and loss of athletic function in the horse. The current surgical techniques for cervical stabilization are costly, technically challenging, require long convalescence and can result in significant postoperative complications.

Materials and Methods: A novel, porous interbody fusion device (IFD) with a pedicle screw and rod construct was used for mid-level cervical fusion in four clinically normal horses. Horses were evaluated pre- and post-operatively for neurologic deficits. Radiographs were obtained pre-operatively and at numerous time points post-operatively. All horses were euthanized at 8 months post-operatively and gross evaluation, micro-CT, and histopathology were performed to evaluate fusion.

Results: The procedure was performed safely in all horses, with minimal post-operative complications. No horses showed neurologic deficits at any time. Micro-CT at 8 months revealed evidence of new bone formation around the implants and continued stability at the disk space. Complete immobility in dorsoventral flexion was achieved in all horses with no implant failure in any horses.

Discussion/Conclusion: This novel fusion system, which requires less disk space removal, results in immediate stability in compression and tension. With proper training and knowledge of the pertinent anatomy, these implants are applied consistently and easily. This technique is a promising alternative to current surgical procedures for the treatment of CVSM.

Acknowledgement: The authors would like to acknowledge the donations of implants by Progressive Motion, Inc and Phusion Metal™, PorOsteon, Inc. Additional funding was provided by a College Research Council (CRC) grant from Colorado State University.

49 EX-VIVO EFFECT OF SLIDING HUMERAL OSTEOTOMY (SHO) ON THORACIC LIMB ALIGNMENT: IMPLICATIONS FOR MANAGEMENT OF MEDIAL COMPARTMENT DISEASE

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Introduction: The objective of this study was to determine the effect of SHO on thoracic limb alignment using an ex vivo canine cadaveric model.

Materials and Methods: Eight pair of thoracic limbs were obtained from skeletally mature Labrador Retrievers. A custom designed limb press was used to obtain standing and recumbent caudocranial radiographs before and after SHO.

Results: Mean±SD mechanical (m) joint angles were determined using the CORA methodology for pre (p) or post SHO (po) radiographs: lateral distal humeral angle (mLDHA): $87.8+2.7^\circ$ (p), $83.2+2.1^\circ$ (po); medial proximal radioulnar angle (mMPRUA): $81.7+3.1^\circ$ (p), $82.0+3.3^\circ$ (po); lateral distal radioulnar angle (mLDRUA): $88.3+3.1^\circ$ (p), $89+2.6^\circ$ (po); lateral proximal carpal metacarpal angle (mLPCMA): $82.7+5.9^\circ$ (p), $82.8+6.5^\circ$ (po); thoracic humeral angle (mTHA): $3.63+2.6^\circ$ (p), $0.9+2.6^\circ$ (po); humeral radioulnar angle (mHRUA): $9.4+4.0^\circ$ (p), $4.8+4.1^\circ$ (po); radioulnar metacarpal angle (mRUMCA): $8.8+5.7^\circ$ (p), $8.0+6.2^\circ$ (po); thoracic metacarpal angle (mTMCA): $3.1+5.8^\circ$ (p), $4.4+7.1^\circ$ (po); elbow mechanical axis deviation (eMAD): $2.7+1.7^\circ$ (p), $0.7+1.6^\circ$ (po); carpal mechanical axis deviation (cMAD): $-1.1+1.3^\circ$ (p), $-1.5+1.4^\circ$ (po); elbow compression angle (ECA): $2.0+1.6^\circ$ (p), $1.0+1.5^\circ$ (po); and elbow rotational position (ERP): $43.8+2.5^\circ$ (p), $44.8+2.5^\circ$ (po). SHO resulted in significant reduction in ERP ($P=0.020$) as well as mLDHA, mHRUA, mTHA, and eMAD ($P<0.0001$).

Discussion/Conclusion: SHO resulted in significant translation of the mechanical axis of the thoracic limb from a medial to lateral direction though alterations in limb alignment values associated with the elbow and humerus. This method may prove useful in the evaluation of thoracic limb alignment in dogs pre- and post-SHO.

Acknowledgement: There was no proprietary interest. Funded by the Wade O. Brinker Resident Research Award (2015). Surgical implants were provided by New Generation Devices (Glen Rock, NJ).

50 SERUM AND SYNOVIAL FLUID SERUM AMYLOID A AS AN AID IN CONFIRMING SYNOVIAL SEPSIS IN THE HORSE

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Introduction: The objective of this study was to investigate using serum and synovial fluid serum amyloid A (SAA) to aid in diagnosing septic arthritis and to compare a handheld test to a validated immunoturbidometric assay for SAA using equine models of synovitis and septic arthritis.



Materials and Methods: Synovitis (n=4) and septic arthritis (n=5) were induced, serial serum and synovial fluid samples collected, and synovial fluid cytology performed. Serum and synovial fluid SAA were quantified by handheld test and immunoturbidometric assay. Cytology and SAA data were compared over time within models, and between models, and SAA assays were compared using continuous data and category by category analysis.

Results: Synovial fluid total nucleated cell count and total protein increased significantly following induction of both models. Serum and synovial fluid SAA remained normal in synovitis horses (controls) and increased significantly in septic arthritis horses over time and compared to synovitis horses. Serum SAA increased more rapidly and were higher than synovial fluid SAA. Overall there was substantial agreement between SAA assays (weighted kappa = 0.824) with 98% agreement for SAA values <50 µg/mL and clinically relevant agreement at higher values.

Discussion/Conclusion: Overall there was substantial agreement between the handheld and immunoturbidometric SAA tests in serum and synovial fluid. Serum and synovial fluid SAA may be useful in diagnosing septic arthritis in horses with serum increasing earlier than synovial fluid.

Acknowledgement: Funded by the Veterinary Memorial Fund, Virginia-Maryland College of Veterinary Medicine. A portion of handheld tests supplied by StableLab (Epona Biotech Limited).

51 BIOMECHANICAL COMPARISON OF TIBIAL PLATEAU LEVELLING OSTEOTOMY PERFORMED WITH A NOVEL TITANIUM LOCKING PLATE VERSUS AN ESTABLISHED STAINLESS STEEL LOCKING PLATE

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Introduction: A novel locking titanium alloy tibial plateau levelling osteotomy (TPLO) plate (Kyon AG, Zurich) relies exclusively on mono-cortical locking screws for fixation to the distal segment. Potential biological benefits can only be evaluated in vivo, but mechanical adequacy of fixation can be addressed in a cadaveric model. The goal of this study was to compare the strength of this new TPLO plate construct with an established stainless steel TPLO construct from Synthes as a control. Our hypothesis was that there would be no difference in load to failure between the two systems when applied to paired hind limbs.

Materials and Methods: Routine TPLO was performed in paired cadaveric pelvic limbs (n=18) with the novel titanium plate (Kyon) and an established stainless steel plate (Synthes) in the contralateral limb. Limbs were tested in a servo-hydraulic machine. Load to failure was compared using an ANOVA. A P value < 0.05 was considered significant.

Results: Mean load to failure was 771.6 ± 197.7 N and 657.7 ± 196.0 N in the Kyon and Synthes groups respectively (P = 0.2374). The average strength ratio was 1.22; Std. Dev. 0.24; Std. Err. 0.08. The Kyon construct was 22% stronger than the Synthes in this study, and no failure of the Kyon constructs involved the distal fixation with mono-cortical screws. Limitations of the study were related to its ex vivo nature.

Discussion/Conclusion: We demonstrated adequate mechanical fixation of the TPLO with a new titanium plate using exclusively mono-cortical screws for the distal segment.

Acknowledgement: Orthopaedic Bioengineering Research Laboratory, Colorado State University for their equipment.

Part II to be published in issue 3/2016

VOS would like to thank Nexvet Biopharma PLC for their sponsorship support which made publication of these abstracts possible.

