

A3760. Ex vivo Biomechanical Comparison of Two Anchoring Systems and Two Suture Patterns for Calcanean Tendon Attachment to the Calcaneus in Dogs

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Introduction: Canine calcaneal tendon injury is a common musculoskeletal injury often requiring surgical intervention. Despite the need for surgery, prognosis is often poor. It has been concluded that knot slippage contributes to gap formation of tendon repairs. In human orthopaedics and sports medicine, knotless anchors are becoming the standard of care for reattachment of tendons/soft tissues. The purpose of our study was to perform ex vivo biomechanical testing of calcaneal tendons either sutured or directly anchored to the calcaneal tuber in canine cadavers.

Materials and Methods: 20 cadaveric pelvic limbs underwent calcaneal tendon insertion transection then repaired by 1 of 4 methods; three-loop pulley (TLP) with 0-polypropylene or no. 2-Fiberwire in a Speed-whip (SW) attached with either a knot (KN) through transosseous tunnels (1.5 mm) or 2, 3.5 mm Swivelock (SL) bone anchors placed into the calcaneal tuber. Ex vivo calcaneal tendon mechanical testing was then performed at a load rate of 25 mm per minute until construct failure. Ultimate strength and stiffness were calculated. Significance was set at $p < 0.05$.

Results: There was no significant difference of ultimate strength between test groups ($p = 0.62$). Stiffness was significantly greater for the repairs performed with SL with either suture pattern compared with KN with the same suture patterns ($p < 0.0001$).

Discussion/Conclusion: SL anchors provide greater construct stiffness than suture bone tunnels placed into the calcaneal tuber for calcaneal tendon repair. Increased stiffness provides resistance to gap formation of a tendon repair site when a patient ambulates.

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A3713. Duration of Effect of Liposomal Bupivacaine in an Induced Equine Lameness Model

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Introduction: Liposomal bupivacaine can provide analgesia for 72 hours postoperatively in dogs at 5.2 mg/kg; its use in horses has not been reported. We hypothesized that at milligram equivalent doses, liposomal bupivacaine in abaxial nerve blocks would not have a significantly longer duration of effect when compared with bupivacaine HCL in an equine induced-lameness model.

Materials and Methods: Eight horses were examined for lameness; two were eliminated from the main study for lameness. Abaxial nerve blocks were performed in the eliminated horse's lame legs using either 10 mg (0.75 mL) or 27 mg (2 mL) liposomal bupivacaine. Neither horse showed adverse reaction. The remaining six horses had forelimb lameness induced in a single limb using a hoof-clamp model modified from Swaab, reported in 2015. Lameness was objectively evaluated using a body mounted inertial sensor system. An abaxial nerve block was then performed with either 10 mg of liposomal bupivacaine or 10 mg (2 mL) bupivacaine HCL. A successful block obliterated skin sensation at 30 minutes postinjection. Each horse was trotted every 30 minutes until the return of 85% of lameness. After at least 3 days, treatment and leg was crossed over.

Results: No horse showed adverse reaction to injection. The liposomal bupivacaine eliminated 85% of lameness for an average of 3.5 hours; bupivacaine HCL eliminated 85% of lameness for an average of 2.9 hours.

Discussion/Conclusion: Further investigations utilizing larger volumes of liposomal bupivacaine are warranted to determine if a longer duration of action can be achieved.

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A3810. 3D Printed Guides for Surgical Planning and Treatment of Pathologies within the Equine Hoof

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Introduction: Diagnostic imaging techniques, such as CT have enabled better understanding of the causes of foot lameness and determining the appropriate treatment options. Three-dimensional modelling and printing have been increasingly used in the medical field as an aid in treating a variety of orthopaedic conditions. We believe that 3D models and subject specific guides can increase accuracy and precision in surgery and reduce surgical time.

Materials and Methods: Eight pairs of forefeet of adult horses were used for the study. Feet were positioned at varying angles and CT volumetric scans were made. Data were exported to 3D modeling software to create custom made 3D printed guides for navicular bone fracture repair and guided navicular bursa injections and compared with conventional jig methods. Surgery time and precision of placement of 3.5 mm cortical screws and injection technique were recorded.

Results: Surgery time for conventional approach ranged from 45 minute in the first surgery to 6 minutes in the last procedure. For the 3D guide approach, surgery times ranged from 10 to 2.5 minutes. For the navicular bursa injections, 3D custom made guides allowed for accurate injection of the navicular bursa ranging from 4.30 minutes to 35 seconds after placement of the guide over the foot compared with ultrasound-guided injection which ranged from 8 to 22 minutes.

Discussion/Conclusion: The recorded surgery times are an indication; there is a steep learning curve associated with the conventional approaches and these uncommon procedures can benefit from a 3D custom made guide to decrease time and improve accuracy.

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A3757. In vitro Osteogenesis in Autologous and IPS-derived Canine Mesenchymal Stromal Cells is Modulated by Dexamethasone and Bone Morphogenic Protein-2

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Introduction: Mesenchymal stromal cells (MSCs) represent promising agents for bone repair. However, osteogenic culture conditions must be optimized. The objective of this study was to determine the effect of varying the concentration and time-of-delivery of dexamethasone and BMP-2 on early- and late-stage osteogenesis of both autologous and IPS-derived cMSCs.

Materials and Methods: cMSCs were cultured under control and osteogenic conditions in the presence of varying concentrations of BMP-2 and dexamethasone. Cultures were assayed for alkaline phosphatase activity (ALP) at day 7 and Alizarin Red staining (ALZ) at day 21. Data were reported as mean \pm SD and analyzed using two-way ANOVA with Tukey's tests.

Results: Increasing concentrations of dexamethasone with low levels of BMP-2 reduced ALP activity in both marrow and IPS cMSCs. This effect was attenuated at high concentrations of BMP-2 in autologous but not IPS cMSCs. In late-stage assays, higher dexamethasone and BMP-2 concentrations, provided at day 1, enhanced osteogenesis in marrow cMSCs. In contrast, dexamethasone impaired osteogenesis of IPS-cMSCs.

Discussion/Conclusion: In vitro osteogenesis of cMSCs can be modulated by varying the timing and concentration of osteogenic factors. The mechanisms underlying osteogenesis of IPS-derived cMSCs may be different as compared with autologous cMSCs. Further work is necessary to identify the mechanistic underpinnings of these differences. This work represents an important first step for development of optimal osteogenic cMSC culture conditions that are tailored to individual preparations of cMSCs.

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A3788. Osterix Over-Expression Is Insufficient to Stimulate Osteogenesis in Equine Adipose-Derived MSCs

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Introduction: Mesenchymal stem cell (MSC) osteogenesis is driven by two transcription factors, RUNX2 and Osterix (OSX). MSCs, by definition, are capable of multilineage differentiation, but the osteogenic superiority of bone marrow-derived (BM) MSCs, in comparison to progenitors from other sources, such as adipose tissue (ADI), is well established. This study compared baseline and inducible RUNX2 and OSX expression in equine ADI- and BM-MSCs and assessed the phenotypic impact of OSX overexpression in ADI-MSC osteogenesis.

Materials and Methods: BM- and ADI-MSCs from four adult horses were expanded in monolayer. Basal RUNX2 and OSX expression was assessed in "passage 3" cells (paired *t*-tests). ADI cells were transferred to osteogenic medium \pm an OSX-expressing adenovirus (20 and 100 MOIs). Osteogenesis was assessed by Alizarin Red staining, alkaline phosphatase (ALP) mRNA and activity, and qPCR assessment of an osteogenic gene panel (ANOVAs).

Results: Basal RUNX2 expression was similar in ADI- and BM-MSCs. In contrast, OSX levels were significantly higher in BM-MSCs. Osteogenic induction of RUNX2 was also similar, but only BM-MSCs significantly upregulated OSX. OSX overexpression in ADI cells increased ALP mRNA levels but not enzymatic activity. Bone sialoprotein, osteocalcin, osteomodulin, osteonectin, and osteopontin expression was not consistently altered by OSX overexpression. There was minimal Alizarin Red stain up-take in 'osteogenic' ADI-MSC cultures.

Discussion/Conclusion: OSX overexpression is not sufficient to significantly improve ADI-MSC osteogenesis. The differential osteogenic capacities of ADI- and BM-MSCs may be due in part to differences in their RUNX2-OSX response axes, but other factors are clearly also important.

Acknowledgment: This study was performed with IACUC approval.

A3839. Optimizing a Critical Gap Femoral Defect Model for Objective Assessment of Bone Regeneration in Dogs

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Introduction: The objective of this study was to develop a canine nonunion femoral defect model using an angle-stable interlocking nail (AS-ILN) and methods to objectively characterize bone healing.

Materials and Methods: Six healthy hounds (age: 2.5–6.5 year; weight: 23.7–35.5 kg) were treated with unilateral, 4 cm femoral osteotomies, followed by stabilization with an 8 mm AS-ILN. Dogs were randomly assigned to negative or positive control groups ($n = 3$ /group). Positive control defects were treated with autologous cancellous bone graft. Healing was assessed at 0, 6, 12, and 18 weeks with radiography and CT/Mimics 16.0. At 18 weeks, dogs were humanely euthanized. Positive control femurs were biomechanically assessed for torsional stiffness, load to failure, and mode of failure. Histology was performed on both groups. Data were reported as median and range.

Results: The AS-ILN provided appropriate stability without any implant-associated complications. Radiographic healing progressed in 0/3 negative and 3/3 positive control dogs from 0 to 18 weeks. Median bone volume increased from 535 mm³ to 662 mm³ (negative control) versus 1,375 mm³ to 3,999 mm³ (positive control). Median torsional failure load for positive control femurs was 12.0 Nm, versus 42.0 Nm for unoperated contralateral femurs. Histology confirmed nonunion or secondary bone healing.

Discussion/Conclusion: When paired with the described outcome measures, use of an AS-ILN represents an advance in large animal bone regeneration models and accomplishes "refinement" and "reduction" goals of humane animal research.

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A3738. Long-Term Fate of Decellularized Allografts used for Cranial Cruciate Ligament Reconstruction in Dogs

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Introduction: Use of a deep digital flexor tendon (DDFT) allograft to replace the cranial cruciate ligament (CCL) has shown promising clinical results in an initial pilot study. A limitation of this previous study was the survival of the allografts was not assessed. Therefore, the purpose of this project was to assess the survival of DDFT allografts used to replace the CCL in dogs.

Materials and Methods: Twenty client-owned dogs were enrolled. Surgery was performed as previously described by Biskup et al. 2017. Outcome was measured with the Liverpool Osteoarthritis in Dogs' questionnaire (LOAD) and force plate analysis (FPA) at 6 and 12 months. Dogs will undergo second look arthroscopy at 12 months.

Results: At 6-month follow-up, all owners graded their dogs as improved except two owners. On exam, 10 dogs had appreciable cranial drawer (> 5 mm). FPA revealed improvement in 16/20 dogs with 3 dogs more lame than before surgery. Arthroscopy results will be available at the time of the conference.

Discussion/Conclusion: At 6 months, the cause of continued lameness was identified in 4 dogs (2 infections, 1 fracture through the tibial screw hole, and 1 meniscal tear). One dog with an infection had all implants explanted and no graft was visualized on arthroscopy. The dog with the meniscal tear was treated with a partial meniscectomy and no allograft was visualized. This prospective study suggests intra-articular allograft placement for CCLR may provide a positive clinical outcome, although second look arthroscopy at 12 months will be needed to assess graft survival.

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A3739. Randomized, Controlled, Prospective Clinical Trial of the Effects of Autologous Greater Omentum Free Graft versus No Graft in Dogs Treated with TPLO for Cranial Cruciate Ligament Rupture

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Introduction: The primary objective of this pilot study was to determine the rate of radiographic healing of TPLO osteotomies and owner reported outcome in dogs with naturally occurring cranial cruciate ligament rupture (CCLR) treated with (OG) or without (NG) a free autogenous omental graft.

Materials and Methods: Eight dogs were prospectively randomized to receive either OG or NG at arthroscopy and TPLO for unilateral CCLR. Radiographs, visual analog scale and owner questionnaire (CBPI and COI) were performed at 6, 8, 10 and 12 weeks postoperative. Radiographs were assessed by a blinded board eligible radiologist using an 11- and a 5-point healing scale.

Results: Five point and 11-point healing scores for OG (2.6 ± 0.4 , mean \pm SE, 5.2 ± 0.9) trended higher than for NG (1.3 ± 0.3 , 2.3 ± 1.5 , $p > 0.05$). No difference in visual analog scale or owner assessments was found ($p > 0.05$).

Discussion/Conclusion: OG in the TPLO osteotomy site does not affect owner assessment of outcome but may reduce

the amount of time for bone healing to occur at the osteotomy site. Further investigation in larger numbers of dogs is warranted to determine the effects of OG on TPLO osteotomy site healing compared with no augmentation in dogs.

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

A3777. Intracapsular Cranial Cruciate Ligament Reconstruction in a Lapine Model Using an Autogenous Semitendinosus Graft: Technique Description

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Introduction: While intracapsular repair of the cranial cruciate ligament (CCL) using a semitendinosus (ST) tendon autograft is widely performed in studies using a lapine model of the human knee, description of this technique is lacking.

Materials and Methods: Reconstruction of the CCL using a ST tendon autograft was performed in 36 Flemish Giant rabbits. Following stifle exploration, the insertion of the ST tendon on the caudomedial aspect of the tibial plateau was exposed and followed proximally. The abductor longus was retracted and deep blunt dissection of the abductor magnus was used to isolate the ST and expose its musculotendinous junction (MTJ) which was then transected. Tibial and femoral bone tunnels were drilled. Using a suture loop, the graft was passed through both tunnels, tensioned, and then secured in place with an interference screw and periosteal sutures. The degree of postoperative drawer was assessed following routine closure.

Results: Graft length (mean \pm SD) was 5.9 ± 0.8 cm. Mild postoperative drawer was present in 50% (18/36) rabbits. In two rabbits, tibial plateau fissures were documented at time of sacrifice 4 weeks postoperatively.

Discussion/Conclusion: Obtaining the longest possible graft is pivotal to the success of this technique. To accommodate shorter grafts, bone tunnels are drilled more vertically. The subsequent steeper graft orientation reduces its ability to eliminate drawer and increases the risk of tibial plateau fissuring. The ST tendon location within the abductor magnus makes exposition of the MTJ challenging. Appropriate retraction and dissection of the abductors are keys to ensuring maximal graft length.

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A3728. Comparing the Complication Rate of Different TPLO Fixation Systems in Dogs over > 45.4 Kg (100 LBS)

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Introduction: Cranial cruciate ligament rupture is the most common canine stifle condition. Large dog TPLO have high complication rates. No studies have compared the complication rates of different TPLO fixation systems in large dogs. Our goal was to compare the complication rate of three TPLO fixation systems in dogs > 45.4 kg. Our null hypothesis was the type of TPLO fixation system was not associated with complications.

Materials and Methods: The medical records of dogs treated with TPLO were reviewed (> 6-week follow-up). A random effects logistic regression model was used to evaluate the association between the type of TPLO fixation system and complications.

Results: The study included 342 TPLO surgeries. The fixation systems included 3.5 mm broad Unity Cruciate Plate (UCP) (8P) (78.4%), 3.5 mm broad UPC (14.9%) with String of Pearls plate (8AP), and 3.5 mm standard UPC (6P) (6.7%). There were 214 locking and 128 nonlocking systems. The statistical model controlled the confounding effects of weight differences between fixation systems. The fixation system was predictive of complications. The 8P had the lowest odds ratio [OR] for complication among the three fixation systems. The 8AP had higher odds of complications than the 8P. Locking fixation eliminated the association between weight and complication rate.

Discussion/Conclusion: The null hypothesis was rejected. Among the fixation systems, 8AP had the highest OR for complication. Contributing factors may include excessive soft tissue dissection, prolonged surgical, and anesthesia time. Locking fixation of TPLO with 8P may be considered in large dogs to reduce complications.

Acknowledgment: No proprietary interest or funding was provided.

A3825. Long-Term Follow-up of Conservative Management of Sacroiliac Luxation in Dogs

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Introduction: Sacroiliac (SI) luxation is a common injury in dogs and is frequently associated with vehicular trauma. Conservative management of unilateral or bilateral SI luxations is not often recommended; however, the author's clinical impression is that dogs can do well with conservative management, even with substantial displacement. The purpose of this study was to evaluate the long-term outcome of dogs with SI luxation treated without surgery. We hypothesized that dogs with SI luxations, treated conservatively, would have a favorable long-term outcome.

Materials and Methods: Medical records were retrospectively evaluated. Follow-up was obtained via phone interview. Measurements of ventrodorsal pelvic radiographs were performed to assess the degree of luxation using a ratio of ilial wing displacement relative to sacral length.

Results: Eleven dogs were included, with mean a follow-up time of 54 ± 47 months. Mean cranial displacement of the ilial wing relative to sacral length at the time of injury was 43.1% ± 22.3% (range, 9–86%). Percent cranial displacement at follow-up was significantly decreased ($p < 0.03$). Nine owners (82%) reported an excellent recovery, indicating no current lameness. Two dogs were reported to exhibit occasional or regular lameness. No dogs were reported to have a poor outcome. Nine of 11 (82%) dogs were bearing weight on their injured limb within 2 weeks following injury. Seven dogs (64%) had complete resolution of lameness within 2 months following injury.

Discussion/Conclusion: Based on radiographic measurements and owner follow-up, conservative, nonsurgical

management can be an effective and appropriate management strategy for dogs with SI luxation.

Acknowledgment: None.

A3785. Evaluation of External Skeletal Fixator Constructs in a Bone Model of the Tibiotarsus of Red-Tailed Hawks (*Buteo jamaicensis*)

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Introduction: Acrylic and Fixteur Externe du Service de Sante des Armees (FESSA) have been used as connecting bars in birds for fracture repair. The null hypothesis was there are no differences in torsional properties of the ESF construct between the FESSA and acrylic connecting bars and with a large IM pin/small transfixation pins versus a small IM pin/larger transfixation pins.

Materials and Methods: Delrin bone models were fabricated. Four different combinations of pin size and rod type were studied. The gap model was rotated in torsion at 5 degree/s to failure or to 80 degrees. The effects of external fixator (FESSA, acrylic) and IM/transfixation pin combination (large IM/small transfixation, small IM/large transfixation) on biomechanical properties were assessed using a mixed model analysis of variance. Construct yield was considered clinical failure.

Results: Both FESSA constructs had significantly greater stiffness at yield and mean yield torque than acrylic constructs. None of the FESSA constructs failed but some acrylic constructs did fail.

Discussion/Conclusion: The FESSA with the small IM pin was stiffest at the yield point yet both FESSA constructs had similar biomechanical properties. Acrylic constructs failed by fracture of the acrylic rod at the location of the insertion of the proximal transfixation pin. The FESSA demonstrates additional advantages over acrylic connecting bars. This study demonstrates that the FESSA may be a superior method of fixation for tibiotarsal fracture repair in the avian species.

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A3827. Evaluation of the Effect of Cannabidiol on Osteoarthritis-Associated Pain in Dogs—A Pilot Study

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Introduction: There is a lack of research evaluating the efficacy of cannabidiol (CBD) for treatment of osteoarthritis-

associated pain using objective outcome measures. This pilot study was designed to evaluate the effect of CBD on pain associated with canine osteoarthritis.

Materials and Methods: Client-owned dogs with radiographically confirmed osteoarthritis were enrolled in this prospective, double-blinded, crossover, placebo-controlled study. Outcome measures included serum chemistry, weekly total activity counts (AC), clinical metrology instruments (CMI), and objective gait analysis (OGA). Baseline data were acquired for four weeks prior to initiation of the first treatment. Patients were randomly allocated to either placebo or oral CBD oil treatment for the first six weeks, then treated for the subsequent six weeks with the opposite treatment.

Results: Twenty-three dogs, medium-large breed dogs, were enrolled. Fourteen dogs displayed elevation in liver enzymes associated with CBD treatment. Significant differences between treatment groups were identified for several CMI and OGA time point comparisons. However, there was a lack of consistency amongst the different outcome measures.

Discussion/Conclusion: This pilot study identified differences in some outcome measures suggesting that CBD may benefit dogs with osteoarthritis-associated pain. However, adequately powered studies with a larger sample size are needed to confirm this suggestion. Further evaluation of the clinical implications of the observed liver enzyme elevation, particularly with long-term administration, is necessary.

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A3840. Outcome of Tibial Tuberosity Avulsion Repaired by Pin (Kirschner Wire) Fixation with or without a Tension Band

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Introduction: Avulsion of the tibial tuberosity is a common traumatic injury in skeletally immature dogs. The purpose of this retrospective study was to compare the outcomes of tibial tuberosity avulsion fractures in dogs treated with pin and tension band fixation or with pins alone. We hypothesized that avulsion fractures treated with pin(s) and tension band fixation would heal faster and have a lower complication rate than fractures treated with pins alone.

Materials and Methods: Radiographs and medical records of dogs surgically treated for tibial tuberosity avulsion fractures at a single referral hospital, from 2015 to 2018, were reviewed. Signalment and surgical stabilization technique were recorded from the medical record. Preoperative, postoperative, and follow-up radiographs were reviewed to determine outcome of surgery.

Results: 33 tibial tuberosity avulsion fractures were included. Overall healing time was 40 ± 14 days with no difference in healing times between groups. Overall complication rate was 50%, with 25% major and 25% minor complications. The major complication rate was significantly higher in the pins only group (50%) than in the pin(s) & tension band group (0%). All major complications consisted of pin migration necessitating pin removal.

Discussion/Conclusion: The results of this study suggest that the use of pin(s) with a tension band for stabilization of tibial tuberosity avulsion is more likely to result in a satisfactory outcome without the need for a second surgery as compared with stabilization with pins alone.

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

A3753. Biomechanical Comparison of Two Conical Coupling Plate Constructs for Cat Tibial Fracture Stabilization

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Introduction: Tibial fractures occur commonly in cats with the majority of fractures involving the mid-diaphysis. Cat diaphyseal tibial fractures in which osteosynthesis fails is largely due to plate bending. The objective of this study was to compare the biomechanical characteristics of two conical coupling plate (CCP) constructs in an ex vivo feline tibial fracture gap model.

Materials and Methods: Paired tibiae harvested from 8 recently euthanized cats were randomized into two groups. One tibia was stabilized with a standard 6-hole 2.5 mm CCP and the contralateral tibia was stabilized with a 6-hole 2.5 mm prototype CCP (pCCP). Nondestructive cyclic four-point craniocaudal bending, mediolateral bending, and axial compression testing was performed, and stiffness was recorded. The specimens were then loaded to failure in axial compression.

Results: During nondestructive testing, the pCCP constructs were significantly stiffer than the CCP constructs in both modes of bending and axial loading. Both constructs demonstrated significantly greater craniocaudal bending stiffness compared with mediolateral bending. Yield load and failure load were significantly greater for the pCCP constructs.

Discussion/Conclusion: The augmented design of the pCCP yielded superior mechanical characteristics compared with the original CCP construct in nondestructive and destructive testing. The superior mechanical properties of the pCCP suggest that this implant would be more suitable for stabilizing complex diaphyseal tibial fractures in cats. Further investigation is needed to prospectively evaluate the clinical performance of the pCCP.

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A3841. Effect of Epitendinous Suture Placement for Flexor Tendon Repair in Combination with Three-Loop Pulley and Locking Loop Suture Patterns in a Canine Cadaveric Model

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Introduction: Epitendinous (E) suture patterns in human flexor tendon repairs increase repair strength by 10–50%. Use of E suture patterns for canine tendon repair with commonly utilized patterns has not been described. The objective of this study was to evaluate the effect of simple running E suture pattern with three-loop pulley (3LP) and locking loop (LL) patterns for flexor tendon repair in an ex vivo canine cadaveric model.

Materials and Methods: Superficial digital flexor musculotendinous (SDFT) specimens were randomly divided into 4 groups ($n = 18$); after sharp transection SDFT were repaired with 3LP, LL, 3LP + E or LL + E. Constructs were placed in a tensile testing machine and tested to failure. Failure mode, gap formation, yield, peak, and failure force were analyzed. Significance was set at $p < 0.05$.

Results: Mean peak force and force at failure for 3LP and LL was $79.8 \text{ N} \pm 23.0$, which was significantly lower compared with repairs where an E pattern was used, $192.1 \text{ N} \pm 57.3$ ($p < 0.0001$). There was complete absence of gapping with the addition of an E pattern. 3-LP was superior to LL when used alone in preventing gap formation ($p = 0.001$).

Discussion/Conclusion: Addition of an E pattern significantly reduced the occurrence of gapping and increased the force at failure, peak force and yield force of tenorrhaphies. Use of an E suture pattern in a clinical setting should be considered to increase repair site strength and resist gap formation.

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

A3766. Gastrocnemius Muscle-Tendon Unit Tension Affects Cranial Tibial Translation

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Introduction: Cranial cruciate ligament (CrCL) deficiency is a leading cause of canine lameness. The circumstances that promote CrCL injury remain largely unknown. We hypothesized that gastrocnemius muscle-tendon unit (GMT) tension induced by tarsal flexion plays a role in generating cranial tibial translation (CTT) in the CrCL-deficient stifle.

Materials and Methods: The effects of stifle and hock angles on CrCL length, CTT, and GMT length in intact and CrCL-deficient cadaveric canine pelvic limbs ($n = 10$) were measured by tracking fiducial markers in the attachments of the CrCL and GMT during in vitro loading (20% body weight) of limb specimens at 3 stifle and 3 tarsal angles. Repeated measures ANOVA assessed the effects of CrCL condition (intact, cut), limb load (unloaded, loaded), and stifle flexion (80, 100, and 120°), tarsal flexion (90, 110, and 130°) angles on CrCL length, CTT, and GMT length.

Results: Mean CrCL length was longer in loaded CrCL-deficient limbs only in combined tarsal flexion and stifle extension ($p = 0.018$). Tarsal flexion had a large effect on GMT length, particularly in combination with stifle extension ($p < 0.001$). CTT was greater with stifle extension ($p < 0.001$), and with tarsal flexion ($p < 0.001$).

Discussion/Conclusion: The data support the hypothesis that CrCL-deficient canine stifles exhibit greater CTT due to GMT tension induced by tarsal flexion. Whole limb biomechanics should be considered in approaches to treatment of CrCL disruption.

Acknowledgment: Center for Companion Animal Health, Students Training in Advanced Research, and Veterinary Student Scholars Program, Morris Animal Foundation. There are no conflicts of interest.

A3815. Retrospective Evaluation of Radiographic Outcome following Surgical Stabilization of Humeral Condylar Y-Fractures in Dogs

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Introduction: Humeral condylar “Y” fractures are uncommon, severe intra-articular traumatic injuries involving

both humeral condyles. The purpose of this study was to retrospectively evaluate the outcome of surgical stabilization of “Y” fractures in dogs. We hypothesized that fractures stabilized with bilateral bone plates and screws would have shorter healing times and lower complication rates as compared with fractures stabilized with pins, screws, and/or cerclage wire or a single bone plate combined with adjunctive fixation methods

Materials and Methods: Medical records and radiographs from humeral condylar “Y” fractures surgically stabilized at a single referral center from 2006–2018 were reviewed. Patient demographics, surgical technique, and implants were recorded. Postoperative and follow-up radiographs were reviewed to assess surgical outcome.

Results: 28 humeral condylar “Y” fractures were included. Six fractures were stabilized without plates, 11 with a unilateral plate, and 11 with bilateral plates. Healing time in the unilateral plate group (105 days) was significantly longer than in the bilateral plates group (55 days). Complication rates: no plate (50%), unilateral plate (71%), and bilateral plates (36%) were not significantly different between groups.

Discussion/Conclusion: We partially accepted our hypothesis as the bilateral plate group had a shorter healing time but not a significantly lower complication rate than the unilateral plate or no plate groups. Our results suggest that utilizing bilateral bone plates to stabilize condylar “Y” fractures may provide the most satisfactory outcome.

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

A3779. Introduction of a Novel Absorbable Bone Anchor Using Bonewelding Technology: First Clinical Cases

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Introduction: The dimensions of currently available bone anchors preclude their use in many indications particularly in small dogs and cats in distal limb regions.

Materials and Methods: WELDIX anchors based on the BoneWelding technology were used in 9 clinical cases (6 cats and 3 dogs) for ligament reconstruction, reinsertion, and tendon reinsertion. Variable suture materials were used including Maxon, Prolene, and Ethibond.

Results: Indications were tarsocrural luxation or tarsal ligament reconstruction in 4 cases, coxofemoral luxation in 3 cases, Achilles tendon disruption and elbow medial collateral ligament reinsertion in one case each. There was one major (coxofemoral luxation requiring FHO) and two minor complications (skin dehiscence and local swelling around the calcaneus), which both healed with conservative treatment. Outcomes were excellent in six cases (full function) and good (slight lameness) in two.

Discussion/Conclusion: The WELDIX anchor is a promising technology offering advantages over other anchor systems in specific indications. Its small size and flush insertion enable application in locations previously inaccessible with anchors, such as the insertion point of the tibiotalar ligament under the medial malleolus. Further clinical investigation of this system is warranted.

Acknowledgment: Anchors used in this study were donated by VetWelding Ltd.

Poster Session Abstracts

A3736. Three-Dimensional Computer-Assisted Surgical Planning and Use of 3-Dimensional Printing in the Repair of a Complex Articular Femoral Fracture in a Dog

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Objective: To describe the use and benefits of 3-dimensional (3D) computer-assisted surgical planning (CASP) and printing in a complex articular fracture repair in a dog.

Study Design: Clinical case report.

Animal: Client-owned dog.

Materials and Methods: One dog with a closed, severely comminuted, distal femoral supracondylar and bicondylar fracture underwent a preoperative computed tomography (CT) scan. Three-dimensional CASP was performed using computer-aided design software. The three-dimensional CASP allowed for visualization of the fracture fragments and virtual surgery, including reduction of the fragments and implant placement. A 3D model of the affected femur was printed, and a bone plate was pre-contoured to the model. Intraoperative fracture reduction and stabilization was performed without complications.

Results: Postoperative radiographs revealed successful execution of the planned procedure. Subsequent radiographs and clinical examination indicated that bone healing was achieved with return to normal function of the limb. Three-dimensional CASP and the printed 3D model allowed for improved understanding of the anatomic relationship between fracture fragments, preoperative implant selection, and contouring, and the ability to practice fracture reduction and implant placement preoperatively. The model was also used for client education, and to teach students and residents.

Conclusion: Three-dimensional CASP and printed models are valuable tools in the preoperative planning of complex fracture repairs, educating clients, and teaching students and residents.

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

A3756. Extended Long-Term Radiographic Comparison of Tibial Plateau Leveling Osteotomy versus Tibial Tuberosity Advancement for Cranial Cruciate Ligament Rupture in the Dog

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Introduction: Our objective was to evaluate extended long-term (≥ 36 months) outcomes of patients who had stifle stabilization surgery by tibial plateau leveling osteotomy (TPLO) or tibial tuberosity advancement (TTA).

Materials and Methods: Medical records were reviewed retrospectively for patients that were > 15 kg and ≥ 3 years postop TPLO or TTA. Follow-up exam and radiographs were performed on dogs meeting the inclusion criteria: 166 stifles (118 dogs), 133 stifles (94 dogs) in the TPLO group and 33 stifles (24 dogs) in the TTA group. Outcomes were assessed by evaluating radiographic OA at 3-time points (0, 8 weeks, and ≥ 3 years) and client questionnaires (canine brief pain inventory [CBPI] and canine orthopedic index [COI]) completed at final follow-up.

Results: Radiographic OA progressed after both procedures over time; however, OA was seen to progress more post-TTA ($p = 0.0054$) and if bilateral procedures were performed ($p = 0.0265$). Owner assessment using the CBPI to rate the severity of their dog's pain and the degree to which that pain interferes with function indicated a better outcome for dogs that had a TPLO. Owner assessment of using the COI to rate their dog's degree of joint stiffness, function, gait, and overall quality of life indicated a better outcome for dogs those had a TPLO.

Discussion/Conclusion: Osteoarthritis progresses over time after TPLO and TTA but progresses less after a TPLO. Client based outcomes indicate that patients have better function, less pain, and overall better quality of life after TPLO.

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

A3828. Tendon Plating for Revision of Tibial Tuberosity Fragmentation in Two Dogs

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Medial patellar luxation (MPL) is a common orthopedic problem. Surgical correction of this condition includes transposition of the tibial tuberosity to restore alignment of the patella within the distal femoral trochlea. Fragmentation and avulsion of the proximal tibia after tibial tuberosity transposition is a reported complication. Due to small quantity and quality of remaining bone stock in this area, repair options can be very limited and challenging. Two dogs presented to a tertiary facility with tibial tuberosity fragmentation after previous MPL surgeries. Both dogs had one attempted corrective surgery to repair the failure of tibial tuberosity transpositions. With the second of revision surgeries, each case was managed with reduction of the remaining fragment of the tibial tuberosity and a contoured locking plate over the proximal aspect of the tendon and patella (tendon plating). The plate was secured with a combination of locking screws distally and suture in each proximal hole. Bone graft was utilized in both cases around the site of the tibial tuberosity fragmentation. Radiographs documented healing of the tibial crest. Both dogs recovered uneventfully from surgery and returned to full function despite cyclic breakage of the plate at the most proximal tibial screw hole in one case. Owners also reported positive outcomes for both cases. The implants were partially or completely removed in both cases. The clinical outcome is promising for this technique as a possible option for complicated tibial tuberosity fragmentation and subsequent avulsions.

A3790. The Effects of Hyperbaric Oxygen Therapy on Edema after Stifle Surgery

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Introduction: HBOT has been reported in certain human studies to be an effective therapy for edema reduction. The objective of this study is to obtain volumetric measurements of a limb the day after Medial Patellar Luxation surgery, before and immediately after HBOT. We theorize that there should be a measurable decrease in inflammation immediately after HBOT.

Materials and Methods: This prospective study includes five dogs which had Medial Patellar Luxation surgery all involving a wedge trochleoplasty, tibial tuberosity transposition, and lateral imbrication. For the volume

measurement a CT was performed prior to and immediately after HBOT, then Horos Imaging Software was used to make the volume measurements.

Results: There were three out of the five subjects that had a reduction in volume post-HBOT and the other two subjects had a very minimal increase in the volume post-HBOT. The average volume of all 5 subjects pre-HBOT was equal to 72.90 cm³ and post-HBOT was 71.01 cm³. The difference in volume overall is equivalent to a 2.6% reduction in volume when calculated among all 5 limbs.

Discussion/Conclusion: The result shows that there is edema reduction after just one HBOT treatment in at least 3 of the 5 subjects. This supports our theory that HBOT could help reduce edema. To provide stronger evidence a larger study with a control group would be important to gather more data. HBOT could be a valuable adjunctive therapy for postoperative orthopedic surgeries or surgeries in general.

Acknowledgment: There was no funding provided for this project.

A3773. Infectious Sacroiliitis in Conjunction with *Brucella canis* in a Dog

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Introduction: Brucellosis is a zoonotic pathogen which causes reproductive failure and osteoarticular abnormalities in dogs and people. Reviews of brucellosis in humans have shown that sacroiliitis was more prevalent than discospondylitis. Comparatively, *Brucella canis* sacroiliitis has not been reported in dogs.

Clinical Findings: A 1.5-year-old, neutered male Labrador retriever with a 1-month history of pelvic limb lameness was referred to our orthopedic service for evaluation. Examination revealed a bilaterally stilted pelvic limb gait with a grade 1/5 left pelvic limb lameness. Pain was elicited during palpation of the lumbar epaxial musculature and extension of the hip joints.

Diagnostics: Orthogonal radiographic views of the spine and pelvis revealed areas of lucency within multiple vertebral endplates and the sacroiliac joints. A computed tomography scan revealed multiple sclerotic lesions in the vertebral endplates and widening of the sacroiliac articulations with subchondral sclerosis. A brucellosis titer was performed, and positive result confirmed by agar gel immunodiffusion (AGID) test.

Discussion: Brucellosis is known to cause discospondylitis in dogs but has never been reported in the sacroiliac joint. Human patients with brucellosis-related discospondylitis and sacroiliitis exhibit pelvic limb lameness and spinal pain. Based on the findings in this case, we suggest that sacroiliitis be included as a differential diagnosis for pelvic limb lameness in dogs with *B. canis* discospondylitis.

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

A3830. Surgical Approaches for Minimally Invasive Interlocking Nailing Osteosynthesis (MINO) in Dogs

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Introduction: Studies have shown motivating results considering bone union and reduced number of complications. Intramedullary interlocking nail-shave mechanical and biological advantages when compared with bone plates, such

as a greater preservation of extra bone vascularization and positioning on neutral mechanical axis.

Materials and Methods: Anatomical dissections were performed in 10 cadavers of dogs (30–40 kg). After dissection, the limbs were used to describe the MINO approaches (portals).

Results: Humerus: a cranio-lateral approach is used. The anatomical point used as a reference for introduction of the intramedullary nail is the major tubercle. The distal portal should be made cranially to the lateral epicondyle. Femur: the cranial portal is made using a lateral approach to the great trochanter, extended to its dorsal portion, allowing access to the intertrochanteric fossa, where the nail will be inserted. The distal portal is cranially to the patella. Tibia: Medial approach is recommended. Incision is performed in the proximal aspect, near the tibial tuberosity, extended dorsally with opening of the knee joint. The drilling point for non-rotational implantation the nail is near the medial border of the tibial plateau and slightly medially and caudally angled.

Discussion/Conclusion: Describing the surgical approaches, and main anatomical points of reference for minimally invasive application of interlocking nails is very relevant.

Acknowledgment: CAPES funding agency.

A3812. Study of the Biocompatibility of Chitosan Gel Associated to Glycerol Phosphate for the Healing of Experimentally Induced Radial Defects in Rabbits (*Oryctolagus cuniculus*)

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Introduction: In many fractures, the expected consolidation is not achieved, requiring additional means to obtain bone union. Chitosan is a nontoxic and compatible biomaterial that stimulates osteogenesis. The present study evaluated the effects of glycerol phosphate associated to chitosan hydrogel on experimentally induced bone defects in rabbit radius.

Materials and Methods: Adult rabbits ($n = 15$) were divided into two groups, the BG group (Biomaterial Group) being treated with glycerol phosphate associated to chitosan hydrogel and the CG group (Control Group) receiving no treatment. The animals were evaluated radiographically by densitometry and histologically at 30, 60, and 90 postoperatively.

Results: Comparing the two groups, there was a significant statistical difference between the averages of radiopacity BG (2.33 ± 0.48) and CG (1.77 ± 0.06). There was also a significant statistical difference ($p > 0.05$) in the densitometry evaluation between groups, BG ($6,207 \pm 1,374$) and CG ($5,71 \pm 1,512$). The average values of the histopathological evaluation of BG were higher than those of CG at 30 (BG: 13.6 and CG: 10.4), 60 (BG: 13.8 and CG: 10.8), and 90 postoperatively (BG: 15.2 and CG: 11.0).

Discussion/Conclusion: Chitosan associated with glycerol phosphate is a biomaterial of desired characteristics, promoting faster bone repair, being nontoxic, and safe to use, which contributes to better bone consolidation results in orthopedic surgeries for fracture repair.

Acknowledgment: Study funded by the Foundation for Research Support of the State of São Paulo–FAPESP. Structure provided by the Faculty of Agrarian and Veterinary Sciences–Unesp, Jaboticabal.

A3774. Autologous Thrombin Production in a Variety of SpeciesPfentner A.¹, McIntyre H.¹, Jr. F. Grimaldi¹, Bare T.¹, Matuska A.¹
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Introduction: Thrombin is an enzyme that plays a large role in hemostasis and wound healing. It can be used as an adjunct in surgical procedures and using an autologous thrombin source eliminates the potential for immune response. Autologous thrombin can be translated into the veterinary field, making it a necessity to understand how it works in many species. In this study, whole blood (WB) and platelet poor plasma (PPP) from multiple species were tested to determine their ability to produce thrombin serum.

Materials and Methods: Porcine, equine, bovine, ovine, and canine blood was obtained from a commercial vendor and human blood was drawn to use as a control. All blood ($n = 3$ donors/species) was processed 24–48 hours after draw time. Thrombin serum was generated from WB or PPP using the Thrombinator System (Arthrex, Inc.). Once removed from the device, serum was tested for thrombin activity. Significant differences were determined with a two-way ANOVA.

Results: When producing thrombin serum, the approximate procedure time was 20 minutes. With the exception of sheep and canine samples, serum thrombin activity was significantly higher when generated with WB rather than PPP ($p < 0.001$). All sera generated displayed thrombin activity.

Discussion/Conclusion: In conclusion, autologous thrombin is a viable option for use in a veterinary setting. Autologous thrombin serum production was shown in multiple species using both WB and PPP.

Acknowledgment: This study was funded by Arthrex, Inc.

A3831. Description of a Novel Veterinary Biplanar Interlocking Nail Systemde Lucena D.V.F.¹, Malta C.A.D.S.¹, Dias L.G.G.G.¹, Minto B.W.¹
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Introduction: Intramedullary interlocking nails (ILN) are orthopedic implants used to stabilize fractures in humans and animals. New models have been being described aiming to correct failures originated from excessive micromovement in previous ones. The objective of this work is to describe a novel veterinary intramedullary nail system with threaded angle-stable locking, which presents the distal holes in two planes. It is also described the instruments necessary for its implantation.

Materials and Methods: Nails of six and eight mm, of 130, 145, 160, 175, and 190 mm in length, were developed. They present the first distal hole at 90 degrees from the others. An adaptation piece was created, which allows the turning of the drill jig in 90 degrees, for proper placement of the screw in a perpendicular plane.

Results: The distal holes are 5.5 mm from each other. The last hole is 7 mm from the distal end of the nail. The major modification that has been made in this implant is the positioning of the first distal hole at a right angle (90°) to the others, allowing a biplanar nail interlocking. For that, a 90-degree rotating device applied to the nail guide was developed.

Discussion/Conclusion: During the tests, it was possible to get all the screws interlocked. The set of instruments proved to be effective and fulfilled its function satisfactorily.

Acknowledgment: CAPES funding agency.

A3832. Femoral Type II Salter–Harris Fracture Repair in a Domestic Ferret (*Mustela putorius furo*)Schmidt L.¹, Blake C.², Dugat D.², Brandao J.¹
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A 15-week-old, neutered male, domestic ferret (*Mustela putorius furo*) presented for a closed type II Salter–Harris fracture of the right distal femoral metaphysis with caudo-medial displacement. The ferret became acutely lame earlier that day after falling from the second-floor indoor balcony. The ferret received a dose of buprenorphine from his primary veterinarian prior to arrival. On presentation, the ferret had a 4/4 right pelvic limb lameness. The ferret was started on meloxicam, buprenorphine, famotidine, sucralfate, and maropitant. The ferret was anesthetized for surgical repair the following day. An approximate 5 cm craniolateral skin incision was made extending from the stifle joint to the distal femoral diaphysis. Subcutaneous soft tissue was dissected, allowing exposure of the fracture. The fracture fragments were opposed and stabilized using two 0.045 mm Kirschner wires using a crosspin technique. The subcutaneous tissue was closed using a simple continuous pattern and the skin was opposed with using an intradermal pattern, both with 4–0 poliglecaprone 25. Postoperative radiographs confirmed appropriate implant placement fracture reduction and apposition. Anesthesia and recovery were unremarkable. The ferret was cage-rested postoperatively for 4 weeks. Follow-up radiographs revealed appropriate bony callus at the fracture site without implant complications. Fracture repair can be surgically managed in ferrets, along with restricted activity and cage rest resulting in appreciable success. This case demonstrates that crosspin fixation and cage rest can be a viable option for distal femoral fracture repair in ferrets.

A3794. A Comparison of the Effect of Three Different Low-Level Laser Energy Settings on Limb Function, Bone Healing and Pain in Dogs Following Tibial Plateau Leveling Osteotomy: A Pilot StudyChen C.¹, Gilbert P.J.¹, Martinez S.A.², Bunch J.A.², Dyke R.², Davis A.J.², Martinez S.E.¹, Hanna A.L.¹

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Introduction: Recently, low-level laser therapy (LLLT) has been evaluated for use with tibial plateau surgeries in dogs. To date, the ideal LLLT power setting has not been identified for this clinical use. We hypothesized that increasing LLLT energy settings would decrease pain levels, improve limb use, enhance radiographic bone healing, and improve the osteoarthritic (OA) environment within the affected joint following surgery.

Materials and Methods: Nine client-owned dogs with unilateral cranial cruciate ligament rupture were divided into 3, LLLT power treatment groups (2, 4, or 6 J/cm²) using an 808 nm, 500 mW power, Class IIIb laser source. All dogs underwent stifle arthroscopy followed by TPLO surgery. Outcome measurements included orthopedic examinations, accelerometry, goniometry, force plate analysis, Canine Brief Pain Inventory (CBPI), Modified Glasgow Pain Score (MGPS), radiographic scoring, and synovial PGE₂ levels during the initial 8 weeks after surgery.

Results: There were no significant outcome differences identified between all 3 treatment groups over the 8-week study period. Trends for decreasing pain levels and increased limb function were observed in groups 1 (2 J/cm²) and 3 (6 J/cm²) based on CBPI, GMPS, and force plate analysis. Trends for increased bone healing and decreased PGE₂ were found in group 2 (4 J/cm²).

Discussion/Conclusion: This is the first study to evaluate variable power doses for LLLT in TPLO patients. The trends for potential beneficial effects from each power setting will allow for the testing of future LLLT treatment protocols for larger TPLO study groups.

Acknowledgment: Study funding provided by Respond Systems Inc. The investigators declare no conflicts of interest.

A3763. Use of a Novel Osteotomy Guide (Bonetractor) for Closing Wedge Osteotomies: Ex vivo Evaluation of Osteotomy Accuracy

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Introduction: Wedge osteotomies are a common orthopedic procedure performed to treat various conditions in animals and people. In particular, closing wedge osteotomies (CWO) are frequently performed for the correction of angular limb deformities and cranial cruciate ligament disease in dogs. Osteotomy accuracy is essential for proper alignment, reduction, and appropriate implant placement. In people, procedure-specific osteotomy guides are used to improve accuracy. However, such guides are not utilized in veterinary medicine, and none of the currently available devices allow for accurate completion of a coplanar wedge osteotomy. The goal of this research was to design a device that produces consistent, coplanar CWOs. We hypothesized that this device would produce osteotomies that are more accurate than osteotomies created using standard technique.

Materials and Methods: A 20° cranial CWO (CCWO) was performed utilizing 16 ($n = 8/\text{group}$) tibia Sawbones. CCWO was created without (standard procedure; STCCWO) and with the aid of the 'wedge osteotomy BoneTractor device' (BTCCWO). The wedges were evaluated for accuracy by comparing wedge angle, divergence of the 2 osteotomies (osteotomy divergence angle [ODA]), and measurements from medial and lateral aspect of the wedges. Mean values of two groups were compared using *t*-tests.

Results: ODA (cranial and caudal) and the difference between the medial and lateral measurements were significantly smaller (all $p < 0.01$) between groups, with the BTCCWO group being smaller. There was no significant difference in wedge angle created between groups.

Discussion/Conclusion: The BoneTractor improved the accuracy of CCWO compared with standard technique.

Acknowledgment: The primary investigator (FD) designed the device used in this study.

A3836. Assessment of Magnetic Resonance Imaging, Musculoskeletal Ultrasound, and Arthroscopy in the Diagnosis of Medial Shoulder Syndrome in Canines

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Introduction: Medial shoulder syndrome (MSS) is an important cause of forelimb lameness in dogs. Following relevant physical exam findings, advanced imaging modalities aid in diagnosis. The aim of the current study was to evaluate the efficacy of MRI for diagnosis of MSS, using arthroscopy as the gold standard.

Materials and Methods: Medical records of dogs that had an MRI of the affected shoulder(s) from 2008–2018 were evaluated for correlation of MRI findings to arthroscopy, as well as musculoskeletal ultrasound findings to arthroscopy (where applicable), in relation to a diagnosis of MSS.

Results: Arthroscopy confirmed MSS in 15/15 shoulders that were included. Musculoskeletal ultrasound was performed in 13/15 (86%) shoulders, and correlated with intra-articular shoulder pathology (inclusively, MSS) in 12/13 (92%). MRI was performed in 15/15 shoulders, and confirmed MSS in 1/15 (7%).

Discussion/Conclusion: The present study indicates that MRI is not a sensitive diagnostic modality for the diagnosis of MSS, in contrast to previous reports. In addition, musculoskeletal ultrasound offers several advantages over MRI, including the ability to perform the test without general anesthesia, less expense, easy evaluation of both shoulders, and dynamic evaluation of relevant structures. The incidence of bilateral MSS has been reported as high as 24%, making bilateral evaluation crucial. Limitations of this study include its retrospective design and natural variation in interpretation between ultrasonographers, radiologists, and surgeons. In addition, this study population represents some of the most diagnostically challenging cases.

Acknowledgment: There was no proprietary interest of funding for this study.

A3816. Ventral Approach for the Placement of a Toggle Rod in Two Dogs with Caudoventral Hip Luxation

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Introduction: This report describes two dogs with caudoventral luxation of the coxofemoral joint, treated via a ventral approach with a toggle rod and capsulorrhaphy.

Materials and Methods: Two dogs presented for lameness associated with recurrent caudoventral coxofemoral luxation that had failed to respond to multiple attempts at conservative management. A ventral approach to the coxofemoral joint was used to assess the joint capsule, transverse acetabular ligament, and ligament of the head of the femur. In both cases the joint capsule and ligament of the head of the femur were deficient but the femoral head would luxate over, rather than through the transverse acetabular ligament. A toggle rod was applied via a ventral approach using the same landmarks described for its application via the dorsal approach.

Results: Both dogs had good functional outcomes at 8 weeks and 4–5 months postoperatively. Coxofemoral extension was mildly decreased. Radiographs showed mild enlargement of the femoral bone tunnel and but no progressive degenerative changes of the coxofemoral joint.

Discussion/Conclusion: Caudoventral coxofemoral luxations result in variable damage to the supporting structures

of the coxofemoral joint. Thorough assessment of the supportive structures requires a ventral approach and this also allows stabilization and reconstruction to be tailored to the individual case. This technique was successful at maintaining reduction of the coxofemoral joint and had a good functional outcome in the medium term.

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

A3723. Percutaneous Fluoroscopically Guided Lag Screw Fixation for Sacroiliac Luxation

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Introduction: Sacroiliac luxation (SIL) is the traumatic separation of the wing of the ilium from the sacrum. The purpose of this study is to describe the surgical technique and evaluate the accuracy of lag screw fixation for SIL in dogs utilizing a novel fluoroscopically assisted percutaneous MIO technique. We hypothesize that this technique will achieve similar results to previously documented MIO techniques with low radiation exposure to personnel.

Materials and Methods: 17 beagles with iatrogenic SIL underwent reduction and stabilization with 3.5 mm screws. 14 G hypodermic needles and fluoroscopy were used to orient 2 K-wires for temporary stabilization and to guide drilling of glide and pilot holes using cannulated drill bits. Surgeons were able to step away during aiming, after initial reduction, and K-wire stabilization. Surgical time and radiation exposure were recorded. Postoperative CTs were performed to assess screw angulation and purchase.

Results: The average time for surgical fixation was 15.85 minutes. A cumulative radiation dose of 0.4 mrem for the dominant arm of the assistant and 0 mrem for the primary surgeon was recorded. The mean DVA and CCA screw angles were 0.68° and 1.9°. 16/17 dogs had 100% sacral screw purchase with the remaining case achieving 93.4%.

Discussion/Conclusion: Accuracy of screw placement was not significantly different ($p > 0.05$) from the previously published MIO values of 1.2° (DVA) and 1.6° (CCA). Use of needles instead of a hand-held drill guide for aiming resulted in accurate screw placement and minimal radiation exposure to personnel in adherence with ALARA guidelines.

Acknowledgment: No proprietary interest. Funded by faculty startup funds

A3752. Reduction of Excessive Tibial Plateau Angle Using a Hinged Fixator and Distraction Osteogenesis

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Introduction: A 24-week-old, spayed female, Rhodesian Ridgeback was referred for premature eccentric closure of the caudal aspect of the proximal tibial physis resulting in an excessive tibial plateau angle (TPA) after sustaining comminuted diaphyseal fractures of the left femur, tibia, and fibula.

Materials and Methods: Surgery was performed to reduce the TPA of 50° using a hinged circular external fixator (IMEX Veterinary, Inc., Longview, TX) and institute distraction osteogenesis for limb lengthening.

Results: Distraction was initiated the day following surgery at a rate of ~1 mm per day as measured along the caudal cortex of the tibia with a rhythm of three distractions daily. At 19 days, postoperatively, there was 17 mm of distraction along the caudal cortex. 7 weeks following surgery, the dog sustained a fracture of the osteopenic tuber calcaneus which was stabilized with orthogonal plates. 12 months after surgery, the dog had a mild weight-bearing lameness at a trot with the limb held in slight abduction and external rotation at rest. Radiographs revealed mild valgus, recurvatum of the left tibial diaphysis, and a TPA of 3°.

Discussion/Conclusion: The magnitude of the crural deformity, excessive TPA, and limb length discrepancy did not offer a favorable outcome for a companion animal. The hinged circular fixator allowed for improvement of lameness, restoration of an acceptable TPA, resultant limb lengthening, and partial correction of angular deformity in this dog.

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

A3797. Metastatic Progression of Osteosarcoma following Intravenous Administration of Mesenchymal Stromal Cells Can Be Ameliorated with Cisplatin

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Introduction: We previously showed that intravenous delivery of MSCs enhanced pulmonary metastatic progression in osteosarcoma (OSA). The influence of chemotherapy with MSC therapy in a micrometastatic environment is unknown. The objective of this study was to determine if cisplatin chemotherapy would ameliorate the accelerated metastasis associated with intravenous MSC treatment.

Materials and Methods: An established model of murine OSA pulmonary micrometastasis was used (Aanstoos, ME, et al). Mice were randomized to receive either: (1) no treatment, (2) IV AdMSCs, (3) IV AdMSCs and cisplatin, or (4) cisplatin. Median survival (MS) was compared between groups using Kaplan-Meier survival analysis

Results: The MS of mice treated with AdMSCs alone was significantly less than mice treated with no adjuvant treatment ($p = 0.036$). Treatment with AdMSCs was associated with a 73% increased risk of death when no chemotherapy was given. When AdMSCs were given in conjunction with cisplatin, median survival did not differ from that of the cisplatin alone group.

Discussion/Conclusion: IV administration of AdMSCs accelerates progression of metastatic OSA. The use of cisplatin in combination with AdMSCs negated this effect. Future study will be focused on determining the influence of cisplatin exposure on the biologic activity of AdMSCs following IV injection.

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A3768. Comparison of Cross-sectional Geometrical Properties and Bone Density between Saint-Bernard and other Giant Breed Dogs

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Introduction: The experience of the authors suggests that Saint Bernard dogs are at greater risk of developing biomechanical complications after surgical limb sparing of the radius. Understanding the possible causes for this increased risk could provide valuable information as to how to manage and decrease it. The goal of this study was to investigate if physical characteristics of the radius of Saint Bernard dogs may play a role on surgical limb sparing postoperative complications.

Materials and Methods: Medical records from Saint Bernard and giant breed dogs with computed tomography imaging were reviewed. Cross-sectional parameters were measured and calculated through the distal-proximal-radial length. BMD was estimated from Hounsfield Units measurements.

Results: Thirteen dogs were selected per-group. Comparison between groups revealed multiple statistically significant differences (i.e., cortical thickness, medullary-cavity area, and cortical/medullary ratio) between groups. Cortical thickness and medullary-cavity area differences resulted in a lower cortical/medullary cavity ratio in the Saint Bernard. There was no difference in cross-sectional BMD, although the mean from all cross-sections revealed a lower BMD in the Saint Bernard.

Discussion/Conclusion: The findings reported in this study are clinically relevant as they provide valuable data for future improvement of surgical limb sparing implants, procedures, and postoperative care guidelines for these patients. Additionally, our findings suggest that the Saint Bernard might not be an adequate donor for bone allografts. Future

studies are indicated to determine the significance of the difference in BMD.

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A3804. Kinesiology Analysis of Different Physical Activities in Hip Dysplastic and Healthy Dogs

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Introduction: Canine hip dysplasia (CHD) produce clinical signs of lameness, reluctance to move and difficulties in getting up, sitting down, climbing upstairs, and walking down slopes. To investigate these CHD signs our objective was evaluate these activities using kinesiology equipment to quantify the limitations in these patients.

Materials and Methods: 20 dogs with bilateral CHD and 20 healthy dogs were used. Both groups were submitted to kinetic and kinematic analysis while walking. Climbing upstairs, walking down a slope, sitting down, standing up were evaluated with kinematic equipment. Vertical forces during walking and motion data collected from the right hip, femorotibiopatellar, and tibiotarsal joints were compared between groups in several physical activities and mean difference on average was recorded after statistics (unpaired *t*-test with $p < 0.05$).

Results: Dysplastic dogs had peak vertical force decreased in 4% of body weight on average, symmetry index increased in 12.6% on average, and maximum hip joint extension angle and range of motion (ROM) reduced in all tests. Mean hip joint ROM difference was 20, 25.5, 25.4, and 11 degrees (climbing upstairs, walking down a slope, sitting down, standing up, and walking exercise, respectively).

Discussion/Conclusion: Kinesiology showed that dogs with CHD have difficulties performing several physical activities not just walking. These results suggest that access to the locomotion in different activities to provide a more comprehensive patient evaluation in dysplastic dogs is recommended.

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