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Part II

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Association Française des Vétérinaires pour Animaux de Compagnie (AFVAC) International Resident Award Winner (continued)

54 IN VITRO EVALUATION OF CASTOR POLYMER ASSOCIATED WITH CALCIUM CARBONATE AS A DEVICE FOR RELEASE OF GENTAMICIN

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Introduction: Orthopedic surgical procedures in equine medicine are a challenge because of the high level of failure due to a high morbidity and mortality caused by infection. Methods for local delivery of antibiotics have been used for control and prevention of musculoskeletal infections. The goal of this project was to evaluate the ability, *in vitro*, of the castor oil polyurethane associated with calcium carbonate as a controlled release of gentamicin.

Materials and Methods: Forty castor oil polymer specimens associated with calcium carbonate were prepared and divided into 4 groups: control group without gentamicin sulfate and three groups with different concentrations of gentamicin (6, 12, 24 mg/g polymer). The release of gentamicin was evaluated in PBS solution at pH 7.4 by the spectrophotometric method at the colorimetric ninhydrin reaction with ninhydrin in different days (1, 2, 7, 14, 21, and 28) besides being conducted *in vitro* analysis in cultures of *Staphylococcus aureus*.

Results: The ninhydrin presented interaction with the amines present in the polymer and not just with the amines present in the gentamicin. The elution pattern of gentamicin obtained showed higher concentrations on day 1, followed by a constant abrupt fall from day 2 to day 7. There was a slow decrease from day 7 to day 14 at the elution of the antibiotic. The MIC test was effective, with positive bacterial growth analysis for the samples of the control group. The 6mg group inhibited growth on days 1 and 2 only, the 12mg group inhibited growth until the seventh day and the 24mg group did not allow growth until the 14th day.

Discussion/Conclusion: The castor oil polyurethane was effective as a mechanism of the *in vitro* release of gentamicin and the proportion of 24mg gentamicin per gram of material had a satisfactory bactericidal effect in cultures of *S. aureus*.

Disclosure: No proprietary interest or relevant financial relationship.

55 NON-INVASIVE METHODS FOR BONE HEALING ASSESSMENT IN HORSES

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Introduction: Several methods are available for bone tissue assessment in horses. Bone densitometry (BD), ultrasonographic examination (US), power doppler US (PDUS) and biochemical markers of bone remodeling.

Materials and Methods: The aim of this study was to compare different non-invasive bone healing assessment methods following creation of a bone defect in third metacarpal bone in 6 horses. Patient follow-up included BD, US, PDUS and measurements of alkaline phosphatase levels for 120 days.

Results: Mean bone density differed significantly from baseline pre-surgical values up to day 60 ($p < 0.05$) and returned progressively to baseline values from post-operative day 90 ($p > 0.05$). US scores differed significantly between days 7 and 120 and days 15 and 120 ($p < 0.001$). Vascularization scores differed significantly between days 7 and 30 ($p < 0.05$). Alkaline phosphatase levels differed significantly between days 30 and 120 ($p < 0.001$; *post-hoc* test). Bone density decreased sharply during the first week following surgery and increased progressively thereafter. US proved suitable for fibrocartilage callus evaluation during the first 15 post-operative days, before bone mineralization occurred.

Discussion/Conclusion: Based on US assessment, experimental metacarpal bone defects heal fast and calcification can be recognized 30 days after the initial injury in horses. A vascularization peak was noted 30 days following surgery, suggesting more prominent blood flow may be responsible for dense tissue formation from post-operative day 30. Peak alkaline phosphatase levels were also noted 30 days following surgery, supporting US findings suggestive of greater bone activity during the first post-operative month. Non-invasive methods proposed in this study provide relevant reliable information on bone tissue activity.

Disclosure: No proprietary interest or relevant financial relationship.

56 TENORRHAPHY IN HORSES: COMPARISON OF THE MECHANICAL PROPERTIES OF TWO DIFFERENT SUTURE PATTERNS AND SUTURE MATERIALS

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Introduction: Traumatic distal limb injuries resulting in tendon rupture are common in equine practice. Several complications have been associated with tendon repair in horses. The aim of this study was to compare the biomechanical properties of two tenorrhaphy techniques using two different suture materials.

Materials and Methods: Twenty four equine deep digital flexor tendon specimens were transected and sutured with the double locking loop pattern (polypropylene, group 1; polyglactin, group 2) or the single locking loop pattern with peripheral epitendon suture (polypropylene, group 3; polyglactin, group 4). Specimens were submitted to mechanical strain testing. Maximum, minimum and peak strain, and maximum, minimum and peak gap formation were evaluated. ANOVA and the non-parametric Kruskal-Wallis and Mann-Whitney tests were used, with a level of significance of 5% ($p < 0.05$).

Results: Higher maximum strength values were documented in group 3. The minimum strength values were higher in groups 3 and 4 than in groups 1 and 2, but did not differ significantly between groups 3 and 4. The peak strength values were higher in groups 1 and 2 than in group 4, but did not differ significantly from group 3. Gap formation was greater in groups 1 and 2 than in groups 3 and 4.



Discussion/Conclusion: The single locking loop pattern with epitendon suture performed with polypropylene had greater resilience, yielded lesser gap formation (3 mm) and is the pattern of choice for clinical application based on the results of this study.

Disclosure: No proprietary interest or relevant financial relationship.

57 THERMOGRAPHIC ASSESSMENT OF THE INFLAMMATORY RESPONSE FOLLOWING CASTOR OIL POLYMER IMPLANTATION IN EXPERIMENTAL THIRD METACARPAL BONE DEFECTS IN HORSES

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Introduction: Thermography is a diagnostic imaging modality employed to estimate the degree of activity of some body tissues. Thermographic diagnostic imaging is becoming increasingly popular in equine medicine. The purpose of this study was to investigate the ability of thermography to detect inflammation following implantation of castor oil polymer into experimental third metacarpal bone defects in horses.

Materials and Methods: A bone defect was created in the proximal aspect of the left and right third metacarpal bones using a trephine saw. Bone defects in each horse were either filled with castor oil polymer and calcium carbonate (treated limb) or left untreated (control limb). Thermographic images were acquired 7, 15, 30, 60, 90 and 120 days following surgery. The Freidman test was employed to assess the progression of the variables studied along the experimental period.

Results: Whenever significant changes were observed, differences between time points were compared using the *post-hoc* Schaich & Hamerle test. The Wilcoxon test was employed for comparison between treated and control limbs at different time points. The level of significance was set at 5% ($p < 0.05$). Thermographic readings did not differ between treated and control limbs over time. However, significantly higher temperatures ($p = 0.046$) were documented in treated limbs on post-operative day 7.

Discussion/Conclusion: Thermography is an easy and straightforward method that can be used to monitor the inflammatory response following implantation of biomaterials into metacarpal bone defects in horses. Thermographic assessment enables early diagnosis of inflammation and can therefore play an important role in routine orthopedic examination in horses.

Disclosure: No proprietary interest or relevant financial relationship.

58 USE OF THE INERTIAL MEASUREMENT UNIT TO ASSESS THE EFFECT OF EQUINE FORELIMB LAMENESS ON THREE-DIMENSIONAL HOOF ORIENTATION AT THE WALK AND TROT

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Introduction: Equine lameness is a significant issue to the equestrian community resulting in poor performance, increased veterinary costs, and loss of use. Horse-mounted systems measuring head or body asymmetry have been developed to supplement the subjective lameness examination. We hypothesize that an inertial measurement unit (IMU) would detect significant changes in hoof orientation at the walk and trot following induction of lameness and these changes would normalize following peri-neural anesthesia.

Materials and Methods: Three grades of lameness were induced in a single forelimb of six normal horses. Peri-neural anesthesia was performed following the most severe lameness. 3-D hoof orientations were determined by a hoof mounted IMU on the lame limb at the walk and trot. Intra-limb comparisons were made between each lameness grade and baseline. Repeated measures, mixed model ANOVA was used to analyze data with significance set at $P < 0.05$.

Results: Lameness resulted in significant increase in external rotation and abduction and a decrease in sagittal rotation during break-over at the trot. These external and sagittal rotations returned to baseline following peri-neural anesthesia. After peri-neural anesthesia, there was also a significant increase in the standard deviations of sagittal plane orientations compared to baseline and lameness conditions.

Discussion/Conclusion: A hoof mounted IMU detected significant 3-D orientation changes following lameness at the walk and trot. These orientation changes should be further investigated to determine their usefulness in evaluation of clinical lameness. The increase in variability in sagittal orientation may be a useful tool for assessing anesthesia of the hoof.

Disclosure: Research funded by The United States Equestrian Foundation Equine Health Research Fund.

59 A RETROSPECTIVE ANALYSIS OF THE RELATIONSHIP BETWEEN FEMORAL NECK REMNANT AND SHORT-TERM CLINICAL OUTCOME FOLLOWING FEMORAL HEAD AND NECK EXCISION IN DOGS

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Introduction: The purpose of this study was to determine the relationship between incomplete femoral head and neck excision (FHNE) and hindlimb function in the post-operative period in dogs. We hypothesized that there would be no relationship between the amount of femoral neck remaining and clinical outcome within the first 8 weeks after surgery.

Materials and Methods: A search of the medical records at the University of Illinois Veterinary Teaching Hospital over a 10-year period returned 125 post-operative FHNE radiographs that met the inclusion criteria. The amount of femoral neck remaining was measured and expressed as a percentage of the non-operated side. Signalment, presenting complaint, rehabilitation protocol and clinical outcome were also recorded.

Results: The average femoral neck remnant was 15.4% (SD 9.8%). Follow-up data was available for 64 cases (51.2%). 14 dogs (11.2%) had an excellent outcome, 30 (24%) had a good outcome; 13 (10.4%) had a moderate outcome; and 7 (5.6%) had a poor outcome. Clinical outcome was not significantly related to the percentage of femoral neck left behind, or to any factors in the signalment or history.

Discussion/Conclusion: While a slight trend towards lower femoral neck remnant percentages was noted in the groups with good or excellent outcomes, it was not statistically significant. It is possible that detrimental effects are not seen until larger percentages of the neck are left behind. However, many factors can affect clinical outcome, and further studies are needed to define them.

Disclosure: No proprietary interest or relevant financial relationship.

60 ADVANTAGES OF FOCAL SHOCKWAVE THERAPY IN DOGS: A PILOT STUDY

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Introduction: Two different types of shockwaves can be used for the treatment of several orthopedic disorders, focused and radial shockwaves. The energy decrease in radial shockwave could lead a painful treatment to get sufficient levels of necessary energy to act in the affected area and anesthesia could be necessary. However, we hypothesized that focal shockwave could avoid anesthesia because the energy is focused and does not decrease with the distance and the pain across the surround areas could be avoided.

Materials and Methods: Shockwave therapy was performed in seven dogs with several orthopedic diseases. A radial probe was utilized in two dogs with similar osteoarthritis in the hip secondary to dysplasia, one dog with radius non-union, and one dog with osteoarthritis secondary to elbow dysplasia. A



focal probe was utilized in two dogs with non-union of radius (one of them was the same in radial group) and two dogs with stifle osteoarthritis. We evaluated the discomfort and pain during treatment and if a general anesthesia was necessary.

Results: In the radial SWT group all dogs expressed severe pain signals and anesthesia was necessary and this was the reason of small sample power. However, in the focal SWT group anesthesia was not necessary and only slight signals of discomfort were observed in all dogs. Both groups showed apparently improvements.

Conclusion and clinical relevance: We suggest that focal SWT could be performed without anesthesia and could be a great advantage against radial SWT, which we do not recommend performing without anesthesia.

Disclosure: No proprietary interest or relevant financial relationship.

61 Arthroscopic treatment of elbow osteochondritis dissecans in dogs: long term radiographic and clinical follow-up

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Introduction: Arthroscopic treatment of elbow disorders is described as a standard procedure in veterinary orthopaedic surgery, however no reports are related to elbow osteochondritis dissecans (OCD). The main objective of this study was to evaluate the long-term clinical and radiographic outcome of the arthroscopic treatment of elbow OCD.

Materials and methods: For this retrospective, complete files of client owned dogs diagnosed with elbow OCD were collected over a period of 4 years. Clinical data and radiographs before and after arthroscopic treatment were evaluated.

Results: 52 dogs were accrued over this period of which 24 dogs had an owner questionnaire filled out, of this 24 dogs, 17 dogs (28 elbows) came for revisit. Of the 17 dogs that were re-evaluated at our clinic mean follow-up period of 4.4-year period was achieved (range 2.3–5.8 years). Over time, clinical parameters (lameness, joint swelling, and pain) subjectively improved, range of motion decreased, and radiographic evidence of elbow osteoarthritis increased significantly. Good clinical outcome was seen in 96.4% of the arthroscopically treated joints, despite the radiographic development of severe osteoarthritis (OA).

Discussion: The arthroscopic treatment should be advised as a minimally invasive surgical treatment for elbow OCD, rendering excellent long-term results. Though the development of osteoarthritis cannot be avoided even by minimally invasive procedure as elbow arthroscopy, the amount of OA seems to be of no clinical significance. Study limitations comprise of a lack of a control group and objective evaluation of clinical outcome as orthopaedic and owners-questionnaires only give a subjective impression.

Disclosure: No proprietary interest or relevant financial relationship.

62 BIOMECHANICAL COMPARISON OF 3.5 MM LCP AND 3–3.5 FIXIN PLATE IN A PLATE-ROD CONSTRUCT: A DOG CADAVERIC STUDY

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Introduction: Comminuted diaphyseal femoral fractures are a common challenge in veterinary medicine. The aim of our study was to compare stiffness and resistance to cyclic fatigue of 3.5 mm LCP and 3.5 mm Fixin plate in a plate-rod construct in a cadaveric canine fracture gap model.

Materials and Methods: Twenty femurs with similar length harvested from 10 large breed dogs. Each pair of femurs was randomly assigned to receive a 3.5 mm Fixin plate or a 3.5 mm LCP Synthes plate with an IM pin (diameter 40% of medullary cavity). Cyclic loading (45,000 cycles) with increasing loads from 200N to 800N was performed. Specimens that did not fail during cycling with underwent load to failure. Data obtained were statistically compared between groups.

Results: During cycling 6/10 Synthes plates and 1/10 Fixin plate failed. This difference was statistically significant. The mean±SD stiffness and load to failure were 166.7±49.6 N/mm and 1006±177 N for Synthes, and 210±39 N/mm and 1173±117 N for Fixin plates. No significant difference was found for stiffness and load to failure between groups.

Discussion/Conclusion: Based on our results a plate-rod construct with 3.5 Fixin plate has a longer fatigue life than plate-rod constructs with 3.5 LCP. This can be explained by the presence of more holes in the Synthes plate that made it more flexible. One limitation of the study is its cadaveric nature. Although both plates are commonly used with excellent results, our study show that Fixin plates are significantly less prone to fail compared to Synthes.

Acknowledgement: Fixin and Synthes implants were donated from the companies

Disclosure: No proprietary interest or relevant financial relationship.

63 COMPARING EASE OF USE AND SEVERITY OF IATROGENIC ARTICULAR CARTILAGE DAMAGE USING THE MENISCAL ARTHREX KNIFE AND THE HOOK KNIFE FOR ARTHROSCOPIC MEDIAL MENISCAL RELEASE IN CANINE CADAVER STIFLES

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Introduction: Medial meniscal release (MMR) has been recommended in conjunction with stifle stabilization procedures to address cranial cruciate rupture in the dog. There are several instruments that have been used to perform arthroscopic MMR. The new Arthrex meniscal knife was designed to improve the ease and safety of MMR. The cut tissue is under tension and the blade retracts automatically when released, which allows to more control while using this instrument. The purpose of this study was to determine the frequency and severity of iatrogenic articular cartilage damage using the new Arthrex knife (AK) compared to the hook knife (HK) during an arthroscopic MMR in canine cadaveric stifles. We also aimed to compare procedure time and ease of use of each instrument.

Materials and Methods: Nine pairs (n=18) of cadaver limbs were used to compare procedure time and ease of use of each knife. The stifles were disarticulated and the articular cartilage was stained with India ink to evaluate for iatrogenic damage.

Results: There was no statistical significance in the differences comparing frequency and severity of iatrogenic cartilage damage and time required for the procedure. There was a significant difference between the VAS scores between the two knives. The average VAS for ease of use was 6.4 for the AK and 2.0 for the HK (p-value 0.001).

Discussion/Conclusion: Although the AK did not decrease procedure time or iatrogenic cartilage damage, the AK was subjectively significantly easier to use to perform MMR.

Disclosure: One of the authors (AP) is a private consultant for Arthrex.



64 COMPARISON OF THE ACCURACY OF TWO ULTRASOUND-GUIDED LOCAL BLOCK TECHNIQUES FOR THE CRANIAL ASPECT OF THE LUMBAR PLEXUS IN DOGS

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Introduction: Lumbar plexus (LP) block is an alternative to epidural analgesia for hind limb surgery. Despite several iterations in injection techniques, blockade failure rates are reportedly high. This study compared two approaches to the LP at the level of L6.

Materials and Methods: Nineteen mixed breed canine cadavers (21.5±5.9kg) were used. The LP's cranial aspect was injected using a dorsal para-lial approach on one side and a lateral para-vertebral approach on the other at the 6th lumbar space. Sides were randomized for techniques. Iodine based and new-methylene-blue mixture (0.1ml/Kg) was injected at the L6 nerve root identified ultrasonographically. Computed tomography and 3D reconstruction of the lumbar spine and contrast material were performed. A blinded evaluator measured the distances between contrast material and the fifth through seventh lumbar foraminae. Length of filling defects observed within each contrast volume correlating with LP nerve tracks was also evaluated. Distances were normalized to L6 body length. The LP was then dissected to evaluate femoral and obturator nerves staining. Approaches were compared using Fisher's exact test and paired t-test for staining and normalized distances, respectively (p<0.05).

Results: No difference was observed between approaches. While the femoral nerve was consistently (92%) stained, the obturator nerve was not (79% unstained).

Discussion/Conclusion: Alternative injection techniques may increase obturator nerve capture rates. However clinical studies are warranted to evaluate the impact of obturator nerve blockade in hind limb surgery.

Disclosure: No proprietary interest or relevant financial relationship.

65 COMPARISON OF TTA AND TPLO FOR CRANIAL CRUCIATE LIGAMENT DEFICIENCY IN DOGS THROUGH KINETIC ANALYSIS

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Introduction: Cranial cruciate ligament rupture is the major cause of lameness in dogs and current techniques have been developed to prevent abnormal movement of the stifle.

Materials and Methods: Evaluation will be done with subjective and objective assessment via analysis in pressure platform. We evaluated 27 adult dogs over 20 Kg with unilateral or bilateral cranial cruciate ligament rupture. They underwent TTA (12 dogs) and TPLO (15 dogs). These patients were evaluated in the preoperative period and at 14, 30, 60 and 90 days postoperatively focusing on claudication on a pressure platform (baropodometry). The animals were divided into groups according to the tibial plateau angle (TPA), and based on clinical recommendation, we used TPLO in all patients with a TPA greater than 27° and TTA in those patients that had TPA less than 27°.

Results: In both groups we observed statistically significant recovery in objective assessment. There was no difference between groups in recovery of the surgery.

Discussion/Conclusion: Despite the differences found in the TPA, there are no differences in final baropodometry results between two groups. This finding is supported by Having et al. (2007). Even after statistics correction of difference in TPA with covariance analysis, there are no differences. Only on day 14 after surgery, was there a difference between the two groups, with the dogs of TTA group showing better weight bearing. We conclude that TPLO

and TTA were effective in promoting improved support in dogs with cranial cruciate ligament deficiency.

Acknowledgement: FAPESP for financial support.

Disclosure: No proprietary interest.

66 COMPARISON OF UNILATERAL, STAGED BILATERAL OR SINGLE-SESSION BILATERAL SURGERY FOR THE TREATMENT OF BILATERAL MEDIAL PATELLAR LUXATION IN DOGS

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Introduction: Medial patellar luxation (MPL) occurs bilaterally in approximately 50% of affected dogs. Single-session bilateral surgical MPL correction in dogs has not been reported, but could shorten overall recovery and reduce owner expense. This retrospective study compared complication rates in dogs undergoing single-session bilateral MPL surgery to unilateral and staged bilateral surgery.

Materials and Methods: Dogs with bilateral MPL that underwent unilateral, staged bilateral or single-session bilateral surgery between 1999–2012 were studied. Clinical characteristics and complication rates were compared between groups and risk factors for major complications were explored. Preliminary statistical analyses were performed using Kruskal-Wallis test, Chi-square analysis and logistic regression.

Results: 40 dogs had unilateral, 16 dogs staged bilateral and 12 dogs single-session bilateral surgery (96 stifles). Median bodyweight of the single-session bilateral group was significantly (p=0.012) lower than the two other groups. Complications occurred in 22/96 stifles (22.9%), of which 11/96 (11.5%) required revision surgery. Timing of surgery was not significantly associated with a major complication ($\chi^2=0.743$; p=0.690). Tibial tuberosity transposition (TTT) was a significant predictor of major complications (Wald $\chi^2=3222.113$; p<0.001). No other significant predictors of complications were identified.

Discussion/Conclusion: Increasing bodyweight and MPL grade were not risk factors for complications in this study. Although TTT has been shown to reduce relaxation rates, the procedure may increase the frequency of major, implant-associated complications. Single-session bilateral surgery for MPL is a feasible treatment option, with a complication rate comparable to unilateral or staged bilateral MPL surgery.

Disclosure: No proprietary interest or relevant financial relationship.

67 CORRELATION BETWEEN CRANIAL CRUCIATE LIGAMENT RUPTURE AND MENISCAL TEARS IN DOGS

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Introduction: Cranial cruciate ligament rupture is the major cause of lameness in dogs and can occur due to degenerative or traumatic causes. It is a commonly observed disease in large breed dogs and its high prevalence made it one of the most studied diseases in veterinary orthopedics. Injury to the medial meniscus often occurs in CCL rupture secondary to cranial tibial subluxation. The cause of the injury is directly related to the relative immobility of the medial meniscus, whereas the lateral meniscus is very mobile.

Materials and Methods: The study correlated the time of the cranial cruciate ligament rupture (CCLR) with medial meniscal tears and the type of injury seen in dogs treated with dynamic stabilization (osteotomies) or static (fabelotibial suture). This retrospective study evaluated the records of 104 dogs (117 stifles). The osteotomies were performed in 98 stifles, with fabelotibial suture in 15 stifles and exploratory arthrotomy performed in 4 stifles.



Results: The average age was 4.47 years, 41.02% of the dogs were male and 58.97% female and the mean body mass was 32.72 kg. The medial meniscal tears observed were: type 1, 2, 3, 4, 6, 7 and associations of types 1–4, 1–6 and 1–7. Type 1 was the most prevalent, accounting for 32.47% of cases.

Discussion/Conclusion: No correlation was found between the presence or absence of medial meniscus injury and the time of occurrence of CCLR and between the type of medial meniscal tears and time CCLR.

Disclosure: No proprietary interest or relevant financial relationship.

68 CORTICAL BONE ALLOGRAFT PRESERVED IN HONEY FOR REPAIR OF COMMUNATED DIAPHYSEAL FRACTURES IN TWO DOMESTIC CATS

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Introduction: Bone fractures represent one of the main disorders affecting domestic cats. Preservation of cortical bone allografts in honey is a simple and widely available alternative for bone banking to use in comminuted fractures. We report the successful utilization of cortical bone allografts preserved in honey for the repair of clinical comminuted fractures of long bones in domestic cats.

Methods: After removing small devitalized bone fragments and leveling the fracture rims, a comminuted tibial fracture in one cat and a comminuted femoral fracture in another one were repaired by stabilization of honey-preserved cortical bone allograft with a 2.7mm dynamic compression plate (DCP) and screws.

Results: Consolidation at the proximal interface and non-union at the distal interface of the tibial fracture were observed in one cat. Bone healing was achieved in both host-allograft interfaces at the femoral fracture in the second cat. Both cats exhibited appropriate weight bearing of the operated limb, without occurrence of infection.

Discussion/Conclusion: Honey-preserved cortical bone allograft can be used for repairing long bone defects caused by comminuted fractures in domestic cats. The biochemical properties of honey on preservation of animal tissues still need to be elucidated.

Disclosure: No proprietary interest or relevant financial relationship.

69 DORSAL ANNULECTOMY OF THE CANINE L7/S1 INTERVERTEBRAL DISK MAY REDUCE THE THREE DIMENSIONAL VOLUME OF THE L7 NEURO-VASCULAR CANAL DURING EXTENSION OF THE LUMBOSACRAL JOINT

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Introduction: Degeneration of the L7/S1 disk in dogs can lead to stenosis of the lumbosacral vertebral canal and/or lateral intervertebral foraminae. Dorsal annulectomy of the L7/S1 disc is often performed concurrently with dorsal decompression. We hypothesised that annulectomy/partial discectomy would destabilise the L7/S1 intervertebral disc resulting in foraminal narrowing when the lumbosacral joint was extended.

Materials and Methods: Vertebral column sections (L7-S3) were obtained from 10 German Shepherd dogs presented for euthanasia due to disease unrelated to the lumbosacral joint. The vertebral sections were fixed in a custom made jig and CT was performed in an unloaded position and then in L/S extension loaded to 15lbs of simple bending. A minimal dorsal laminectomy of S1 was performed (sufficient to allow a rectangular dorsal annulectomy and partial nuclear discectomy) then the sections were reimaged under load 15lb load in extension. The foraminal volume was calculated from 3D reconstructed CT images using tissue segmentation algorithms. The results were compared using a linear mixed-effects model.

Results: Mean volume of the L7-S1 intervertebral foramen was 358 mm³ in neutral positioning and 137 mm³ when loaded in extension. Following annulectomy the volume was significantly ($p < 0.01$) reduced by an average of 28% to 100 mm³. Reduction in volume of the neuroforamen occurred in 19 of 20 foraminae, ranging from a 3 to 69% reduction in the volume (median 28%).

Discussion/Conclusion: In cadavers, dorsal annulectomy of the L7/S1 intervertebral disc resulted in significant reduction of the volume of the intervertebral foramen when loaded in full extension.

Disclosure: The study was funded by Massey University.

70 EFFECT OF DORSAL ACETABULAR RIM LOSS ON STABILITY OF THE ZURICH CEMENTLESS TOTAL HIP ACETABULAR CUP IN DOGS

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Introduction: In vitro biomechanical study evaluating magnitude and mode of acute load to failure of the Zurich cementless acetabular cup prosthesis in cadaveric specimens with and without 50% dorsal rim loss.

Materials and Methods: Cadaveric hemipelvises of adult dogs (n=8). Each pair of hemipelvises was prepared by dissection of surrounding musculature and implantation of a Zurich cementless acetabular cup prosthesis. One hemipelvis had the dorsal rim left intact (group 1), while the contralateral hemipelvis had 50% of the dorsal rim excised (group 2). Each hemipelvis underwent acute load to failure with an axial load applied through a prosthetic femoral head. The mode of failure was recorded. The load at failure was compared between hemipelvises with and without dorsal rim loss with a paired t-test; $P < .05$ was considered significant.

Results: The mean failure load was not significantly different between group 1 (3713 ± 362 N) and group 2 (3640 ± 751 N; $P < 0.8$). Bone fracture (n=6), ventroversion of the cup (1), and absolute failure unreached (1) occurred in group 1 and bone fracture (6), ventroversion of cup (1), and cup loosening (1) occurred in group 2.

Discussion/Conclusion: Failure loads for both groups exceeded 12 times normal physiologic loads. Acetabular cup stability does not appear to be compromised by 50% acetabular rim loss at normal physiologic weight bearing loads. Thus, modifying procedures such as augmentation of the dorsal acetabular rim or deeper reaming for acetabular bed preparation is questionable in clinical patients.

Disclosure: No proprietary interest or relevant financial relationship.

71 EFFECTIVENESS OF POST-OPERATIVE ANTIBIOTIC ADMINISTRATION FOR INFECTION CONTROL IN TIBIAL PLATEAU LEVELING OSTEOTOMY PROCEDURES

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Introduction: Infections in tibial plateau leveling osteotomies (TPLO) are the most frequent complication. The current guidelines published for antimicrobial prophylaxis in human medicine recommend antimicrobial therapy not exceed twenty-four hours post-operatively, but previous publications assessing TPLO complications suggest post-operative antimicrobials have protective effects. Our objective was to assess effectiveness of post-operative antibiotic administration in infection control of tibial plateau leveling osteotomies. Our null hypothesis was that antibiotic coverage beyond the perioperative period does not influence post-operative infection rates.

Materials and Methods: In this retrospective observational study, all TPLOs performed between the years of 2008 and 2010 were evaluated. A control group was generated from the non-infected cases and the test population consisted of infected cases. Each group was subcategorized into two groups:



treated with antibiotics >24 hours post-operatively or <24 hours of antibiotic administration. Descriptive data was summarized and comparisons of antibiotic usage to infection compared by chi-squared test to determine significance ($p < 0.05$).

Results: A total of 111 TPLO patients (37 infected cases and 74 non-infected) were reviewed. Of the infected cases, 16 (44%) received antibiotics >24 hours post-operatively, while 21 (56%) did not. Of the non-infected cases, 58 (78%) received antibiotics >24 hours post-operatively, while only 16 (22%) did not ($p < 0.0002$).

Discussion/Conclusion: We reject our null hypothesis. Our results corroborate other findings, suggesting that the performance of a tibial plateau leveling osteotomy warrants post-operative antimicrobial therapy, regardless of identified intra-operative contamination. A prospective study investigating the duration of antimicrobial therapy necessary for protective benefits should be undertaken.

Disclosure: No proprietary interest or relevant financial relationship.

72 EFFICACY OF A NEW FIBRIN DRESSING IN SPINAL BLEEDING

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Introduction: Hemostasis in elective surgery and trauma remains a challenge in certain circumstances. Most hemostatic agents currently in use employ collagen or starch. We tested a standard hemostatic dressing, GelfoamTM (GF) with thrombin, against a fibrin dressing, AnimalClotTM (AC), in a porcine corpectomy model.

Materials and Methods: A retroperitoneal approach to the spine was made in 5 female Yorkshire pigs, average weight 65 kg, after anesthesia had been achieved. Wedges were cut out of the vertebral bodies and the dressings were applied in a randomized fashion after free bleeding for 25 seconds. Manual pressure was applied to the dressing for 3 minutes and then the sites were observed for hemostasis for 2 minutes. Following the experiment the animal was humanely euthanized.

Results: 36 injuries were created and treatment was eventually divided between control and test articles. Hemostasis within 4 minutes was achieved in 16/18 AC treated animals and in 2/18 GF treated animals ($p = 0.006$). The odds of achieving hemostasis within 4 minutes were 0.02 times lower with GF treated injuries than with AC treated injuries (95% CI: 0.00–0.31). Hemostasis was maintained after 2 minutes of observation in 16/18 AC treated animals and in 1/18 GF treated animals ($p = 0.0002$).

Discussion/Conclusion: AnimalClotTM comprises lyophilized thrombin and fibrinogen embedded in a dissolvable dextran nanofiber mesh. The proteins hydrate upon contact with blood and form a fibrin clot with no residue. In this corpectomy model of bone bleeding AC was superior to GF plus thrombin in achieving hemostasis.

Disclosure: one of the authors is the Chairman, Scientific Advisory Board of St. Francis Veterinary Medical, Inc.

73 ELEVATED SYNOVIAL FLUID CONCENTRATION OF ADENOSINE TRIPHOSPHATE (ATP) IN DOGS WITH OSTEOARTHRITIS OR SODIUM URATE-INDUCED SYNOVITIS/INFLAMMATION OF THE STIFLE

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Introduction: Currently, the association between osteoarthritis and joint pain is unpredictable and non-linear. A novel outcome measure that correlates with a decrease in the joint pain pathway is needed. There is encouraging data demonstrating a correlation between synovial fluid (SF) adenosine triphosphate (ATP) concentrations and osteoarthritic knee pain in humans. To the author's knowledge there are currently no reports describing SF ATP

in naturally occurring canine osteoarthritis (OA) or in a urate-induced synovitis (UIS) model of inflammation. Our hypothesis is that elevated SF ATP is present in OA and UIS stifle joints as compared to normal joints.

Materials and Methods: Stifle SF was collected in 26 normal, 25 UIS, and 32 OA dogs. ATP concentration was determined with a luciferase assay. Comparison was performed with the Kruskal-Wallis test, multiple comparisons with Dunn's test. An ANOVA evaluated the effect of cruciate or meniscal pathology. Tests were 2-sided with significance at $\alpha = 0.05$.

Results: SF ATP from normal joints was significantly lower than UIS ($p < 0.0001$) or OA ($p < 0.0001$) joints. No difference existed between UIS and OA ($p = 0.639$). Cruciate ligament ($p = 0.279$) and meniscal status ($p = 0.760$) had no effect on SF ATP in the OA group.

Discussion/Conclusion: These data support our hypothesis and ATP as a potential biomarker of inflammation. Furthermore, these data reveal equivalent SF ATP elevations in UIS and OA stifles. Future studies will focus on the correlation of SF ATP as a biomarker for joint pain and dysfunction in OA as well as for tracking clinical improvement following therapy.

Disclosure: No proprietary interest or relevant financial relationship.

74 EVALUATION OF A LATERAL PARAVERTEBRAL ULTRASOUND-GUIDED INJECTION TECHNIQUE AT THE LEVEL OF L7 FOR LUMBAR PLEXUS BLOCK IN DOGS

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Introduction: Incomplete lumbar plexus (LP) blockade results in partial failure of hind limb local analgesia. Injections at the level of the 6th lumbar vertebra (L6) consistently lack obturator nerve capture which is a potential reason for blockade failure.

Materials and Methods: Ten mixed breed canine cadavers (28.9±6kg) were used. The LP's cranial aspect was visualized ultrasonographically using a lateral paravertebral approach at the 7th lumbar space. Iodine based and new-methylene-blue mixture (0.1ml/kg) was injected bilaterally in the juxta-foraminal region along L7 nerve root. Computed tomography was performed followed by segmentation and 3D reconstruction of the lumbar spine using dedicated software. Distances between contrast material and the fifth through seventh lumbar foraminae were measured along with lengths of filling defects within each contrast volumes. Distances were normalized to the L6 body length for comparison to studies previously conducted with identical methods. Distances and rate of femoral and obturator nerve staining were compared (unpaired t-test and Fisher's exact test, respectively; $p < 0.05$).

Results: Mean normalized contrast proximity to L6 (0.33±0.01) and L7 (0.5±0.01) were significantly higher ($p < 0.001$) with L7 injections. Femoral nerve staining rate were not different between groups (89.5%) while obturator nerve staining rate (90%) was significantly higher with L7 ($p < 0.001$) compared to L6 injections (21%).

Discussion/Conclusion: This study showed that an L7 LP approach allowed consistent visualization and accurate injection of both nerves targeted. Further studies are necessary to determine if this correlates with improved clinical outcome.

Disclosure: No proprietary interest or relevant financial relationship.

75 EX VIVO BIOMECHANICAL EVALUATION OF THE CANINE THORACOLUMBAR SPINES WITH TECHNIQUES OF STABILIZATION USING LOCKING PLATE, CLAMP ROD INTERNAL FIXATION, PINS WITH BONE CEMENT AND MODIFIED SEGMENTAL INSTRUMENTATION

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Introduction: Traumatic spinal fractures and luxations are frequent disorders in clinical veterinary practice, with thoracolumbar spine the most



common in dogs. Several techniques are proposed to perform spinal stabilization; however, few studies of the thoracolumbar spine have been carried out to evaluate the biomechanical properties of each technique.

Materials and Methods: The objective of the present study is to analyze biomechanical effects and compare strength and stiffness promoted by five different techniques of stabilization in canine thoracolumbar spine (Locking Plate, monocortical and bicortical CRIF, Pin with Bone Cement and Modified Segmental Instrumentation) under compression and bending forces. Thirty-four canine thoracolumbar spines were used; each was submitted to three biomechanical tests, the control (intact segment), after disarticulation of the T13/L1, and after performance of one of the proposed techniques. Data were exported to statistical analyses.

Results: Statistically, locking plate and bicortical CRIF showed more stiffness and stability in T13/L1 when compared to monocortical CRIF.

Discussion/Conclusion: Despite the fact that there was no statistically significant difference between techniques, Locking Plate was the technique that promoted greatest rigidity and stability in the injured vertebrae, followed by bicortical CRIF, Modified Segmental Instrumentation and Pins with Bone Cement. Monocortical CRIF did not achieve adequate rigidity for the stabilization of the vertebrae. It is believed that Modified Segmental instrumentation causes biomechanical change on the vertebrae adjacent to the stabilization; however, further studies are needed to evaluate its impact. We concluded that all constructs, except monocortical CRIF, are adequate to thoracolumbar stabilization in dogs.

Disclosure: the presenting author is a private consultant for Synthes Brazil.

76 FATIGUE ANALYSIS OF LOCKING RECONSTRUCTION PLATE USING MONO- OR BICORTICAL SCREWS

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Introduction: The aim of this study was to evaluate the influence of screw length on the mechanical properties of a locking reconstruction plate designed with locking rings located into the plate holes.

Materials and Methods: Cylinders of non-osteoporotic synthetic bone with 10 mm fracture gap and seven-hole locking reconstruction plates were used. Two groups of bone-plate constructs were mounted: Group 1 – monocortical screws, Group 2 – bicortical screws. In both groups, the area of the fracture gap was maintained without screw. To establish the loads for fatigue testing, for each group nine bone-plate constructs were tested until failure, each three in bending and compression. For each group, 21 bone-plate constructs were tested for failure in fatigue testing, each seven in bending and compression. Data of the static and fatigue mechanical properties were investigated by Student's t-Test for Independent Samples. Differences were considered significant at $p < 0.05$.

Results: Four-point bending fatigue testing showed significant differences between Groups (G1 < G2) in maximum load, maximum bending load, minimum bending load, maximum moment, and minimum moment. Failure occurred before one million cycles in three out of seven of the specimens in G1, and in four out of seven of the specimens in G2. Axial compression fatigue testing showed significant differences between Groups (G1 > G2) in maximum load, maximum compression load, minimum compression load, maximum moment, minimum moment. Failure occurred before one million cycles in two out of seven of the specimens in both G1 and G2.

Disclosure: No proprietary interest or relevant financial relationship.

77 GAIT ANALYSIS WITH AN ELECTRONIC WALKWAY SYSTEM TO EVALUATE RECOVERY IN DOGS AFTER TIBIAL PLATEAU LEVELING OSTEOTOMY

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Introduction: Subjective gait assessment in orthopedic disorders is challenging, with studies showing that intra- and inter-observer variability have poor agreement with objective assessment. Benefits of temporal-spatial gait analysis include the ability to obtain data in dogs that are significantly lame. The aim of this study was to evaluate changes in gait using a pressure sensitive walkway system (GAITFour) to evaluate dogs recovering from tibial plateau level osteotomy (TPLO), and to determine which measurements would most reliably distinguish between normal gait and lameness. We hypothesized that total pressure index (TPI) and number of sensors (NS) triggered would be the most reliable measurements.

Materials and Methods: Prior to surgery, visual and electronic gait evaluations were performed. Analysis included stance time, stance percent of the gait cycle, stride time, stride length, NS and TPI. Evaluations were repeated one time between 39–89 days after surgery. Data was compared between dogs recovering from TPLO (n=25) and normal Labradors (n=56) previously reported, and analyzed using logistic regression. Interclass correlation coefficients were determined.

Results: Trend lines for symmetry ratios for TPI and NS indicated progressive improvement in the operated limb, with trend lines within normal range (one standard deviation) for NS and TPI symmetry ratios at day 80 and 91, respectively. TPI symmetry ratio was the most reliable measurement to distinguish between normal gait and dogs recovering from TPLO.

Discussion/Conclusion: Quantitative differences found within lameness grades indicate that the walkway system is an objective way to measure gait and could be considered a more incremental method of gait analysis than visual assessment.

Disclosure: Victoria Light is a current employee of CIR Systems.

78 HEMIPELVIC AND PROXIMAL FEMORAL LIMB SALVAGE ENDOPROSTHESIS WITH TENDON INGROWTH

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Fitzpatrick Referrals

Introduction: Excision of tumours involving the pelvis requires hemipelvectomy and frequently amputation. In humans, hemipelvectomy followed by implantation of endoprostheses has been performed. This report describes the concurrent use of custom designed hemipelvic and femoral endoprostheses for limb salvage following wide en bloc resection of a histiocytic sarcoma.

Materials and Methods: A five year old, neutered female, Flat Coated Retriever was presented with progressive left pelvic limb lameness. Radiographs, CT and MRI revealed an invasive soft tissue mass with bone lysis affecting the femoral head and acetabulum. Custom designed hemipelvic and proximal femoral endoprostheses were developed from patient CT images. These were manufactured with hydroxyapatite-coated surfaces to allow tissue integration. The proximal femoral implant allowed tendon in-growth and muscle attachment. The pelvic implant was anchored to the ilium and ischium with screws and the femoral implant was cemented. Lomustine chemotherapy was provided.

Results: Radiographs and CT revealed no evidence of implant loosening or local/thoracic metastases at 6 weeks, 3, 6, 9 and 12 months post-surgery. Neuropraxia resolved 14 weeks post-operatively. Intensive rehabilitation was performed. Activity is unrestricted with minimal residual lameness.

Discussion/Conclusion: Neoplasia involving the bones of the coxofemoral joint requires hemipelvic and proximal femoral resection to achieve tumour free margins. Previously in veterinary patients pelvic limb amputation has



also been required but this report demonstrates that in select cases limb salvage is achievable allowing return to satisfactory levels of activity.

Disclosure: This implant was manufactured by Fitzbionics Ltd, Eashing, UK of which the primary author is a director.

79 HUMERAL OSTEOSYNTHESIS OF A CAPE BARREN GOOSE (*CEREOPSIS NOVAEHOLLANDIAE*) WITH A LOCKING PLATE AND A CRIF

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Humeral fractures are common in birds, and many stabilization methods have been used for their treatment. A female adult cape barren goose (*Cereopsis novaehollandiae*), was presented with a complete humeral fracture. The patient underwent surgery for the stabilization of the fracture that was fixed with a 2.7mm LCP, and a 2.0mm CRIF. At 60 days, complete bone healing was seen. At 218 days post op, a remodeled bone callus was observed and the implants were removed. We concluded that the use of a locking plate associated with a CRIF for the osteosynthesis of humeral fractures in this species can allow for adequate bone healing and return to function of the wing. Plates are still seldom used for treating fractures in birds, and the CRIF system was never used in birds as per the recent literature, and are both excellent techniques when used correctly.

Disclosure: No proprietary interest or relevant financial relationship.

80 INCIDENCE OF CONCURRENT ABDOMINAL INJURIES IN DOGS WITH PELVIC FRACTURES: 116 CASES

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Introduction: Pelvic fractures (PF) account for 20–25% of fractures in dogs, however the incidence of concurrent abdominal injury (AI) is not known.

Materials and Methods: Records of 133 dogs with PF were reviewed for occurrence of AI. Cases with complete medical records and pelvic radiographs were included.

Results: 116 cases met inclusion criteria; 51(44%) had AI [hemoabdomen (36), gross hematuria (22), septic peritonitis (3), uroabdomen (3)]. Dogs with sacral fractures were 5 times more likely to have a concurrent hemoabdomen. Sacroiliac luxations were more frequently associated with urinary tract injury. The number of PFs and percent pelvic canal narrowing did not correlate with AI. Dogs were hospitalized longer if they had AI. Overall survival to discharge was 92%.

Discussion/Conclusion: AI occurs commonly in dogs with PF. Dogs with sacral fractures or sacro-iliac luxations should be scrutinized for concurrent AI. No correlation was found between pelvic fracture and urinary tract trauma.

Disclosure: There was no proprietary interest or relevant financial relationship.

81 INFLUENCE OF MESENCHYMAL STROMAL CELLS ON PULMONARY METASTASIS FOLLOWING PRIMARY TUMOR REMOVAL IN OSTEOSARCOMA

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Introduction: Mesenchymal stromal cells (MSC) are used in bone healing and trauma reconstruction. However, MSCs have also been shown to promote osteosarcoma growth in rodent models with a primary tumor. The hypothesis for the study was that MSCs, injected either at the surgical site or intravenously following coxo-femoral amputation for osteosarcoma would have no influence on pulmonary metastatic disease burden.

Materials and Methods: C3H mice were injected into the proximal tibia with syngeneic DLM8-M1 osteosarcoma cells. At day 14, a coxo-femoral amputation was performed, followed by injection of 4×10^5 adipose-derived MSCs either locally or systemically. Lung sections were obtained and analyzed for disease presence, number of pulmonary nodules, and percentage of metastatic area.

Results: Nineteen mice developed pulmonary metastases but a significant difference was not found between groups for tumor presence or absence ($p=1.0$) or mean number of metastatic nodules ($p=0.73$). With respect to metastatic area to total pulmonary area, no significant difference between treatments was noted ($p=0.13$). Pairwise comparisons in nearly all situations were not significantly different. There was a significantly larger percentage of metastatic area in the group receiving MSCs locally compared to the control group ($p=0.048$).

Discussion/Conclusion: This clinically relevant model investigated the influence of MSC on pulmonary metastatic disease burden in a setting where removal of the primary tumor has already been performed but microscopic pulmonary disease remains. In one outcome parameter, the use of MSCs increased pulmonary metastatic disease burden following removal of the primary tumor. Confirmatory studies with larger animal numbers are currently underway.

Disclosure: There was no proprietary interest or relevant financial relationship.

82 LUMBOSACRAL DISTRACTION-FUSION USING AN INTERVERTEBRAL SPACER AND SCREW-ROD FIXATION SYSTEM FOR TREATMENT OF DEGENERATIVE LUMBOSACRAL STENOSIS

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Fitzpatrick Referrals

Introduction: Degenerative lumbosacral stenosis (DLSS) is a common cause of compression of the cauda equina and L7 nerve roots in dogs.

Materials and Methods: Dogs presenting with clinical signs of lumbosacral and sciatic nerve pain, with cauda equina and neuroforaminal stenosis on MRI and CT scan, were operated. Dorsal laminectomy and disc annulectomy was followed by insertion of a titanium spacer device (FITS, Fitz Intervertebral Traction Screw). Two titanium screws in L7 bilaterally and two in the alar wings of the sacrum were connected by rods and polyhedral screw fixation clamps (Fitzateur). CT scans, owner interviews and clinical examinations were performed to 6 months.

Results: 36 dogs were operated with age 5.9 years (SD +/- 1.9yrs), duration of clinical signs 2 months (0.25 weeks–13 months), and time to improvement 5.8 weeks (2–24 weeks, SD +/- 4.85). 34/35 had follow-up at 244 days (SD +/- 158 days). 29/35 owners felt quality of life had improved and 2/35 felt it was equal. 4/35 owners were indifferent or displeased. Average pre-surgery lameness score (0–5) was 2.5 (SD +/- 1.42); average post-surgery lameness score was 0.32 (SD +/- 0.72). Average pre-surgery musculature score (0–3) was 1.03 (SD +/- 0.45); post-surgery musculature score was 0.38 (SD +/- 0.54). Average pre-surgery pain score (0–3) was 1.65 (SD +/- 0.62); average post-surgery score was 0.26 (SD +/- 0.51). On CT scans, significant difference was found between pre-operative and six months measurements of all end-plate distances and all neuroforaminal dimensions.

Discussion/Conclusion: Clinical data and CT documentation support application of this technique for the management of DLSS.

Disclosure: Dr. Fitzpatrick is the owner and director of Fitzbionics.



83 MASSIVE CORTICAL ALLOGRAFTS ELICIT DEFINITIVE HOST IMMUNE RESPONSES AGAINST DONOR ANTIGENS

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Introduction: The purpose of this study was to determine if massive cortical allograft recipients mount immune responses to donor bone antigens. To accomplish our objective we utilized a murine bone vaccine model developed in our laboratory. We hypothesized that the mice receiving an allograft bone vaccine would have greater immune response against donor antigens as compared to mice receiving autograft vaccine.

Materials and Methods: C57BL/6 mice received a vaccine derived from either an autograft (C57BL/6) or an allograft (Balb/C) femur. Femurs from the respective strains of mice were stripped of soft tissues, freeze-fractured into a powder and re-suspended in a CLDC adjuvant. Mice received a 0.1mL vaccine injected subcutaneously on days one and seven. C57BL/6 femurs and tibias were harvested, flash-frozen, freeze-fractured, and subjected to a TRIzol-based protein isolation procedure. RNA and DNA were extracted and the remaining protein concentration quantified using a bicinchoninic acid (BCA) assay. This protein was used as an antigen for an antibody-detection ELISA. The serum collected from vaccinated mice was subjected to this ELISA in order to quantify antibody created towards the C57BL/6 bone protein antigen.

Results: Mice receiving allograft vaccine had an increase in antibody production levels seen at day seven and at day 21, whereas the group receiving an autograft bone vaccine had levels remaining consistent with baseline.

Discussion/Conclusion: Cortical allograft vaccines will elicit immune responses in a murine model whereas mice receiving autograft vaccines do not mount such a response. Further studies are being conducted to examine if mesenchymal stem cells abrogate host immune responses to allograft bone.

Disclosure: There was no proprietary interest or relevant financial relationship.

84 MECHANICAL STUDY (IN VITRO) OF THE RESISTANCE OF AXIAL FORCES OF 3.5MM CANNULATED AND CONVENTIONAL SCREWS IN FEMORAL HEAD AND FEMORAL NECK FRACTURES

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Introduction: The treatment of proximal femur fracture is osteosynthesis with compression screws. The objective of this work was to study the effects of axial forces on bone-conventional screw vs. bone-cannulated screw.

Materials and Methods: Two screws were inserted from the lateral portion of the femur, below the greater trochanter to the femoral head of 14 dogs divided into 2 groups, seven with conventional screws and 7 with cannulated screws. We observed maximum force, maximum displacement, force within the proportional limit, offset within the proportional limit, and force applied throughout the time that underwent displacement of 3mm.

Results: A large variation of values was observed in clusters of bone/implant within the same group. The maximum force and maximum displacement corresponding to the critical point of compression and from that point, the study is considered destructive.

Discussion/Conclusion: Numerous studies with compression have shown that the technique and the implants used in this research are suitable for repairing fractures of the femoral neck and head. When the bone screws are fixed closer to the medial cortical diaphysis and closer to the upper surface of the femoral head, the maximum force was greater, regardless of the type of screw. The reverse was also observed, in which the fixation was carried farther from the medial cortex of the femoral shaft, the maximum force was smaller. It was concluded that the resistance of conventional and cannulated

screws used in osteosynthesis of fractures of the femoral neck and head of dogs are similar.

Disclosure: There was no proprietary interest or relevant financial relationship.

85 MEDICAL INFRARED IMAGING TO DETERMINE LAMENESS IN THE HIND LIMBS OF DOGS

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Introduction: Medical infrared imaging (MII) is a non-invasive imaging technique that measures skin surface temperature based on cutaneous perfusion and generates thermal pattern maps in a color scales. MII has been used in equines detecting several orthopedic injuries, and in recent years it has been studied in dogs. The purpose of this study was to determine if there is change in the thermal pattern and temperature in the paw print of a lame dog compared to a normal dog

Materials and Methods: 14 dogs with unilateral hind limb lameness due to CCLR (lame limb versus weight bearing limb) and 14 healthy dogs (right limb versus left limb) were evaluated. Thermal images of the paw print were taken after the dog was kept in a static position on a foam mat for 30 seconds. Average temperatures and thermographic patterns were analyzed. Gait analysis was performed in the same position. The asymmetry index for each gait variable was calculated.

Results: There were no significant differences in the temperature between the groups. Imaging pattern analysis showed 80% success in differentiating lame limb versus weight bearing limb (abnormal group), and 100% in identifying the same thermal pattern between the right versus left limb (normal group). The mean peak vertical force showed 10.0% difference in normal dogs and 72.4% in abnormal dogs. Symmetric index analysis showed 5% in the normal group and 36.2% abnormal group.

Discussion/Conclusion: It was concluded that the MII can be successfully used as a complementary tool to detect lameness in dogs.

Disclosure: This paper was supported by CNPq, Conselho Nacional de Desenvolvimento Científico e Tecnológico - Brazil.

86 MODIFIED MAQUET TECHNIQUE FOR TREATMENT OF CANINE CRANIAL CRUCIATE LIGAMENT INJURY: EARLY RESULTS, COMPLICATIONS AND RISK FACTORS IN 109 DOGS

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Introduction: The purpose of this retrospective study was to describe the complications, risk factors and owner satisfaction associated with the modified Maquet technique (MMT).

Materials and Methods: Medical records and radiographs of 109 dogs (117 stifles) were reviewed. A major complication was defined as complication requiring a second surgery. Risk factors analyzed for intra- and post-operative complication were age, drill hole at the distal part of the osteotomy, angle of opening, thickness of bony attachment, and post-operative tibio-patellar angle. Long-term follow-up was obtained by telephone interview.

Results: Complications occurred in 27% of the dogs (9% major and 18 % minor). Subsequent meniscal tear was the most common major complication and was not associated with a high tibio-patellar tendon angle. Fracture of the bony attachment of the tibial crest was the most common intra-operative and minor post-operative complication. Risk factors for intra-operative crest fracture were a high angle of opening, and a drill hole distal to the osteotomy.



Risk factor for post-operative crest fracture was a thin thickness of bony attachment. Overall outcome was rated as excellent or good by respectively 82% and 13.1% of owners.

Discussion/Conclusion: Outcome of MMT was comparable with other techniques used for treatment of cranial cruciate ligament injury. The osteotomy should be extended distally, no drill hole should be performed, and the thickness of bony attachment of the tibial crest should be calculated with a maximum load equivalent to 6 times dog's bodyweight.

Disclosure: There was no proprietary interest or relevant financial relationship.

87 NORMAL FEMOROPATELLAR KINEMATIC PATTERNS DURING DAILY ACTIVITIES IN DOGS

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Introduction: When defining new treatment methods for various orthopaedic conditions, a detailed understanding of normal motion must first be established. The relative motion between the femur and patella in dogs is not well-described in-vivo. Patellar abnormalities are common in both dogs and people, potentially causing profound pain and lameness. The objective was to define normal femoropatellar kinematics in three planes of motion using non-invasive methods.

Materials and Methods: Six healthy dogs with no orthopaedic disease underwent computed tomography scans of their hind limbs to create 3D models of the patella and femur. Knee motion was captured via fluoroscopy while the dogs underwent a series of routine activities, including stand-to-sit motion, walking, and trotting. The 3D models of the patella and femur were digitally superimposed over the fluoroscopic images with shape-matching software and the precise movement of the patella relative to the femur was calculated.

Results: As the stifle flexed, the patella flexed and moved caudally and distally within the femoral trochlea, linearly coupled with femorotibial flexion angle during sit and walk. Offset was evident during trot, where the patella poses were significantly different between early and late swing phase. The patella traversed the entire proximal-distal length of the femoral trochlea, almost exiting the groove in deep flexion during sit.

Discussion/Conclusion: Normal in-vivo femoropatellar kinematics is tightly coupled with femorotibial motion; however, trot kinematic patterns were significantly different from walk and sit. Knowing the baseline pattern of normal femoropatellar kinematics in the dog provides a comparison for future experimental studies.

Disclosure: There was no proprietary interest or relevant financial relationship.

88 OSTEOMYELITIS AFTER CRANIAL CRUCIATE LIGAMENT DISEASE OSTEOTOMIES IN DOGS

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Introduction: Different osteotomy techniques have been used to treat CCLD in dogs. Among the complications observed in osteotomies, stand out the osteomyelitis, with 7,3% frequency in TPLO and 6,6% in TTA. The aim of this study was to describe 14 cases of osteomyelitis in dogs after CrCL rupture corrective osteotomy.

Materials and Methods: We evaluated 89 dogs (104 stifles) that had undergone any of the CCLD corrective osteotomy. TTA (n = 56), TPLO (n = 36) or CWO (n = 12). 14 developed osteomyelitis, requiring the removal of the implants. The implants were removed and sent to bacterial culture and antimicrobial sensibility test (BCAST) before an antimicrobial therapy was instituted. However, if bone consolidation was not complete, an empirical therapy based on amoxicillin associated with clavulanic acid was performed.

Results: Fourteen animals were evaluated. The technique chosen was TTA (7), TPLO (6) and CWO in one animal. The osteomyelitis rate was 13,46% against all the osteotomies (12,5% TTA, 16,6% TPLO and 8,3% CWO). Nineteen bacterial cultures were performed, isolating coagulase-positive Staphylococci (n = 8), coagulase-negative Staphylococci (n = 4), Staphylococcus intermedius (n = 2), Streptococcus sp. (n = 1), Pseudomonas spp. (n = 2), Hafnia alvei (n = 1).

Discussion/Conclusion: The most frequent microorganisms isolated were the Staphylococcus genus. The coagulase-positive Staphylococcus is responsible for most infections. The high rates of osteomyelitis found in CCLD osteotomies emphasize the importance of rational use of antimicrobials drugs, as well as the importance of performing BCAST, in order to guarantee appropriate antimicrobial therapy.

Disclosure: There was no proprietary interest or relevant financial relationship.

89 PADS PRESSURE DISTRIBUTION IN GERMAN SHEPHERD DOGS

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Introduction: Assessment of feet pressure is a special form of kinetic analysis that provides data on plantar pressure distribution and has been extensively documented in humans. In veterinary medicine, few studies have concentrated on the pressure distribution on each region of the pads. Our objective was to evaluate the pressure distribution in the pads of forelimbs (FL) and hind limbs (HL) of German shepherd dogs using a pressure sensitive walkway (PSW).

Materials and Methods: A PSW was used to collect vertical force data for each pad of the limbs of 16 healthy client-owned German shepherd dogs used for kinetic gait analysis. The load for each pad was evaluated as a percentage of total limb load. Weight distribution among limbs was also recorded. Velocity and acceleration were within a range of 1.3 and 1.6 ± 0.1 m/s². The ANOVA test was used to compare data and the paired t-test was used to assess symmetry ($P < 0.05$).

Results: The load was higher on the metacarpal pad (McP) than on the metatarsal pad (MtP). Peak vertical force (PVF) was highest on the MCP and MtP followed by the digital pads (DP) -3, -4 and -5 of the FL; and in the HL by DP -3, -4. Vertical impulse (VI) was greatest in the MCP and DP -3, -4 of the FL and HL respectively, followed by DP -3, -4, -5 of the FL and MtP. The M-pattern is associated with the pads, as either MCP or MtP generate the first force peak and the DPs the second.

Discussion/Conclusion: A clear pressure distribution pattern was observed for the pads of the German shepherd dogs. These data are important for improving the understanding of load distribution during gait and to assess orthopedic conditions.

Disclosure: There was no proprietary interest or relevant financial relationship.

90 PATHOLOGICAL CHANGES IN THE LATERAL COMPARTMENT IN ELBOWS OF DOGS AFFECTED WITH MEDIAL COMPARTMENT DISEASE: PRELIMINARY RESULTS

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Introduction: Whereas, according to current literature, the lateral compartment rarely seems to be affected in dogs with medial coronoid disease, in our experience, pathological changes are commonly seen during arthroscopy. Our objective was to define those changes and categorize them.

Materials and Methods: Arthroscopic videos of 53 elbows were reviewed. The scoring system included degree of synovitis within the lateral compartment, shape and Outerbridge score of the lateral coronoid process and ulnar



trochlear notch, osteochondrosis on the lateral humeral condyle, and divergence between lateral coronoid process and radial head.

Results: Five elbow joints had to be excluded. Pathological changes within the lateral compartment were present in all elbow joints. The mean Outerbridge score of the lateral coronoid process was 1.4 and 2 on the trochlear notch. In three dogs, there was fissuring of the lateral coronoid process. Thirty joints (62.5%) showed irregular edges of the lateral coronoid process and an indentation on the trochlear notch, respectively. Osteochondrosis of the lateral humeral condyle was present in 42 joints (87.5%). Divergence between the lateral coronoid process and the radius was seen in 41 joints (85.4%).

Discussion: We found pathological changes in all examined elbows, a fact that contradicts the veterinary literature stating that mostly the medial compartment is affected. Albeit the clinical significance of our findings remains unknown, the existence of pathology within the lateral compartment should be considered as a possible reason for persisting lameness after subtotal coronoid ostectomy and also before performing ulnar or humeral osteotomies.

Disclosure: There was no proprietary interest or relevant financial relationship.

91 PLATELET RICH PLASMA AND BONE MARROW IN MINIMALLY INVASIVE OSTEOSYNTHESIS IN THE TIBIA OF DOGS. PRELIMINARY RESULTS

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Introduction: The minimally invasive plate osteosynthesis (MIPO) has become widely accepted for the treatment of fractures because the fracture is reduced indirectly preserving the initial hematoma in the focus fractured and minimizing damage to adjacent soft tissues. Another way to aid the bone healing process is through the use of grafts such as platelet rich plasma (PRP) and aspirated bone marrow (BM). Due the shortage of research on these treatments, aimed to evaluate the regeneration bone obtained of the association between minimally invasive osteosynthesis and the percutaneous injection of PRP or BM, the focus of tibial fractures in dogs.

Materials and Methods: Twelve dogs with tibial fractures were used. Each was a patient in routine clinical surgical practice at the School Veterinary Hospital. The animals were evaluated for ambulation, edema intensity, and radiographic findings in immediately postoperative, 15, 30, 60 and 90 days postoperatively

Results: Five of these fractures were repaired without the addition of grafts, four received centrifuged bone marrow and three dogs received platelet rich plasma. At 15 days after the surgical procedure has no line of fracture. At 30 days, an animal group MIPO, two dogs MO group and one PRP group showed absence of the fracture line. At 90 days, all animals showed bone healing of the fracture.

Discussion/Conclusion: Through the clinical and radiographic rating, that the grafts applied percutaneously accelerates the initial phase of bone healing and allows faster patient ambulation, showing that bone marrow provided greater healing than other groups.

Disclosure: Recipient of research funds.

92 PRELIMINARY EVALUATION OF A NOVEL EXTRACAPSULAR ARTICULATED STABILIZING DEVICE FOR TREATMENT OF THE CANINE CRANIAL CRUCIATE LIGAMENT DEFICIENT STIFLE

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Introduction: The goal of surgical treatment of the canine cranial cruciate ligament (CrCL) deficient stifle should be immediate stabilization of the joint while allowing normal movement in all planes. The hypothesis was that an

articulated extracapsular implanted device could provide immediate stifle stabilization without an osteotomy allowing patients to begin limb rehabilitation limited only by the healing of soft tissues. Therefore, the stabilizing device must allow normal stifle movements in all planes, tolerate reasonable forces, and be biocompatible.

Materials and Methods: In vitro, the device was evaluated for performance during tibial thrust, flexion/extension, rotation, and loaded cycles. The device was implanted in 5 CrCL deficient clinical patients. Post-operative evaluation included assessment of cranial drawer and lameness scores.

Results: Biomechanical testing showed the device tolerated 1000N of tibial thrust, does not impede stifle flexion or extension in normal ranges, allowed normal tibial rotation (10o) and tolerated at least 1 million cycles up to 300N. All patients had negative cranial drawer test after surgery and were weight bearing within 48 hours of surgery. Lameness scores improved from a pre-surgical mean of 2.5/5 to 1.4/5 at 2 weeks. No major complications were seen.

Discussion/Conclusion: The device was found to provide immediate stifle stabilization, normal joint movement, tolerates expected forces, and is biocompatible. Patients can begin rehabilitation exercises within 48 hours of surgery. This device appears to be a promising alternative for treatment of the CrCL deficient canine stifle. Further investigation is warranted to assess stifle kinematics and long term efficacy of this device.

Disclosure: New Generation Devices supplied implants. Neil Embleton is one of inventors of the device and director of Embark Enterprises, which holds the patent.

93 QUANTUM DOT LABELING OF CANINE MESENCHYMAL STROMAL CELLS FOR LONGITUDINAL VISUALIZATION

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Introduction: Determination of MSC fate in vivo is critical for evaluating MSC efficacy; yet in vivo tracking of MSCs has been notoriously difficult. Quantum dots (QDs) are a novel labeling alternative to traditional fluorophores. Their advantages over traditional fluorophores such as GFP, make QDs attractive for MSC labeling and tracking in a complex in vivo environment. There have been no published data regarding the labeling of canine MSCs with QDs. The study objectives were: 1) develop a method for QD labeling of canine MSCs; 2) determine the duration of fluorescence in vitro; and 3) seed QD-labeled MSCs onto a demineralized bone matrix (DBM), determine percentage cell adherence, and confirm proliferation. We hypothesized that QDs could be visualized up to 14 days in vitro and that QD-labeled MSCs would adhere and proliferate when seeded onto DBM.

Materials and Methods: Canine adipose-derived MSCs were labeled using QDs and imaged daily using fluorescent microscopy for 14 days. Labeled cells were seeded onto 0.25cc of canine DBM and cultured for 7 days.

Results: Fluorescence of QD-labeled MSCs was successfully observed for 14 days. Thirty-one percent of labeled cells adhered to DBM. Proliferation of QD-labeled MSCs on DBM was confirmed for up to 7 days.

Discussion/Conclusion: Canine MSCs can be successfully labeled with QDs; these can be visualized using fluorescent microscopy for 14 days. Successful adherence to and proliferation on DBM was achieved. These data will be utilized to design in-vivo studies to determine the bone-regeneration potential and cell fate of an MSC/DBM tissue product.

Disclosure: There was no proprietary interest or relevant financial relationship.



94 RADIAL SHOCK WAVE THERAPY IN DOGS WITH HIP OSTEOARTHRITIS

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Introduction: This study evaluated the effects of radial shock wave therapy (RSWT) in dogs with hip osteoarthritis (OA) using clinical and kinetic analysis.

Materials and Methods: Thirty dogs diagnosed with hip OA were treated with RSWT in a randomized longitudinal unilateral study design. Dogs were evaluated while walking on a pressure walkway. Peak vertical force (PVF) and vertical impulse (VI) expressed as a percentage of body weight were documented. Blinded clinical evaluation was performed using a visual analogue scale. Owner perception data regarding levels of physical activity was also collected. RSWT involved 3 weekly sessions (2000 pulses, frequency of 10 Hz and pressures ranging from 2 to 3.6 bars). Follow up data were collected 7, 30 and 60 days after the last RSWT session. Treated and contralateral (control) limbs were compared. Longitudinal comparisons (i.e. between treated limbs) were also performed. The level of significance was set at 5%.

Results: Treated limb mean PVF and VI increased 10.6% and 10.4% respectively at the end of the sixty day of follow up. Control limb PVF and VI did not differ significantly. Pain and lameness scores improved significantly in the treated group. Owner perception suggested improved levels of physical activity following treatment.

Discussion/Conclusion: RSWT was beneficial to dogs with hip OA in this study.

Disclosure: There was no proprietary interest or relevant financial relationship.

95 RARE SPINAL ROUND CELL TUMORS IN FOUR DOGS AND ONE CAT: A RETROSPECTIVE STUDY

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Introduction: Little information is available regarding rare spinal round cell tumors in dogs and cats and the goal of this retrospective study was to describe their clinical and radiological features.

Materials and Methods: The inclusion criteria were histopathologically diagnosed spinal round cell tumors in dogs and cats, excluding lymphoma and multiple myeloma. Magnetic resonance imaging was required.

Results: Five cases met the inclusion criteria, a primary mast cell tumor (MCT), a secondary MCT, two histiocytic sarcomas and one plasmacytoma. Four dogs and a cat were affected at a median age of 10 years. The median duration of clinical signs was 7 days. Lesions were extradural, two in the vertebral bone and three affecting the epidural space. All lesions were T2-hyperintense to spinal cord. T1-weighted signals varied; vertebral bone of the plasmacytoma was severely T1-hyperintense. Only in one histiocytic sarcoma was vertebral cortical bone interrupted. There was moderate to severe contrast enhancement, of the entire lesion (n=4) or in a ring (n=1). The metastatic case of MCT was euthanized immediately after imaging. The others underwent decompressive surgery. A dog with primary spinal MCT underwent gross total resection, received CCNU and is clinically normal at 18 months. The plasmacytoma case is alive at 11 days. The histiocytic sarcoma cases survived 19 days (dog; CCNU) and 52 days (cat; CCNU and palliative radiation therapy).

Discussion/Conclusion: Rare spinal round cell tumors tend to be rapidly progressive and have a poor outcome. Imaging findings are non-specific. Primary spinal MCT occurs in dogs and may respond to treatment.

Disclosure: There was no proprietary interest or relevant financial relationship.

96 SURGICAL TREATMENTS FOR CRANIAL CRUCIATE LIGAMENT RUPTURE IN DOGS: A SYSTEMATIC REVIEW

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Introduction: Surgery is commonly recommended to treat cruciate ligament (CCL) rupture in dogs, however it is unclear if one procedure is best. This study aimed to perform a systematic review of peer-reviewed scientific literature on the outcome of surgical treatments for naturally occurring CCL disease in dogs and to evaluate whether evidence supports return to normal clinical function following surgery.

Materials and Methods: An a priori question was defined and a literature search was performed electronically through September 2013. Peer reviewed publications in the English language with at least six months of post-operative follow-up were reviewed. Studies were evaluated with regard to surgical technique, study design, outcome, outcome assessment, complications, and evidence classification.

Results: 441 manuscripts were initially identified and reviewed; 31 met the inclusion criteria. 4 studies provided level I evidence, 6 provided level II evidence, 6 provided level III evidence, and 15 provided level IV evidence relative to the study question. The most common surgical procedures that were evaluated included: tibial plateau leveling osteotomy (TPLO, n=13), lateral fabellotibial suture (LS, n= 11), tibial tuberosity advancement (TTA, n=7).

Discussion/Conclusion: The strength of the evidence reviewed and evaluated strongly supports the ability of the TPLO and moderately supports the LS and TTA procedures to allow dogs to return to normal function post-operatively. The evidence also provides strong support for findings that demonstrated that TPLO was better than LS in restoring normal clinical function in the intermediate post-operative time period. There was not enough data to sufficiently evaluate other surgical procedures.

Disclosure: funding was provided by the American Animal Hospital Association (AAHA) and Morris Animal Foundation.

97 SHORT-SHORT-TERM BIOCOMPATIBILITY EVALUATION OF 0.5 % ZINC CONTAINING HYDROXYAPATITE IN RABBITS

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Klinik

Introduction: There is a critical demand for bone-substitute materials in medicine and veterinary. Bone defects that result from congenital, infectious, traumatic or neoplastic processes represent the most important challenges in reconstructive treatment. Hydroxyapatite (HA) is widely used as a biomaterial to fill bone defects and to coat metal parts of prostheses. Synthetic HA is well known as an implant material with characteristics of excellent biocompatibility, including non-toxicity, low biodegradability and bone affinity. Despite having these optimal properties, synthetic HA differs from biological apatite. Several research studies have attempted to mitigate these differences by doping synthetic HA with small amounts of impurities. These ionic substitutions can alter the properties of HA, including its solubility and mechanical character. Zinc ions were incorporated into the structure of hydroxyapatite (HA) to add the biological effects of zinc to hydroxyapatite.

Materials and Methods: The synthetic zinc-containing hydroxyapatite (ZnHA) powder with 0.5% Zn substituted for calcium was shaped into spheres (425µm<Ø>550µm). With approval from the Ethics Committee of Antonio Pedro University Hospital (CEP-HUAP: 195/06), 15 adult male and female rabbits (White New Zealand) weighing between 2,500 and 3,000 g were randomly assigned to individual cages. All animals were pre-anesthetized with Ketamine 20 mg/kg and Xylazine 1 mg/Kg and then anesthetized 15 min later with general anesthetic (1 % isoflurane by inhalation) and a spinal injection of lidocaine 5 mg/kg and morphine 0.1 mg/kg. One 2 cm incision was made in the lining epithelium of the animal leg to expose the tibia



bone surface. One perforation was made in each tibia bone at a slow speed using a 2 mm spherical bur. The perforated region of the right tibia was filled with HA spheres (control group) immediately after opening, and the perforated region of the left tibia was filled with 0.5 % ZnHA spheres. The skin was closed using continuous #5.0 nylon sutures. A single dose of antibiotics Pen-tabiotico Veterinario and antiinflammatory Meloxicam 0.3 mg/kg. A 5 µm section was obtained for histological evaluation in bright field and histomorphometric analysis

Results: SEM images revealed similar morphologies between the tested bio-materials. Histological analysis showed that there was no difference between the test and control groups. The histomorphometric analysis did not show any difference in the newly formed bone area at 4 weeks post-implantation between both groups ($p>0.05$).

Discussion/Conclusion: Our data provide evidence that zinc-containing hydroxyapatite could be useful in the production of biomaterials capable of promoting osteoconduction and bone regeneration and be a more soluble hydroxyapatite for clinical applications.

Disclosure: There was no proprietary interest or relevant financial relationship.

98 THE ADVANCED LOCKING PLATE SYSTEM (ALPS). A RETROSPECTIVE EVALUATION IN 71 SMALL ANIMAL PATIENTS

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Introduction: The Advanced Locking Plate System (ALPS) is a locking plate system developed for veterinary use. The purpose of this study was to evaluate results of application of ALPS in small animal surgery. We hypothesized that ALPS provides a suitable alternative to treat many small animal fractures and orthopedic conditions.

Materials and Methods: Medical records of dogs and cats that were treated with ALPS were evaluated. Data retrieved included signalment, indication for surgery, surgical procedure, outcome, and complications.

Results: Twenty-nine dogs and 42 cats were treated. Fifty-four bone fractures and 12 tarsal or carpal ligament injuries were stabilized with ALPS. In 6 cases ALPS was used to prevent or treat fractures during total hip replacement surgery. Complications needing revision surgery occurred in 4 cases (5.5%): Fixation failure was identified in 3 cases (2 fracture-fixations and 1 pancarpal arthrodesis), and a fracture occurred through a screw hole. The most common complication after tarsal arthrodesis was suture dehiscence. All the cases went to heal by the end of the study.

Discussion/Conclusion: ALPS is a reliable option to treat fractures and some orthopedic conditions in small animals with good handling possibilities. Most of the complications occurred due to technical errors during surgery.

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

99 THE CHALLENGE OF QUANTIFYING MENISCAL VOLUMES IN THE CANINE STIFLE

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Introduction: The goals of this investigation were to determine if accurate measures of canine meniscal volume could be obtained using clinical veterinary MR facilities, and to compare results using 1.5T and 3.0T systems with similar protocols using a single proton density (PD) sequence.

Materials and Methods: IACUC approval was obtained for this study involving 15 cadaver stifles from large breed dogs. Each stifle was prepared and placed into a nonmetallic loading jig that provided a fixed flexion angle and a

net 9kg load across the joint. A quadrature knee coil was used for both 1.5 T and 3.0 T MR systems for scans. The MR scans were segmented to reconstruct 3D surface representations of the meniscus and compared with volumes measured using a water displacement technique.

Results: Average meniscal volumes were significantly smaller ($p<0.001$) for all MR measurements compared to the water displacement measurement. There were no significant differences between volumes measured using 1.5T or 3.0T MR for either medial or lateral menisci ($p>0.05$).

Discussion/Conclusion: It appears standard clinical imaging methods and open-source software tools do not provide accurate measurements of canine meniscal volumes. There are numerous potential factors contributing to the significant underestimation of meniscal volumes using MR imaging. For example, the volume differences in human knees and canine stifles, the scanners available for this study and the software package used for canine meniscus 3D reconstructions. Veterinary clinicians should remain cautious of using MR for quantitative evaluation of meniscal volumes until further technical solutions with appropriate validation are available.

Disclosure: There was no proprietary interest or relevant financial relationship.

100 THE ECONOMIC IMPACT OF ORTHOPEDIC SURGICAL SITE INFECTIONS: A RETROSPECTIVE ANALYSIS USING A TIBIAL PLATEAU LEVELING OSTEOTOMY MODEL

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Introduction: Surgical site infection (SSI) is a well-recognized cause of morbidity and mortality in veterinary orthopedic surgery. The objective of this study was to determine the cost of SSI to the client and hospital using a tibial plateau leveling osteotomy (TPLO) model. We hypothesized that the true cost would be financially material to both the client and the hospital.

Materials and Methods: All TPLO cases with documented SSI meeting inclusion criteria from 2010 to 2012 were identified. Cost of treatment borne by the client and hospital was determined from retrospective review of medical and financial records. Financial data was corrected for inflation to 2013 values.

Results: Nineteen cases met the inclusion criteria. All patients had at least one positive aerobic bacterial culture and were treated with antimicrobials. Nine patients (47.4%) had wound drains placed. Eight patients (42.1%) required implant removal to resolve the SSI which significantly increased the cost of treatment. Mean total cost of treatment from the time of clinical suspicion to SSI resolution was \$1538.82 (range: \$221.18 to \$6656.20). Mean SSI treatment cost represented 49.6% (range 7% to 215%) of the original procedure cost. Mean client cost was 47% of the total SSI treatment cost; the remainder was absorbed by the hospital.

Discussion/Conclusion: Surgical site infections are a financially material complication for patient owners and hospitals. Efforts to decrease the incidence of SSI should take the entire economic picture into consideration, not just the cost of prophylaxis. Continued vigilance and efforts to decrease SSI incidence should be strongly encouraged.

Disclosure: There was no proprietary interest or relevant financial relationship.



101 THE EFFECT OF EXTERNAL SKELETAL FIXATION PIN INSERTION SPEEDS ON THERMAL AND MECHANICAL DAMAGE IN CANINE BONE WITH AND WITHOUT PREDRILLING

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Introduction: We sought to evaluate the effect of predrilling and insertion speed of external skeletal fixation pins on temperature and morphologic damage in canine cortical bone. We hypothesize that predrilling, but not insertion speed, will have a significant effect on temperature and morphologic damage.

Materials and Methods: Fixation pins were inserted into cadaveric canine femurs at insertion speeds of 700rpm and 150rpm with and without predrilling. All four treatment combinations were performed on each femur. Temperature was measured at each cortex 0.5 and 3.0mm from each insertion site. Samples were examined grossly and by scanning electron microscopy for evidence of morphologic damage by a veterinary pathologist blinded to the insertion method. Data were analyzed for maximum temperatures, temperature increase, number of sites above osteonecrosis thresholds, microcracks, thread quality and gross damage.

Results: Predrilling had a significant effect on maximum temperature at high insertion speed along with temperature increase, microcracks, thread quality and gross damage at both insertion speeds. Speed of insertion had no significant effect on any of the measured parameters following predrilling. It had a significant effect on only thread quality without predrilling.

Discussion/Conclusion: Our results largely support our hypothesis that insertion speed has no significant effect on thermal or morphologic damage following predrilling. Feed rate of threaded fixation pins is determined by the thread pitch at any given revolutions per minute. This report highlights the importance of predrilling fixation pin insertion sites and permitting the pin to advance at the rate determined by thread pitch and revolutions per minute.

102 THE EFFECT OF SCREW ANGULATION AND INSERTION TORQUE ON THE PUSH-OUT STRENGTH OF 2.0 MM & 2.4 MM POLYAXIAL LOCKING SCREWS AND THE SINGLE CYCLE TO FAILURE IN BENDING OF 2.0 MM & 2.4 MM POLYAXIAL LOCKING PLATES

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Introduction: Fracture management has shifted away from direct fracture visualization and anatomic reduction to minimal tissue disruption and biologic stabilization. Locking plate technology differs from standard plating and promotes an optimal environment for healing. The purpose of this study was to report the mechanical properties of the polyaxial locking (PAX) plate system. We hypothesized that screw push-out strength would not be affected by the angle of insertion. By contrast, we hypothesized that insertion torque would affect push-out strength regardless of angle of screw insertion. Last, second generation plate systems would have enhanced mechanical properties in comparison to first generation systems.

Materials and Methods: Test groups evaluated for screw push-out included plate size 2.0mm & 2.4 mm, plate generation (1st & 2nd), insertion angle (0, 5, & 10 degrees from perpendicular), and insertion torque (0.4 Nm & 0.8 Nm). The test groups used for four-point bending evaluated plate size (2.0 mm & 2.4 mm) and plate generation (1st and 2nd).

Results: There was no significant difference in screw push-out force by insertion angle, plate size, or generation. However, a statistically significant difference was noted between insertion torques. The 2nd generation 2.0mm & 2.4 mm plates were significantly superior to the 1st generation plates in bending stiffness, strength, and structural stiffness.

Discussion/Conclusion: The PAX plating system offers up to 10 degrees off-axis screw insertion. Increased insertion torque enhances the screw-plate interface. The augmentations made to the 2nd generation of the PAX system have lead to increased bending stiffness, strength, and structural stiffness.

Disclosure: There was no proprietary interest or relevant financial relationship.

103 THE PREVALENCE OF MUSCULOSKELETAL CONDITIONS IN SERVICE AND WORKING DOGS

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Introduction: Little information exists regarding the prevalence of musculoskeletal conditions in service and working dogs. The purpose of this study was to evaluate working dogs for musculoskeletal problems that could affect performance and longevity. We hypothesized that less than 5% of dogs would have significant musculoskeletal conditions.

Materials and Methods: The Service and Working dog Ophthalmologic and Orthopedic Program was initiated to evaluate dogs for musculoskeletal issues. Gait and orthopedic examinations were performed by a single examiner. Ground reaction forces were determined at a trot. Clinically significant differences between forelimb and pelvic limb peak vertical force were set at 10 and 5, respectively, as a percent of body weight. Data regarding orthopedic examination findings were recorded.

Results: 34 working and service dogs were evaluated. Activities included search and recovery (13), society activities (9), handicap assistance and guide dogs (7), and police dogs (5). Problems were identified in 14/34 dogs, including cranial cruciate ligament rupture (3 stifles in 2 dogs), hip laxity (2), lumbar pain (5), pain and excessive shoulder abduction angle (2). Gait abnormalities were suspected in 11 dogs at a walk and 10 dogs at a trot. Seven dogs had > 10% and 5% difference in weight bearing between the forelimbs and pelvic limbs, respectively.

Discussion/Conclusion: A significant number of dogs had musculoskeletal problems, some of which were serious. Counseling handlers and close follow-up of working and service dogs may result in earlier treatment of potential career-ending conditions. There was no proprietary interest or funding provided for this project.

Disclosure: There was no proprietary interest or relevant financial relationship.

104 THE SAFETY AND EFFICACY OF A NUTRACEUTICAL FOR THE CONTROL OF PAIN ASSOCIATED WITH OSTEOARTHRITIS IN DOGS

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Introduction: Nutraceuticals receive little oversight addressing their safety or efficacy. Clinical trials evaluating nutraceuticals for treating OA in dogs are infrequent and have had mixed results. Most of these studies used subjective assessments to evaluate the outcome of their studies. In this study accelerometers and an owner survey evaluated patient outcome. Our null hypothesis is treatment with a nutraceutical would not have an effect on the level of pain in dogs with osteoarthritis.

Materials and Methods: This is a randomized, blinded, placebo-controlled pilot study with 70 canine participants with strict inclusion criteria. After enrollment, each dog was fitted with an accelerometer collar and owners completed a questionnaire. Patient exams and owner questionnaires were completed on day 0, 7, 28, and 49 of the study. Activity for the first seven days was averaged to establish a base line for each individual dog's level of activity.



Results: Currently 44 dogs have been enrolled. Dogs in the treatment group had more activity ($p < 0.01$) during the study period than the placebo group. Also, dogs in the placebo group showed a decrease in activity when compared to their initial 7 days. To ensure that the changes observed in the groups were not only due to chance, a random (33.3%) change group was established. When compared to a random chance of a change in activity, dogs in the placebo group significantly worsened during the treatment period ($p < 0.01$) and dogs in the treatment group had a significant increase ($p < 0.0032$) in activity.

Discussion/Conclusion: Our preliminary data suggest that we should reject our null.

Disclosure: There was no proprietary interest or relevant financial relationship.

105 THREE CASES OF POST-OPERATIVE SUBLUXATION OF THE RADIAL HEAD RESULTING IN A LOSS OF REDUCTION FOLLOWING ANGULAR LIMB DEFORMITY CORRECTION

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Introduction: Angular limb deformities in chondrodystrophic dogs generally involve a short ulna and a biapical radial deformity. While successful angular correction based on a center of rotation of angulation technique has been described, suboptimal correction can result in ongoing morbidity.

Methods and Material: Three cases of radius and ulnar angular limb deformity in chondrodystrophic dogs were treated with corrective osteotomies of both the radius and ulna. The fixation included an external skeletal fixator, a ring fixator, and plate fixation.

Results: Acceptable post-operative correction was achieved in all 3 cases. However by the 2 month re-check, re-angulation of the limbs was evident, radiographs revealed subluxation of the radial head. Clinically, two cases were associated with a poor outcome. Joint congruity and limb alignment was considered unacceptable in all three cases. No clients consented to surgical revision.

Conclusion: The cause of post-operative subluxation of the radial head is unknown. Soft tissue laxity in conjunction with the weight of external fixation may have resulted in drifting of the radial head. It is possible that a proximal ulna osteotomy released the proximal radius, providing the opportunity for radial head subluxation. A lack of articular congruency may result in progressive arthritis of the elbows. Abnormal forces would likely be exacerbated by an abnormal mechanical limb alignment, which may also affect the carpus and shoulder. If noted, intervention to reduce the radius utilizing either transarticular fixation or inclusion of the ulna in the apparatus could be considered.

Disclosure: There was no proprietary interest or relevant financial relationship.

106 TPLO (TIBIAL PLATEAU LEVELING OSTEOTOMY) BASED ON CENTER OF ROTATION AND ANGULATION (CORA): DESCRIPTION OF PRE-SURGICAL PLANNING AND SURGICAL TECHNIQUE

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Veterinary Medical and Surgical Group

Introduction: This paper describes the pre-surgical planning and surgical technique that centers a focal domed osteotomy on a CORA to level the tibial plateau for treatment of the cranial cruciate ligament deficient stifle joint.

Materials and Methods: Pre-surgical Planning: Using routine radiographs of the tibia, the desired post-operative tibial plateau angle (TPA) and distal tibial anatomic axis is made. The intersection of these corresponds to the

CORA for the osteotomy. A curved line (focal dome) is drawn distal to but centered on the CORA. The amount of required rotation is measured. Surgical Technique: An osteotomy is made in the fibula. The TPLO saw blade is used for the focal domed osteotomy distal to and centered on the CORA. The proximal segment is rotated the measured distance and stabilized with bone plate.

Discussion/Conclusion: This technique provides an alternative to traditional osteotomies where anatomic consideration may preclude these options, previous surgical attempts have failed and require revision, or re-operation at the failure site would be deemed inappropriate. Osteotomy centered on the CORA, but distal in the diaphyseal bone, permits stable implant fixation and less potential complications associated with more proximal metaphyseal osteotomies.

Disclosure: There was no proprietary interest or relevant financial relationship.

107 TREATMENT OF A FEMORAL FRACTURE DELAYED UNION WITH PERCUTANEOUS INJECTION OF RECOMBINANT HUMAN BONE MORPHOGENETIC PROTEIN (RHBMP-2)

D. Puerto

Center for Animal Referral and Emergency Services

A one year old spayed female Labrador retriever presented for severe trauma after being hit by a car. Severe swelling of the left hind limb was noted. Radiographs showed a comminuted fracture of the left femur.

The fracture was repaired with a 12-hole 3.5 mm broad locking plate and pin combination. There were large cortical defects present mid-diaphysis. The fracture site was grafted with autogenous cancellous bone and synthetic bioactive ceramic.

Post-operative radiographs were taken every four weeks. The implants remained stable throughout healing. At 20 weeks there was a delayed-union healing with progressive resorption of the diaphyseal bone and a 3 cm fracture gap. Digital radiography was used to guide multiplanar placement of 18 gauge spinal needles along the diaphysis of the bone. Recombinant human bone morphogenetic protein (rhBMP) was mixed with a calcium phosphate carrier. The rhBMP-2 was injected. Post-procedural radiographs confirmed deposition of rhBMP-2. At 6 weeks an increase in radiographic density of intramedullary and cortical bone was seen throughout the diaphyseal bone and fracture gap. The fracture union was complete at 20 weeks post injection.

This case demonstrated successful application of rhBMP-2 through percutaneous injection to stimulate healing of a delayed-union of a femoral fracture. Further studies are needed to evaluate the role of percutaneous application of rhBMP-2 in treatment of delayed and non-union of fractures.

108 TREATMENT OF MEDIAL COMPARTMENT DISEASE OF THE CANINE ELBOW USING THE PROXIMAL ABDUCTING ULNAR OSTEOTOMY PROCEDURE AND A CUSTOM KYON PLATE

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The purpose of this study was to describe the use and outcome of a novel technique used to treat canine medial elbow compartment disease, consisting of fragmented coronoid process (FCP) and elbow incongruity.

Two Bernese mountain dogs and one Golden retriever (4 total limbs) were included in this study and all showed obvious clinical signs of elbow disease. Elbow radiography and arthroscopy were employed to diagnose all joints with elbow incongruity and concomitant FCP. Treatment consisted of arthroscopic fragment removal and correction of the incongruity by a proximal abducting ulnar osteotomy (PAUL) with a custom Kyon plate fixation.



Vertical ground reaction forces were determined prior to surgery in 3 of 4 limbs. Repeat force plate measurements were collected for one limb once a month for 5 months while the remaining 3 limbs had follow-up data collected anywhere from 1 to 4 times following surgery. Following an initial decrease in peak vertical force and impulse 1 month post-surgery in all dogs, a steady increase in these measures was then noted. Subsequent radiographs revealed screw loosening in one implant and intact implants in the remaining three. Persistent degenerative joint disease was noted in each case.

Arthroscopic fragment removal with treatment of elbow incongruity with a custom Kyon plate fixation of a proximal ulnar osteotomy suggested that there was short-term progressive improvement after the first month. This novel technique should be further investigated as a future treatment option for the relief of pain and lameness associated with canine medial compartment disease.

109 UNCOMMON USE OF AUTOGENOUS BONE GRAFT FOR THE TREATMENT OF A NONUNION OF THE RADIUS-ULNA WITHIN AN AMPUTEE DOG

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Fracture nonunion is an important complication in orthopedic surgery. Repairing nonunion or a bony defect is surgically challenging. Our objective was to describe an uncommon use of autogenous bone graft for the treatment of a nonunion of the radius-ulna within an amputee dog. An 8-month-old male mixed breed dog that had been operated once previously was presented to Veterinary Medical Teaching Hospital, São Paulo State University – Brazil, with a right radius-ulna nonunion and an amputated contralateral forelimb. A cancellous bone graft was collected from an amputated limb to correct nonunion in association to a locking plate. After 4 weeks the bone graft has been incorporated to the original bone. Clinical union with good weight bearing has been achieved after 8 weeks. This uncommon bone graft combined with a LP was an effective and appropriate treatment for no weight-bearing attribute to nonunion radius-ulna fracture.