Comparison of Exercise vs. a Rolling Technique Under General Anesthesia for the Correction of Nephrosplenic Entrapment of the Large Colon in Horses: 97 Cases (2004-2010). Lisa Fulzi1, John Peloso1, Steve Gigueré2, Aric Adams1, 2, Surgery, Equine Medical Center of Ocala, Ocala, FL; 3Department of Large Animal Medicine, University of Georgia, Athens, GA.

Nephrosplenic entrapment of the large colon (NSELC) is caused by left dorsal displacement of the ascending colon that subsequently becomes entrapment over the nephrosplenic ligament. Medical treatment options include exercise or rolling under general anesthesia following the IV administration of IV phenylephrine.

We hypothesized that the concentration of cells would be higher in the sternum site and harvest fraction on stem cell quantity and rate of growth. We compared exercise versus a rolling technique under general anesthesia following IV phenylephrine that precedes a rolling technique under general anesthesia has a higher success rate than exercising for the treatment of NSELC.

The medical records of ninety – seven cases with a diagnosis of nephrosplenic ligament entrapment of the large colon presented to the Equine Medical Center of Ocala were reviewed. Horses with a gas echo proximal to the spleen that prohibited visualization of the kidney on ultrasound examination or identification of the ascending colon that could be palpated in or traced to the nephrosplenic space on rectal examination were included in the study. All horses received IV phenylephrine and were assigned to an exercised or rolled treatment group. A treatment success was defined as the resolution of signs of colic and a treatment failure was defined as the return of signs of colic.

The higher success rate of rolling under general anesthesia suggests that this therapy should be the initial recommendation for horses with NSELC.

Equine Bone Marrow-Derived Mesenchymal Stem Cells: Comparing the Sternum and the Ilium. Mackenzie K. Adams1, Laurie Goodrich1,2, Sangreeta Rao1, Francisco J. Olaya-Popelka1, Nikki Phillips2, John D. Kissiday1,2, C Wayne McIlwraith1,2. 1Department of Clinical Sciences, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO; 2Equine Orthopedic Research Center, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO.

Bone marrow-derived mesenchymal stem cells (BMDMSCs) have been shown to improve healing of cartilage, bone and soft tissues of horses and other species. The two sites of equine BMDMSC harvest are the sternum and ilium, and site selection is based primarily on practitioner preference. The goal of this study was to determine the effects of harvest site and harvest fraction on stem cell quantity and rate of growth. We hypothesized that the concentration of cells would be higher in the sternum than the ilium, and that the first fraction of marrow harvested from either site compared to subsequent fractions. Furthermore, we hypothesized that cell growth rates would not differ between sites. Two sequential 5-ml marrow samples were taken from the sternum and ilium of seven horses prior to euthanasia. Nucleated cell counts (NCCs) were obtained at each passage. 5-ml marrow samples were taken from the sternum and ilium of seven horses prior to euthanasia. Nucleated cell counts (NCCs) were obtained at each passage.

In vitro, NCCs were obtained at each passage. 5-ml marrow samples were taken from the sternum and ilium of seven horses prior to euthanasia. Nucleated cell counts (NCCs) were obtained at each passage.

Hemilaminectomy and Vertebral Stabilization for the Thoracolumbar Intervertebral Disc Associated Vertebral Instability in 11 Dogs. Takeshi Aikawa1, 2, Mitsuhiko Shibata1, Moe Asano3, 1Aikawa Veterinary Medical Center, Tokyo, Japan; 2Veterinary Surgical Service Japan, Tokyo, Japan.

Thoracolumbar (T-L) intervertebral disc disease (IVDD) is the most frequent neurological disorder in veterinary medicine. A relationship between degenerative changes of the intervertebral disc and biomechanical functions of the lumbar spine has been documented in human biomechanical study. The disc associated vertebral instability (DAVI) is defined as vertebral segment that has dynamic spinal cord compression due to degenerated intervertebral disc. The diagnostic method and treatments for T-L DAVI have not been described in veterinary medicine.

Medical records (2005-2010) of dogs with a stress myelographic diagnosis of post-stress spinal cord dynamic compression without pre-stress compression that had hemilaminectomy and vertebral stabilization were reviewed.

Eleven dogs (mean: 4.7 years old) were identified. All dogs had acute onset of ambulatory or non-ambulatory paraparesis. The stress myelography demonstrated distinct post-stress ventral dynamic compression by bulging of the disc. The site of DAVI was the PI-II plate in 9/11 dogs (T12-L1, T12-L3, T13-L1), the PI-II plate lateral in 2/11 dogs (T13-L1, L3-4) and the PI-II plate in 2/11 dogs (T12-L1, T12-L3, T13-L1, L3-4). The percentage of reduction on post-stress spinal cord compression was 5.7% to 27.2% (mean 18.5%). All dogs recovered postoperatively and remained to be ambulatory at follow up (mean: 24 months).

Disc degeneration may cause the loss of stiffness in the intervertebral disc with resulting increase in motion at the segment prior to disc herniation. Conventional imaging (Myelography, CT, MRI) may not exclude the possibility of DAVI. The use of stress myelography may be warranted to make a definitive diagnosis of DAVI. Hemilaminectomy with stabilization was an effective treatment for T-L DAVI resulting in long-term neurologic improvement in all dogs.
Thoracolumbar Intervertebral Disc Extrusion in French Bulldogs: The Dissimilarity from that of Miniature Dachshund and the Association with the Congenital Vertebral Anomalies. Takeshi Aikawa1,2, Moe Asano1, Mitsuhiro Shibata1, Hiroshi Fujita1, Yasushi Harasa, Masahiro Tagawa2, Hiromitsu Orima1.

1Aikawa Veterinary Medical Center, Tokyo, Japan; 2Division of Veterinary Surgery, Nippon Veterinary and Life Science University, Tokyo, Japan; 3Veterinary Radiology, Nippon Veterinary and Life Science University, Tokyo, Japan.

French Bulldog (FB) is a chondrodystrophic breed with high risk of thoracolumbar intervertebral disc extrusion (T-L IVDE). T-L IVDE in FB and its association with the congenital thoracic vertebral anomalies have not been well evaluated.

Medical records of 47 FBs and 671 Miniature Dachshund (MD) with definitive diagnosis of T-L IVDE by myelography or MRI and hemilaminectomy by one surgeon were reviewed. The age, gender, vertebral anomaly, kyphosis/kyphoscoliosis, distribution of IVDE site, non-recovery and progressive hemorrhagic myelomalacia (PHM) development from Grade (G)5 (paraplegia with absent DPP) were compared between 2 breeds.

The age of FB was significantly younger (P = 0.00001) and the rate of male FB was significantly higher (P = 0.0226) than those of MD. The risks of vertebral anomaly and kyphosis/kyphoscoliosis in FB were both significantly higher (P < 0.00001) than those of MD. No dog had IVDE within kyphotic/kyphoscoliotic segment. The risks of FB with IVDE within typical site (T11-L3) was significantly lower (P = 0.000487) and within caudal segment (L5-S3) was significantly higher (P = 0.000119) than those of MD. There was no significant difference (P = 0.1818) of non-recovery from G5 but the risk of developing PHM in G5 FB was significantly higher (P = 0.0328) than that of MD.

The T-L IVDE sites of FBs are different from that of MDs distributing T-L to caudal lumbar spine. The vertebral anomalies and kyphosis/kyphoscliosis were not associated with the IVDE. FB appears to have T-L IVDE in younger ages, with higher male predisposition and with higher risk of developing PHM from G5 than those of MD.

Assessment of Postoperative Recovery, Time to Ambulation, Urinary and Fecal Incontinence in 831 Dogs with Thoracolumbar Intervertebral Disc Disease. Takeshi Aikawa1,2, Hiroshi Fujita1, Shinachi Kanazono1, Yuki Yoshiyama1, Mitsuhiro Shihata1, Aikawa Veterinary Medical Center, Tokyo, Japan; 2Veterinary Surgical Service Japan, Tokyo, Japan.

In canine thoracolumbar intervertebral disc disease (T-L IVDD), the time to ambulation (TTA) and the risk of mild urinary/fecal incontinence (UI/FI) in recovered dogs have not been well evaluated.

Records of dogs (2000-2007) that had hemilaminectomy by one surgeon were reviewed. The TTA, the rate of early recovery (<14 days), the incidences of UI and FI in recovered dogs were statistically compared among preoperative grades. In dogs that had not recovered DPP, the incidence of dogs that became ambulatory, their urinary/fecal function and self-mutilation were evaluated.

Eight hundred and thirty-one dogs met the inclusion criteria with mean follow-up of 39.8 months. The recovery rates were G1-2 to G4b (95.0-98.7%) and G5 (52.1%). The mean and median TTA were G1-2 (4.8–4.4), G3 (7.7–7), G4a (10.5–10), G4b (12.1–10) and G5 (21–21). The rate of early recovery were G1-2 (86.7%), G3 (81.9%), G4a (74.4%), G4b (69.7%) and G5 (36.4%).

In 709 recovered dogs, the UI rates were G1-2 (5.6%), G3 (5.3%), G4a (14.6%), G4b (18.4%) and G5 (38.2%). The FI rates were G1-2 (3.3%), G3 (2.9%), G4a (7.3%), G4b (10.5%) and G5 (18.2%). In 75 surviving dogs that had persistent DPP loss, 20 dogs became amputatory and 5 dogs had episodic self-mutilations.

The rates of early recovery were lower and the mean and median TTA were longer with the worse preoperative grades. The results indicate the UI/FI can occur in recovered dogs from any preoperative grade and the worse grades were associated with a greater risk of UI/FI. The results suggested that preoperative grades can be used as a prognostic indicator for recovery, for TTA and for the risk of UI/FI.


Inappropriate acetabular cup position (ACP) is a risk factor for postoperative complications including total hip replacement in dogs. We hypothesized that radiographic position artifact of craniocaudal pelvic tilt (CTC) will cause significant inaccuracy in ACP measurements from a ventrodorsal radiograph (VDR); and ACP measurements of coronal version and angle of lateral opening (ALO) viewed from a lateral radiograph (LR) will be consistent and accurate.

Eleven VDRs were obtained after insertion of a CFX cup into the acetabulum of a Sawbones pelvis. For each radiograph, the pelvis was placed in varying degrees of CTCP. Fifteen LRs were obtained of a pelvis with the cup implanted in varying positions of coronal version and ALO. Five blinded observers measured the angles of version, inclination and ALO on each VDR and the ALO and coronal version on each LR.

An almost perfect level of agreement was observed for the repeatability of both the VDR and LR measurements. When varying degrees of CTCP were introduced, there was no agreement in the measurements of ACP from the VDRs. At all ACPs, measurements taken from the LRs were in agreement. Undetectable CTCP causes significant variability in cup measurements on VDRs, predisposing measurements to inaccuracy. Measurements obtained from the LRs of coronal version and ALO are accurate and consistent and can be used to determine ACP.

VDRs should not be used to assess measurements of ACP. Reproducible and accurate measurements of ACP obtained from the LR may allow for an understanding of the influence of ACP on luxation following THR.

In Vitro Comparison of 7 Polydioxanone and 2 Poly lactin 910 for Closure of Ventral Midline and Right Ventral Paramedian Celiotomies in Horses. Stacy L. Anderson, Jose Bracamonte, James L. Carmalt, David G. Wilson, Steven Hendrick. Large Animal Clinical Sciences, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada.

The objective of this study was to compare the bursting strength (BS) and mode of failure (MF) of ventral midline (VM) and right ventral paramedian (RVP) celiotomies closed with either 7 braided polydioxanone (7PD) or 2 poly lactin 910 (2PG). A 25-cm VM or RVP celiotomy was created in 20 fresh equine cadavers. A 200-L polyurethane bladder was inserted into the abdomen. Celiotomies were closed in a simple continuous pattern using 1 strand of 7PD in 1 section or 2 single-strands of 2PG in 2 sections. The bladder was inflated with compressed air until construct failure. The horses’ signalment, body weight, celiotomy type, suture type, MF and BS (mmHg) were recorded and analyzed statistically for interactions.

No significant difference was found between the mean BS of VM and RVP celiotomies nor between the mean BS of celiotomies closed with 7PD or 2PG. Increasing age had a negative effect on BS (P = 0.01). When the effect of age was considered, RVP celiotomy had a significantly lower BS compared to VM celiotomy (P = 0.032). Suture type, but not celiotomy type, had a significant effect on MF (P = 0.003). Suture failure was the main MF for 2PG with 6 of 10 celiotomies failing at the suture, whereas fascial failure was the main MF for 7PD with all celiotomies failing at the body wall.

In this study, 7PD proved to be a superior suture material compared to 2PG for closure of VM and RVP celiotomies as failure occurred by fascial failure rather than suture failure.

Biomechanical Comparison of V-Loc and Biosyn Suture in Canine Incisional Gastropexies. Melissa Arbauge, Eric Monnet. Colorado State University, Fort Collins, CO.

The purpose of this study is to compare the tensile strength of Biosyn suture in canine incisional gastropexies with V-Loc suture. We hypothesized that incisional gastropexies performed with V-Loc would be as strong as those performed with Biosyn in the acute model. Twenty-four cadaveric stomachs and body walls were harvested from medium sized dogs euthanized for reasons unrelated to the study. The samples were divided into six groups: 2-0 Biosyn, 3-0 Biosyn, 4-0 Biosyn, 2-0 V-Loc and 3-0 V-Loc. Standard 4 cm incisional gastropexies were performed with each suture by the same individual. The tensile strength of the gastropexies was determined by placing the stomach and body wall within a distraction device. Failure was defined as either tearing of the suture or the tissue. The tensile strength (newtons) was compared between the different suture types and sizes.

Suture failure was not observed in any group. The mean and standard deviation of tensile strength for each group was as follows: 2-0 Biosyn (44.0 +/- 10.8), 3-0 Biosyn (40.9 +/- 4.9), 4-0 Biosyn (44.1 +/- 6.7), 2-0 V-Loc (51.2 +/- 5.1), and 3-0 V-Loc (44.9 +/- 5.7). There was no statistical difference in total hip xenograft with regards to size (P = 0.17). The data was evaluated for interaction between suture type and size, and none was identified (P = 0.58).

Based on these data, V-Loc suture appears to be as strong as Biosyn suture for incisional gastropexies in the acute model. Suture size does not appear to affect tensile strength of an incisional gastropexy.
Does Preoperative Ionized Calcium or Parathyroid Hormone Concentrations Predict Subsequent Pyometra in Horses Following Parathyroidectomy? (17 Dogs?) Melissa Arbaugh, Daniel Smeak, Eric Monnet, Clinical Sciences, Colorado State University, Fort Collins, CO.

The purpose of this study is to evaluate predictors of postoperative hypocalcemia in dogs following parathyroidectomy. We hypothesize that the preoperative calcium concentrations will aid in predicting postoperative hypocalcemia. We also hypothesize that the slope of the regression line over the first 24 hours will aid in prediction of hypocalcemia following surgery.

Medical records were evaluated from years 2001–2009. Data evaluated included age, breed, sex, clinical signs, diagnostics performed, preoperative and postoperative iCa, preoperative PTH concentrations, and whether or not calcium supplementation was provided following surgery. Two groups were identified based on whether dogs became hypocalcemic (HO) (iCa < 1.2 mg/dl) or not (NHO) following parathyroidectomy. Seventeen dogs were entered in the study, 12 developed hypocalcemia postoperatively. Preoperative (within 24 hours of surgery) iCa concentrations for the HO group 1.82 ± 0.22 mg/dl and the NHO group 1.83 ± 0.29 mg/dl (P = 0.66) were not significantly different. Calcium levels declined in a linear fashion during the 24 hours following parathyroidectomy and the slopes of the decay over that time were not significantly different between the two groups (P = 0.42). Preoperative PTH concentrations were not significantly different between the HO and NHO groups (P = 0.51). Preoperative iCa levels or PTH levels are not predictive of postoperative hypocalcemia. The relationship between hypocalcemia and underlying parathyroidism, resulting in pyometra, is limited and ovariohysterectomy may be indicated. In the authors’ experience, resection of a portion of the cervix can restore the lumen, enabling treatment and reducing recurrence of pyometra, and allowing the production of foals through assisted reproductive techniques.

Cervical Wedge Resection for Treatment of Transluminal Cervical Adhesions and Subsequent Pyometra: 3 Clinical Cases. Carolyn E. Arnold, Steven P. Brinsko, Dickson D. Van Cott. Texas A&M University, College Station, TX.

Cervical adhesions result from trauma at parturition or excessive manipulation of the cervix. In severe cases, adhesions may completely occlude the lumen resulting in pyometra. Without cervical patency, treatment of pyometra is limited and ovariohysterectomy may be indicated. In the authors’ experience, resection of a portion of the cervix can restore the lumen, enabling treatment and reducing recurrence of pyometra and allowing the production of foals through assisted reproductive techniques.

Effect of Stifle Angle on the Magnitude of the Tibial Plateau Angle Measurement in Dogs with Intact and Transected Cranial Cruciate Ligament: Cadaveric Study. Karanvir S. Aulakh1, Tisha A. Harper1, Otto I. Lanz2, Gregory B. Daniel1, Stephen Werre3.1Small Animal Clinical Sciences, Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA; 2Biomedical Sciences and Pathobiology, Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA.

The objective of the study was to determine the effect of stifle angle on the magnitude of the radiographic tibial plateau angle (TPA) in normal and cranial cruciate ligament (CCL) deficient stifles. Fifteen stifles following parathyroidectomy were used for this study. Three pairs of canine cadaver hind legs from three skeletally mature dogs were positioned in a custom made positioning device which allowed positioning of the legs at various stifle angles. A lateral radiograph of each specimen was obtained before and after transection of the CCL at four stifle angles: 130°, 135°, 140°, and 145° (range: 0.206–1.812 mg/ml). Bupivacaine concentration decreased quickly after single intra-articular injection, however, is unknown. This study’s purpose was to determine synovial fluid bupivacaine concentrations after a single intra-articular injection. Eight client-owned dogs undergoing stifle surgery for cranial cruciate ligament disease were recruited. Prior to surgery, 0.2 ml/kg of 0.5% preservative-free bupivacaine (1 mg/kg) were injected into the stifle joint. Joint fluid samples were taken immediately after (T1) and 30 minutes after injection (T3), and analyzed with high-performance liquid chromatography.

Mean patient body weight was 31.7 kg (range 22-45 kg). Mean time to acquire the second sample was 30.07 (min:sec). At T1, the mean (± SD) bupivacaine concentration was 2.670 ± 0.855 mg/ml (range: 1.900 to 4.371 mg/ml). At T3, mean bupivacaine concentration was 0.692 ± 0.501 mg/ml (range: 0.206–1.812 mg/ml).

Bupivacaine concentration decreased quickly after single intra-articular injection, however, is unknown. This study’s purpose was to determine synovial fluid bupivacaine concentrations after a single intra-articular injection.

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multiple use (Clickline®, Karl Storz). Instrument set B included grasping forceps and scissors designed for single use (Endo Shears® COVIDIEN). Skills were tested four times (twice for each set of instruments) in a randomized AB-BA or BA-AB crossover design. Scores generated using set A or set B were compared with a Wilcoxon matched-pairs signed rank test.

Fourteen veterinarians completed the study. Overall, participants scored significantly higher when using instrument set A (median 208, IQR 162–237) compared with set B (median 183, IQR 121–219) (P = 0.0461) with a 25 point difference between median scores. For individual tasks, a strongly significant difference was seen for the pattern cutting task, which utilized a grasper and scissors (P = 0.0009). The differences for the peg transfer and ligature loop tasks were not significant (P = 0.0287 and 0.4802 respectively; significance set at P = 0.016).

We concluded that laparoscopic skills were affected by instrument type. When developing and performing a high-stakes test to assess veterinarians' laparoscopic skills, the instruments used should be standardized.

### Effects of Intraperitoneal Administration of Bilirubin on Infarct Area and Left Ventricular Function in a Rat Model of Acute Coronary Occlusion

Ron Ben-Amotz, Chris Adin, Feng Xu, Veterinary Clinical Sciences, The Ohio State University, Columbus, OH.

Bilirubin was considered to be a toxin that accumulates after catabolism of heme by the enzyme heme oxygenase. However, a mounting body of evidence suggests that bilirubin, at a physiological (non-toxic) doses, is a powerful antioxidant and anti-atherosclerotic agent. Interestingly, recent clinical studies have shown that human beings with genetically induced hyperbilirubinemia (Gilbert Syndrome) are protected against coronary heart disease. The purpose of this study was to investigate whether administration of exogenous bilirubin to normal rats would convey similar protective effects in an experimental model of coronary ischemia. Our hypothesis was that bilirubin administration (20 μM/kg, IP, 1 hour before injury) would decrease infarct area and preserve left ventricular function when compared to non-treated rats.

Coronary ischemia was induced by temporary (30 min) ligation of the left anterior descending coronary artery in control rats (n = 5), bilirubin treated rats (n = 5), followed by a 1 hour period of reperfusion. Left ventricular function was estimated non-invasively using echocardiographic measurements of fractional shortening and area shortening. Effects of anesthesia on cardiac function were controlled for by using a sham group (n = 5). There was a significant reduction of infarct size in the bilirubin treated group compared to the non-treated group (13.34% vs. 25.5%, P < 0.0067). Left ventricular function decreased in both experimental groups after ischemia and reperfusion, although bilirubin provided a protective effect on fractional shortening during the period of ischemia (18.8 vs. 25.8%, P = 0.034). Based on the results of this study, bilirubin supplementation appears to provide significant decrease in infarct size although protective effects on left ventricular function were noted only during the period of ischemia.

### Evaluation of Equine Compensation in Fifty-Five Clinical Cases of Lameness

Dusty Patterson1, Troy N. Trouble1, Nicholas Ernst1, Megan Swaab1, Alicja Biedrzycki1, Sabrina Brounts1, Ashley Kelly1,2, Donna Groschen1. 1Veterinary Population Medicine, University of Minnesota, St. Paul, MN; 2Rood and Riddle Equine Hospital, Lexington, KY.

Clinical cases often involve multiple limb lameness. This retrospective study evaluated fifty-five clinical cases with various lameness types using both a traditional lameness examination and force plate data. Two sets of comparisons were made: (1) the PVF for clinical cases were compared within each horse (e.g., sound to lame contralateral limb, diagonal pair, and ipsilateral pair) and (2) clinical cases were compared with seven sound control horses to look for differences in PVF between lame and sound horses.

No statistically significant patterns emerged in PVF between the clinical cases and control nor when comparing contralateral limbs, ipsilateral limb pairs, or diagonal limb pairs within the clinical cases. In a number of cases, however, the force plate data from the clinical cases reflected evidence of compensation. There were trends in compensation patterns when examined based upon the primary lameness identified subjectively. Patterns were specifically identified in primarily forelimb and primarily hind limb lamenesses. In 70% of the primary forelimb lameness cases force was shifted to the contralateral and ipsilateral limb. In 61% of hind limb primary lameness cases force was shifted to the ipsilateral limb.

Descriptive analysis of peak vertical forces provided some insight into compensation patterns of lame horses even though no statistical differences could be identified. Controlled research studies are necessary to determine exact compensation patterns with a known lameness or combination since clinical cases are complex.

### Effective Knockdown of Interleukin-1β in Osteoarthritic-Prone Guinea Pig Chondrocytes Influences Gene Expression of Additional Mediators Implicated in Disease Pathogenesis

Kelly S. Santangelo1, Alicia Bertone1,2. 1Veterinary Biosciences, The Ohio State University, Columbus, OH; 2Veterinary Clinical Sciences, The Ohio State University, Columbus, OH.

Targeted reduction of gene products involved in osteoarthritis (OA) via RNA interference (RNAi) may define contributions of specific molecular pathways to pathogenesis and offers potential as a therapeutic strategy. We recently constructed and validated a adenovirus associated virus serotype 5 (AAV5) vector containing a U6-driven short hairpin RNA (shRNA) capable of silencing the interleukin-1β (IL-1β) transcript in guinea pig chondrocytes. It was our hypothesis that in vitro application of this AAV5 vector would result in changes in expression of additional disease mediators. IL-1β and an additional 9 transcripts were quantified using relative real time RT-PCR following transduction with our novel knockdown AAV5 vector. Percent gene expression levels relative to non-transduced and non-targeting AAV5 vector controls were calculated using the comparative CT (2^-ΔΔCT) method. Statistically significant decreases in IL-1β expression were achieved by the targeting knockdown AAV5 vector relative to both control groups. Further, the targeting AAV5 vector statistically increased transcript levels of a key anabolic mediator, and significantly decreased expression of inflammatory cytokines and catabolic agents. To validate in vitro findings, our AAV5 vector or saline equivalent were injected into contralateral knee joints of Hartley guinea pigs. In vivo application resulted in a > 50% reduction of the IL-1β transcript relative to vehicle-only escalating arthritis. In conclusion, successful in vitro and in vivo application of the IL-1β transcript was achieved via RNAi techniques. Importantly, this diminution influenced transcript levels of several major players involved in OA in the direction of beneficial disease modification, indicating further in vivo investigations are warranted.

### Comparison of Bilateral Ovariectomy Versus Ovariohysterectomy for the Sterilization of Pot Bellied Pigs: 14 Cases

Ashley Kelly1,2, Adam Bedziacki, Sabrina Brounts1, Donna Groschen1, Ashley Kelly1,2, Christina Dart1, Nigel Perkins1, Leo Jeffcott1, Andrew Desanti1,2, Donald F. Maloney1. 1Veterinary Population Medicine, University of Minnesota, St. Paul, MN; 2Rood and Riddle Equine Hospital, Lexington, KY.

The increased popularity of Vietnamese Pot Bellied Pigs (VPBP) as pets has resulted in an increased request to perform routine neutering procedures. While there have been several publications concerning bilateral ovariectomy (OVE) and ovariohysterectomy (OVH) in other species, there have been no reports evaluating these procedures and outcome in swine. Our aim was to evaluate the surgical technique and complications between bilateral OVE and OVH for routine neutering of pet pigs. Medical records of pig’s presented for neutering from 2001–2010 were reviewed to determine history; signalment; clinical examination findings; surgical technique; intra-operative complications; postoperative complications; length of hospitalization and outcome. Long-term follow-up was obtained via an owner telephone questionnaire. There were 14 intact female pigs with a mean age of 131 ± 66 days. Nine pigs underwent an OVE and 5 underwent an OVH. Surgical time for an OVE was significantly shorter than for an OVH (P < 0.0001). Fewer postoperative complications, such as hemorrhage, fever, inappetence and incisional site infections, were encountered with the OVE group than the OVH group. Return to normal behavior and appetite was significantly shorter for the OVE group than the OVH group. No long-term complications were reported. There was no significant difference in client satisfaction of outcome between the two procedures. OVE is technically more complicated, time consuming and associated with greater morbidity compared to an OVE. OVE is a safe and recommended alternative to OVH as the procedure of choice for routine neutering of swine.

### The Effect of Short- and Longer-Term Treatment with Manuka Honey Gel on Secund Intention Healing of Wounds Contaminated with Feces and Non-Contaminated Wounds on the Distal Aspect of Equine Forelimbs

Andrea S. Bischoffberger1, Ashley Kelly1,2, Cristina Dart1, Nigel Perkins1, Leo Jeffcott1,2, Andrew Dart1. 1Biomedical Research and Clinical Trials Unit, University of Sydney, Camden, NSW, Australia; 2Australian Army Health Services, Toowoomba, NSW, Australia.

Manuka honey modulates healing of distal wound in horses. The consistency of honey requires application under a bandage. Manuka honey gel is less water based gel that can be applied without a bandage. The study hypotheses were that 1. The gel would be as effective as manuka honey in minimizing wound retraction; 2. Treatment with the gel throughout healing would improve overall healing time and 3. Manuka honey would enhance healing of wounds contaminated with feces. Five full thickness skin wounds (2 x 2cm) were created on both meta carpi. Wounds on one forelimb were covered with horse feces for 24 hours while wounds on the contralateral limb were left non-contaminated. Wounds were randomized assigned different treatments: manuka honey gel applied for 12 days, manuka honey gel applied throughout healing.
gel control applied for 12 days and untreated control. Wound area was measured on days 1, 7, 14, 21, 28, 35 and 42, and overall healing time recorded.

Wounds treated with manuka honey and manuka gel were smaller than gel control and untreated control wounds until day 35. Wounds treated with manuka honey gel throughout healing healed faster than all other wounds. There was no effect of manuka honey gel on healing of contami-
nated wounds.

Treatment of wounds with manuka honey gel reduced wound retraction and overall healing time. As a gel, manuka honey can be used safely to pro-
 mote healing of equine clinical wounds without need for a bandage thereby reducing complications and costs associated with long-term bandaging.

The Effect of Prosthesis Tension, Position and Number on the Area of the Rima Glottidis in Normal Equine Laryngeal Specimens. Andreas S. Bischofberger1, Marta Wereszka1, Ines Hadidane 1, Nigel Perkins2, Leo Jeffcott1, Andrew Dart1. 1Biomedical Research and Clinical Trials Unit, University of Sydney, Camden, NSW, Australia; 2Ausvet Animal Health Services, Toowoomba, QLD, Australia.

The cricoarytenoid dorsalis muscle has 2 distinct neuromuscular com-
partments that act synergistically to modulate the area of the rima glottidis. Surgically prosthesis placed coincident to each compartment may optimize the area of the rima glottidis.

Three prostheses were preplaced at different positions in the cricoid. A cranial prosthesis through the dorsal cricoid spine 70% along the total cricoid length measured from the caudal rim. A dorsal prosthesis through the caudal part of the dorsal cricoid spine 1 cm lateral to the dorsal cricoid spine. In 14 larynges, the area of the rima glottidis was measured after loading each prosthesis in 5 Newton (N) increments from 0–35 N. In 9 larynges, the 3 prostheses were tied alone and in combinations each at a fixed load of 15 N and the area of the rima glottidis measured.
The area of the rima glottidis increased as load on the prosthesis increased reaching a maximum area at 20 N. Compared to any single prosthesis, tying 2 and 3 prostheses in combination resulted in a larger cross sectional area at 15 N, however there was no significant difference between the combinations of 2 and 3 prostheses.

Applying 20 N to the prosthesis optimized the area of the rima glottidis. Two and 3 prostheses yielded a larger area of rima glottidis com-
pared to one prosthesis. Using a prosthesis corresponding to the medial cricoarytenoid dorsalis muscle compartment provided no benefit in terms of rima glottidis area over a conventional 2 prosthesis technique in cadaveric specimens.

Effect of Local Anesthetic Deposition into Structures of the Equine Foot on Subsequent Magnetic Resonance Images. Belinda Black1, Nicola C. Cribb1, Stephanie Nykamp1, Donald R. Trout2, Jeffrey J. Thomason3. 1Clinical Studies, University of Guelph, ON, Canada; 2Biomedical Sciences, University of Guelph, ON, Canada.

The effect of diagnostic anesthesia on the interpretation of MRI is un-
known. Our objective was to determine if mepivacaine injection in the foot would cause artiographic variation detectable with MRI. We hypothesized that MRI will detect an increase in joint fluid at 24 h, but not 72 h post-injection and that abnormalities at necrotic area of rima glottidis com-
pared to one prosthesis. Using a prosthesis corresponding to the medial cricoarytenoid dorsalis muscle compartment provided no benefit in terms of rima glottidis area over a conventional 2 prosthesis technique in cadaveric specimens.

Fifteen sound adult horses had baseline MRI performed up to 6 h prior to injection of the podotrochlear bursa (PB), digital flexor tendon sheath (DFTS), distal interphalangeal joint (DIPJ) and palmar digital nerve block (PDNB). MRI was repeated at 24 h and 72 h post-injection then objective and subjective measurements were made.

MRI measurements made >24 hours after mepivacaine injection of the DIPJ, PB and PDNB did not alter significantly from baseline values. Compared to baseline values, MRI at 24 h and 72 h after injection of the DFTS revealed a significant increase in synovial fluid volume. DIPJ and PB fluid volume increased over time.

Mepivacaine injected into the DIPJ, PB and PDNB does not interfere with MRI interpretation >24 hours after, however, DFTS injection caused increased synovial fluid, detectable on MRI for at least 72 hours. The increased DIPJ and PB fluid volume over time may result from prior general anesthesia.

In conclusion, DFTS injection can cause an increase in synovial fluid detectable on MRI for at least 72 hours. No effect of mepivacaine injection into the DIPJ, PB or PDNB was detected in normal horses.

Incidence of Trans-Cortical Tibial Fractures with Self-Tapping and Non-Self-
Tapping Screws in a TPLO Model. Christina L. Boekhout, Alan R. Cross, Georgia Veterinary Specialists, Atlanta, GA.

Investigation of self-tapping screws (STS) and non-self-tapping screws (NSTS) has yet to determine the superior screw type. In this retrospective study we compared the two screw types in a clinical setting. The objective of the study was to compare the incidence of radiographically apparent trans-cortical diaphyseal tibial fractures between STS and NSTS in a tibial plateau leveling osteotomy (TPLO) model.

STS and NSTS were compared by reviewing postoperative TPLO radio-
graphs. Three screws distal to the tibial osteotomy served as the in-vivo model for canine cortical bone. A trans-cortical fracture was defined as the presence of a saucer-shaped radiolucent defect on the periosteal surface of the trans-cortex surrounding the screw and the presence of radio-opaque material (bone) separate from the trans-cortical periosteal surface. The ef-
fect of screw type and screw composition on the incidence of trans-cortical fractures was evaluated.

STS had a significantly higher (P = 0.006) incidence of trans-cortical fractures (18.0%) compared to NSTS (0.8%). The effect of screw material on the incidence of trans-cortical fractures was not statistically significantly different (P = 0.485). Systemic conditions that compromise diaphyseal bone quality may warrant the use of NSTS when internal fixation is required. We suspect the increased incidence of trans-cortical fractures in STS is attributed to the shorter cutting flute compared to that of a tap utilized with a NSTS.
mineral in non-coagulated samples. In contrast, CCL5 release was not associated with coagulation and appeared to persist for much longer. High concentrations of TNF caused significantly greater release of CCL5 at 6 h than any other stimulus tested.

GF release from equine platelets was dependent on coagulation but independent of the activation-initiating stimulus. Release of proteinase 3 and superoxide mediators was independent from coagulation and more sustained. Super- natants collected from coagulated platelets could be an alternative treatment option to PRP.


Surgical site infections (SSIs) result in repair breakdown and loss of many long-bone fracture equine patients. Recalcitrant SSIs are commonly associated with biofilm formation on hardware components requiring difficult revision surgery in attempt to resolve the infection. We reported infection rates following long bone fracture repair and arthrodeses to be at 28%. The objectives of this follow-up study were to determine whether recent advances in fracture repair decreased the rate of SSI in patients, and to re-evaluate which factors continue to be prognostic indicators. The overall infection rate in fractures repaired changed from 28% to 14.6%. This figure remains high and continues to be an important factor in the decision for surgery. Reduction of long bone fractures. While the duration of hospital stay decreased for infected cases, antimicrobial therapy increased when compared to our previous study. Horses with SSIs have a significantly lower chance of discharge as well as increased hospitalization and medication requirements. Method of repair (ORIF vs. MIF) showed no significant association with SSIs or outcome. As a result, awareness of the factors increasing the chance of SSI and its effect on discharge remain unchanged and continue to be an essential factor to the clinician. In this study KLP was not associated with improved outcome which may be aligned with the trend of decreased severity of infections. Surface modifications of orthopedic hardware under development in our laboratory rendering implants bioactive could be a promising technology to further decrease SSI in an attempt to eliminate implant associated infections.

Correction of Rotational Deformity of the Pes with Plate Fixation in 5 Dogs. Randy J Boudreau1, Michael P Kowaleski1, Massimo Petazzoni2.

1Clinical Sciences, Cummings School of Veterinary medicine at Tufts University, North Grafton, MA; 2Clinica Veterinaria Milano Sud, Milano, Italy.

Metatarsal rotation, or external rotation of the pes, is a congenital deformity of unknown cause in large breed dogs. Excellent results have been reported with deformity correction/arthrodesis at the proximal intertarsal joint using external skeletal fixation. We hypothesized that internal fixation would simplify the surgery and postoperative management. The study’s purpose was to describe the surgical technique and outcome of metatarsal rotation using plate fixation in 5 dogs (8 limbs). Pre- and postoperative pes rotation and any complications were recorded. In-hospital evaluation of limb function and alignment, and length of time to radiographic healing were reviewed. Long-term outcome was assessed by owner telephone interview. Mean preoperative metatarsal rotation was 57.9° (range: 50–71). Standard and locking plate fixation spanned the tarsometatarsal joint in 4 limbs. In the remaining limbs, locking plate fixation was confined to the tarsus. Mean postoperative rotation was 11.5° (range: 8–16°). A metasplint was applied for a mean of 7.8 wk (range: 4–12 wk); all arthrodeses were healed at this time, and all dogs were sound. Incidental implant failures occurred only in cases where the fixation spanned the tarsometatarsal joint, and were removed in one dog. Mean long-term follow-up was 21.2 mo (range: 11–42 mo). All dogs had returned to full activity; none had any other complications or further surgery. All owners were fully satisfied with the outcome. Locking plate fixation confined to the tarsus appears to be a viable method for treatment of metatarsal rotation, and may be the most appropriate fixation method in large breed dogs.

Predictors of Outcome Following Development of Support Limb Laminitis in Horses with Unilateral Lameness. Celine Bourque1, Nicola C Cribb1, Sheila Lavigne1,2, Judith K Koening1, Donald R Brown1. Clinical Studies, Ontario Veterinary College-University of Guelph, ON, Canada; 2Clinical Studies, Faculty of Veterinary Medicine, University of Montreal, Saint Hyacinthe, QC, Canada.

Support limb laminitis (SLL) is a devastating sequel to severe unilateral lameness in horses. We hypothesized that prediction of outcome at the onset of SLL could be made from historical, clinical and radiographic information.

Medical records for horses with unilateral lameness were reviewed (1982–2007). Horses that developed SLL were included in the study. Signalment, weight, nature of unilateral lameness, position of the affected limb, duration of non-weight-bearing lameness, release of pro-inflammatory cytokines, and development of acute and chronic SLL and whether rotation or sinking of the 3rd phalanx occurred were recorded. Prophylactic procedures against laminitis, treatments and outcome (euthanasia or discharge) were recorded. Twenty-seven horses met the criteria for inclusion in the study. Eight were discharged and 19 euthanatized. Rotation of the 3rd phalanx (P = 0.01, OR = 12.3) predicted a negative outcome and there was a trend (P = 0.06, OR = 7.0) for the nature of the initial fracture (to fracture) to do so. A decrease in phenylbutazone administration within 3 days prior to the laminitis diagnosis (P = 0.028, OR = 8.3) was identified as a positive predictor.

Rotation of the 3rd phalanx in the supporting limb (SL) may be evidence of a very severe or advanced chronic SLL. Decreased phenylbutazone levels most likely indicate a lesser severity of the unilateral lameness. Alternatively, high doses of phenylbutazone may have masked signs of laminitis. Fracture pain may increase loading of the SL, worsening severity of laminitis and therefore outcome.

Measures to prevent laminitis and reduce pain in the injured limb should be taken especially in horses with lame fracture.

Does Method of Jejunocecostomy Affect Incidence of Complications or Survival in Horses? Jennifer A. Brown1, Susan Holcombe1, Louise L. Southwood2, Rolf M. Emberton3, Chris R. Byron4, Joe G. Hauptman5, 1Tampa, FL; 3Rood and Riddle Equine Hospital, Lexington, KY; 4College of Veterinary Medicine, Michigan State University, East Lansing, MI; 5College of Veterinary Medicine, University of Pennsylvania, Kennett Square, PA.

Jejunocecostomy is performed as end-to-side (E2S) or side-to-side (S2S) anastomosis when devitalized distal ileum warrants resection. Surgeons strongly favor one method or the other, despite a lack of evidence of increased morbidity or mortality associated with either procedure. The purpose of this retrospective study was to determine if survival, re-operation, complications, or survival, survival, survival, survival, survival, survival. Data were analyzed using multiple logistic regression with significance set at P < 0.05.

One hundred and fifty horses from 5 referral veterinary hospitals were included in the study. Side-to-side jejunocostectomy was performed in 90 horses and E2S in 60 horses. There was no significant difference in postoperative complications or survival between the E2S and S2S techniques. PCV and TS at hospital admission were associated with development of postoperative coelitis. PCV at hospital admission was associated with re-operation. Age was associated with the development of postoperative reflux and long-term survival.

Based on these results there is no evidence to suggest that either S2S or E2S is superior regarding postoperative complications or survival, and supports the use of either procedure in horses.

In Vivo and Ex Vivo Effect of Meloxicam on Chondrocyte Metabolism in Osteoarthritic Canine Cartilage. Steven Budsberg1, Aaron M. Stoker2, Spencer Johnston1, Bill Liska1, Lisa Reno1, James L. Cook1. 1Small Animal Medicine and Surgery, University of Georgia, Athens, GA; 2Comparative Orthopaedic Laboratory, University of Missouri, Columbia, MO; 3Gulf Coast Veterinary Specialists, Houston, TX.

The study objective was to assess the effect of meloxicam on chondrocyte metabolism in a naturally occurring osteoarthritic (OA) canine cartilage model. 21 dogs with coxofemoral OA at the time of total hip replacement (THR) were used. Cartilage was harvested from two groups: 16 dogs that received no NSAID for at least 14 days prior to THR (group 1), and 5 dogs that received meloxicam for at least 14 days before THR (group 2). Cartilage Explants: Group 1 dogs had meloxicam added to culture medium at 0.0, 0.3, 3.0 and 30.0 ug/ml. Group 2 explants were cultured with meloxicam added at 0.3, 3.0 and 30.0 ug/ml. Tissue Matrix Analysis: Sulfated GAG, total collagen content, and cartilage DNA content were measured. Media analysis: GAG, chondroitin sulfate 846 (CS-846), Nitric oxide (NO), PGE2, MMP-2, -5, and -13 were measured. Tissue gene expression: RNA extraction and gene expression analysis for matrix genes was performed determined by RT-PCR. Statistical Analysis: a repeated measures analysis of
Effects of Serum and Autologous Conditioned Serum on Equine Articular Chondrocytes Treated with IL-1. Eric Carlson, Allison A. Stewart, Kelly Carlson. University of Illinois, Champaign, IL.

The purpose of this study was to evaluate the effects of autologous horse serum (HS) and ACS on equine cartilage proteoglycan metabolism in an IL-1 model. Our hypothesis stated there would be no difference in proteoglycan metabolism in IL-1 treated equine cartilage combined with HS or ACS. Cartilage articular, HS, and ACS were collected from 5 horses. Cartilage was digested and chondrocytes were isolated and formed into pellets. Treatment groups consisted of 10% HS only, 10% HS with IL-1, 20% HS with IL-1, 10% ACS with IL-1, and 20% ACS with IL-1.

GAG synthesis and release, total GAG concentration, total DNA content, and media MMP3 and IL-1Ra content were evaluated. Non-normally distributed data were logarithmically transformed and presented as mean ± SEM. Repeated-measures ANOVA was performed. Comparing positive and negative controls, treatment with IL-1 caused a decrease in pellet GAG synthesis and total pellet GAG concentration. There was no change in GAG release DNA content, or media IL-1Ra. There was an increase in media MMP-3.

Comparing treatment groups, there was no difference in GAG synthesis or release, total GAG concentration, total DNA content, or media MMP-3 content. Media for ACS treatment groups had higher concentrations of IL-1Ra compared to HS treatment groups.

Treatment with ACS increased IL-1Ra concentrations, but failed to significantly affect proteoglycan cartilage metabolism. Furthermore, ACS had no significant effect on media MMP-3 concentrations compared to HS.


The purpose of this study was to perform a cadaveric analysis of the elongation associated with five methods of femoral attachment and four prosthesis materials used clinically for extracapsular stabilization of the cranial cruciate ligament (CrCL)-deficient stifles. We hypothesize that techniques utilizing osseous fixation (TightRope and bone anchor) will elongate less than those reliant on soft tissue integrity (circumfascial techniques).

Eight cranial femora were collected from 5 skeletal mature dogs euthanized for reasons unrelated to this study. Femurs were randomly assigned to one of five treatment groups: circumfascial FiberWire (CFW), circumfascial nylon leader material (CNL), single TightRope (TR), double TightRope (2TR), or SwiveLock bone anchor (BA). Elongation at failure, conditioning elongation, and peak to peak elongation were measured using a mechanical testing machine. Ten isolated loops of each prosthetic material were subjected to the same mechanical testing procedure.

The BA construct had the least peak to peak elongation and BA and CNL constructs had the least elongation at failure and conditioning elongation. The CFW constructs had the greatest conditioning elongation, and CFW and CNL constructs had the greatest peak to peak elongation. Elongation of extracapsular stabilization techniques in the short-term postoperative period is increased when the prosthetic material is anchored within the femorofibular ligament compared to osseous anchors. However, the prosthesis and the method of securing the free ends also affect elongation in the construct. Extracapsular stabilization techniques relying on circumfascial fixation may be less effective in mitigating cranial drawer motion due to their propensity for elongation.

Confounding Factors in Algometric Assessment of Mechanical Thresholds in Normal Dogs. Kevin Coleman1, Chad Schmid1, Kristin Kirkby1, Amanda Erickson2, B. Duncan Lascelles2. 1Small Animal Medicine and Surgery, College of Veterinary Medicine, University of Georgia, Athens, GA; 2Small Animal Clinical Sciences, College of Veterinary Medicine, North Carolina State University, Raleigh, NC.

The purpose of this study was to evaluate algometric readings in normal dogs in a design that would also look at possible confounding influences.

Nineteen skeletal-mature orthopedically and neurologically normal retriever or retriever mix dogs were recruited. Fourteen common surgical sites were selected for algometric pressure testing (Commander, JTech; 1 cm2). Threshold response was defined as a higher center recognition of the stimulus, and recorded in pounds of force. Sites were tested in the same order, and the testing sequence repeated 3 times for each side of the dog. The patients were tested in the morning and evening of a single day; this was repeated 10–14 days later, allowing 4 separate data collections for each patient. Data were analyzed using ANOVA or ANCOVA.

When all the data was included in the analysis, dog, order, site, time, day, repetition (all above P < 0.0001) and site order (P = 0.0217) significantly affected the algorimeter readings. When just the first reading for each site was analyzed, dog, site, and sex (all P < 0.0001) significantly affected algorimeter readings.
readings. These data suggest that learning occurred over repeated collection times. Thomas B. Waddell, Henry J. Anderson, Mark Anderson, Mary Jean Gorse, Richard Madsen. Veterinary Specialty Services, St. Louis, MO; 2Statistics, University of Missouri, Columbia, MO.

Prior studies have reported TPLO complication rates up to 28%. We hypothesized the level of complications reported would be lower and less severe with experienced surgeons.

Medical records of TPLO surgeries from January 2005 until December 2009 were reviewed. A total of 1,519 surgeries performed on 1,231 dogs were identified. Statistical analysis was performed on all complications occurring within 6 months following surgery. Data was collected from the three board-certified surgeons in the practice, each having experience of over 100 TPLO surgeries prior to January 2005.

Total complication rate was 11.4%. Major complication rate (those requiring a surgical intervention or a prolonged lameness greater than 12 weeks) was 3.1% and minor rate was 8.3%. Newfoundland and German shepherds had a total complication rate of 24% and 31.1% respectively. At presentation, 13.9% of dogs had bilateral cruciate ruptures. The cruciate ligament was completely torn in 56% and partially torn in 44% of the stifles. The medial meniscus was torn in 40% of stifles. Our study shows the effect of an intervention on the outcome of a disease.

This study is from a large metropolitan area and represents an accurate description of the biostatistics of cruciate ligament disease in dogs. This is the lowest complication rate yet described for TPLO. The majority of complications resolved with minor therapy. Owner and surgeon satisfaction is high with this procedure and the complication rate is low.

Effect of Proximal Rotational Ulnar Osteotomy on Ex Vivo Elbow Contact Mechanics and Three-Dimensional Kinematics in Dogs. Laura C. Cuddy, Antonio Pozzi, Daniel D. Lewis, Bryan P. Conrad, MaryBeth Horodyski, Stanley E. Kim, Scott A. Banks, Noel Fitzpatrick. Comparative Orthopaedics and Biomechanics Laboratory, University of Florida, Gainesville, FL.

Fragmented medial coronoid process is the most common cause of thoracic limb lameness in dogs. Simulation of the supinated pose of the proximal ulna with a proximal rotational ulnar osteotomy (PRUO) may unload the medial elbow compartment.

PRUO will significantly reduce mean and peak contact pressures in the medial elbow compartment with corresponding increases in the lateral compartment.

Digital pressure sensors measured contact area, mean contact pressure and peak contact pressure in the medial and lateral elbow compartments in unpaired thoracic limbs harvested from 12 dogs (26 ± 3.6 kg) subjected to 200 N axial load. Three-dimensional static poses of the elbow were obtained using a Microscribe digitizing arm. Each specimen was tested at three elbow flexion angles (115°, 135° and 155°), with the antebrachium in neutral, 28° supination and 16° pronation. A transverse ulnar osteotomy was performed 15 mm distal to the medial coronoid process. The proximal ulna was rotated cranio-lateral around the radial head and stabilized with a dynamic compression plate with a 30° twist. The testing protocol was repeated. Repeated measures analysis of variance with post-hoc Bonferroni correction was performed.

Mean and peak contact pressures significantly decreased in the medial and increased in the lateral elbow compartment. The tip of the medial coronoid process rotated 20.7° caudolateral and translated 4.7 mm caudal and 2.7 mm distal to the center of the radial head.

PRUO shifts mean and peak contact pressures from medial to lateral elbow compartments, and may have therapeutic value in dogs with medial compartment disease.


Refractory urinary incontinence (RUI), where traditional medical/surgical techniques fail, is a major dilemma. The purpose of this retrospective study was to evaluate the efficacy and safety of a percutaneously controlled hydraulic occluder (HO) for the treatment of RUI in female dogs.

The hypotheses were: 1) This procedure is safe and effective; 2) This device can be considered in patients with urethral sphincter mechanism incompetence alone and in conjunction with other anatomic urinary defects.

An uninflected silicone ring (HO) was surgically placed around the proximal urethra, connected to a subcutaneous injection port, and inflated with sterile saline as needed to maintain continence. RUI was assessed using an owner subjective continence score.

All 18 dogs were reported to have dramatic improvements in continence scores following HO placement. The continence rate after HO placement was 61% in the 18 patients, though only 12/18 clients were compliant with appropriate recommended inflations. In compliant dogs, 11/12 (91.6%) became continent. Seven of 18 (39%) did not require percutaneous inflation to achieve continence. In 12 compliant dogs, 4/4 with USMI alone; 6/7 with previous EU fixation; and 1/1 with a severe urethral anatomical anomaly were continent. Severe complications were seen in 3/18 dogs resulting in the development of a urethral stricture.

Overall, the placement of an HO device provided a safe and effective alternative when traditional options failed. The technique was associated with a few major complications, and the HO can be considered an alternative for treatment of RUI in dogs.

A Retrospective Analysis of Return to Function Following Colic Surgery in 195 Horses (2003–2010). Weston Davis, Callie Fogle, Mat Gerard, Jay Levine, Anthony Bilsbarger. Veterinary Teaching Hospital, North Carolina State University, Raleigh, NC.

Return to intended use and performance following colic surgery is of major concern to the equine industry and there is minimal objective data on this topic. The purpose of this study was to investigate return to functional use of horses following colic surgery and factors associated with a negative outcome. It was hypothesized that prognosis for return to use and performance would be good, but that multiple variables (especially postoperative complications) would impact outcome.

Medical records of horses that underwent exploratory celiotomy for acute colic were reviewed (2003–2010). Horses were excluded if they survived less than 6 months, had no intended use preoperatively, or were lost to follow-up. Information retrieved included history, signalment, use, and selected pre-, intra-, and postoperative factors. Phone interviews were used to obtain follow-up data. Logistic regression was used to investigate associations between clinical data and outcome, reported as odds ratios with a 95% confidence interval.

At 6 months, 68% were performing their intended use and 56% were at or above their preoperative performance. At one year, 76% were performing their intended use and 69% were at or above their preoperative performance. Animals that failed to return to use/performance at follow-up were more likely to have had previous celiotomy, stall rest for an orthopedic condition, a non-strangulating lesion type, incisional hernia, diarrhea, or laminitis.

The overall return to general use and performance following colic surgery is fair. Multiple pre and postoperative factors may affect return to use and performance.

Stereolithography of Complex Angular & Rotational Deformities (Femoral Malunions) as an Aid in Surgical Planning and Treatment with Locking Plate Fixation in 31 Horses. Michael D. DeFoer, Jacky J. Boudreau. Cummings School of Veterinary Medicine, Tufts University, North Grafton, MA.

Correction of angular limb deformities is frequently performed to re-establish normal function and cosmetic appearance. Complex rotational and coronal angular limb deformities are typically challenging cases to assess radiographically. Stereolithography (SLA) is a rapid prototyping technology used to produce exact anatomic bone replicas from CT data using computer aided design software. We hypothesized that preplanning with SLA biomodels would facilitate correction of complex distal femoral malunions; furthermore, a novel locking plate system (Advanced Locking Plate System [ALPS]; KYON, Zürich, Switzerland) also was hypothesized to permit uncomplicated fracture fixation. Three dogs (4 limbs) were identified with complex angular and rotational distal femoral deformities. Full-size exact replica epoxy bone biomodels were produced by ProtoMED®, Westminister, CO, and were used as templates for surgical planning prior to in vivo correction. Corrective osteotomies were first performed on the SLA biomodels, which were planned using direct observation and a guide wire technique, and plate fixation applied. This preliminary experience was then used at the time of the definitive surgical correction. All pre-contoured implants (ALPS) were applied at the definitive surgical procedure with minimal modification. All femurs healed without complications. All dogs had markedly improved functional outcomes (only one dog had a persistent mild lameness) at the final in-hospital follow-up at a mean of 16.8 mo after surgery. Obtaining optimal outcomes at a reduced cost to the owners is the ultimate goal. SLA preoperative
planning and ALPS fixation were performed without difficulty, and resulted in uncomplicated healing with excellent results.

Hand Assisted Laparoscopic Ovectomy via Colpotomy in Standing Mares, Dustin Devine, Veterinary Clinical Sciences, Oklahoma State University, Stillwater, OK.

There are many indications for ovectomy in mares. Laparoscopic surgical methods have been demonstrated to reduce morbidity as well as shorten convalescence periods in patients. This purpose of this project was to determine the feasibility of an alternate technique for performing bilateral ovariotomy in standing mares. Proposed advantages would be a reduction in patient morbidity, shortened convalescent times, and improved cosmesis through use of fewer skin incisions with this technique.

A total of 19 adult mares were included in the study. The mares were operated standing sedated in stocks with caudal epidural performed. The abdomen was approached laparoscopically using two, left paralumbar portals. A third colpotomy incision was made to permit hand assistance for the procedure and ovary retrieval from the abdomen. The ovaries were removed using either a chain ecrasure (n = 8) or LigaSure™ device (n = 11).

The procedure was successfully performed in all except one mare (18/19), this mare was of large stature and working length of the equipment was insufficient to complete the task.

The results of this work demonstrate that bilateral laparoscopic ovariotomy by means of two, same-sided portals in combination with hand assistance via a colpotomy is a technically feasible, safe and effective practice in small (312 kg) to average sized mares (≤495 kg).

Foaling Rates and Factors Associated with Fetal Outcome After Colic Surgery in Pregnant Thoroughbred Mares in Central Kentucky, Niklas J. Drummond1, Rolf M. Emberton2, Scott A. Hopper2, Brett J. Woodie1, Alan J. Ruggles1, Lawrence R. Bramlage1, Rolf Fimmers4, Johannes Handler3. 1Surgery, Rood & Riddle Equine Hospital, Lexington, KY; 2Surgery, Pferdeklinik Abegglen, Zurich, Switzerland; 3Surgery, Pferdeklinik, Krefeld, Germany; 4Institut fuer Biometrie, Universitaetsklinikum Bonn, Germany.

Colic surgery in the pregnant broodmare raises owners concerns not only for the mare’s health, but also for the fetus. This paper investigates foaling rates and factors associated with fetal outcome following colic surgery in the pregnant Thoroughbred mare.

The medical records of 529 mares that underwent a colic surgery from 1993 through 2007 at the Rood and Riddle Equine Hospital were reviewed. Age of the mare, date of surgery, gestational age at the time of surgery (P = 0.0008), mares bred less than 40 days before surgery had a significantly increased foaling rate compared with mares 40 days or longer post breeding: (0.5497 ± 0.0572 vs. 0.6964%). Other factors influencing foaling rate were mares age reduced foaling rate compared with mares 40 days or longer post breeding: (0.5497 ± 0.0572 vs. 0.6964%).

Intra-articular injection of a low dose of tiludronate into horses’ middle carpal joints did not have any short-term detrimental effects and appeared safe at the administered dose.


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Clinical observations suggest that feline tibial fractures are prone to delayed union and nonunion healing complications. This study sought to quantitatively describe the intramedullary arterial supply of the adult feline tibia and determine if the arterial supply is different from that of adult small dogs, who seemingly do not exhibit the same rates of delayed and nonunion fracture healing. Our null hypothesis was that the intramedullary arterial density and diameter of the nutrient artery in the adult feline tibia was the same as the age and size matched dog.

Using microvascular injection and modified Spalteholz techniques, caudal tibiae and canine pelvic limbs were obtained to prospectively characterize the intramedullary arterial supply of the tibia. Processed specimens were evaluated using the ImageJ morphometric program. Statistical comparisons were made between cats and dogs for the intramedullary arterial density and diameter of the nutrient artery.

There was no significant difference in the intramedullary arterial density between dog and cat tibiae. The feline nutrient artery diameter (0.5497 ± 0.0552 mm) was significantly different than the canine nutrient artery (0.2976 ± 0.0423 mm) in the distal section of bone. Dogs subjectively exhibited more branching vessels in the distal and mid-diaphyseal sections of bone.

Delayed fracture healing in the feline tibia does not appear to be due to diminished intramedullary arterial supply. However, a lack of diffuse arborization of the arterial supply to the middle and distal feline tibia may explain, in part, why feline tibia delayed or nonunions may be more common than in canine tibial fractures.

A Retrospective Evaluation of the Effect of Antibacterial-Impregnated Sutures on Surgical Site Infection and Inflammation in 283 TPLO Procedures, Sean Eiter, Gaullaire R. Ragelly, David J. Schaeffer, R. Avery Bennett. Veterinary Clinical Medicine, University of Illinois, Champaign, IL.

The study objective was to compare infection and inflammation rates between polydioxanone and poliglecaprone 25 for a standardized orthopedic procedure (TPLO).

283 dogs that underwent a TPLO procedure between November 2005 and December 2009 were included in this retrospective study. The variables recorded included age, surgery and anesthesia durations, body weight, body condition score, propofol use, postoperative administration of antimicrobials, presence of a preoperative infection, use of a TPLO jig, technique of joint exploration, suture materials used to close the different layers of the incision, and use of staples. The outcome variables included superficial inflammation, infection, or infection/inflammation.

No confounding factor was identified as having an effect. The rates of infection or inflammation did not differ between surgeries where triosan-impregnated sutures were used (n = 160, 19% and 9%, respectively) and those where non-impregnated sutures were used (n = 113, 15% and 10%).

The use of staples compared to sutures decreased the infection/inflammation rate (16% compared to 29%).

Triclosan-impregnated sutures may not work as effectively in vivo where the environment is not controlled or where triosan may elute quickly from the suture. It is unlikely that our findings are related to a statistical error since the power was high (80%) and the infection/inflammation rate was greater for the impregnated sutures. The decreased complications associated with staples could be due to the decreased tissue reaction. Further studies are needed to understand and overcome the limitations of the commercialized antibacterial-impregnated sutures.
Augmentation of Trauma Hardware in a Proximal Femoral Osteotomy Model – Use of Micro CT: Radial Incisure Versus Tip Fragmentation. Noel Fitzpatrick1, Tanjya Garcia-Nolen2, Anjolie Daryani 3, Shinya Watari 3, Kei Hayashi 2. 1Fitzpatrick Referrals, 2Surgical and Radiological Sciences, University of Sao Paulo, Brazil. 

It was concluded that the omentum pedicle flap can be taken through a subcutaneous tunnel for Long Bones in Dogs. Cassio A. Ferrigno, Kelly Ito, Vanessa C. Ferraz. 

Results were satisfactorily accomplished and in 100% of the cases the flap length were: 30.87 cm when double layer was used; 54.37 cm in simple flap length, and 25.13 cm to radius/ulna. 


Autoclaved autologous graft in limb sparing surgery is successfully used in human oncologic surgeries, and may represent an alternative when bone bank or prosthesis are not available. The alternative procedure is attractive because it preserves the original anatomy, has low costs and promotes satisfactory clinical results in humans. Our research promoted the use of autologous graft, autoclaved for 5 minutes at 132 C, at 2 atm of pressure associated to platelet rich plasma, in 10 dogs with appendicular bone neoplasia. For the evaluation, clinical and radiographic studies were made at 7, 14, 21, 28, 60, 90, 180 and 360 days. Results showed that the mean time for metastasis was of 187 days and occurred in 40% of the animals, pulmonary metastasis happened in 20% of the patients and the mean survival time was of 271 days. The conclusion was that the technique is feasible and that the studied times and pressures cause little alteration in bone resistance.


Maximum length of the omentum pedicle flap was 30.87 cm when double layer was used; 54.37 cm in simple layer; and 92.7 cm when the flap was built in L. The maximum length of the omentum has the secured the possibility of reaching the distal metaphase of all long bones in studied. The average length exceeded 29.87 cm to femur, 20.73 cm to tibia/fibula, 21.13 cm to humerus, and 16.27 cm to radius/ulna. It was concluded that the omentum pedicle flap can be taken through the subcutaneous defect until the distal metaphase of the long bones of dogs.

Structural Analysis of Canine Medial Coronal Disease by Micro CT: Radial Incisure Versus Tip Fragmentation. Noel Fitzpatrick1, Tanjya Garcia-Nolen2, Anjolie Daryani 3, Shinya Watari 3, Kei Hayashi 2. 1Fitzpatrick Referrals, Godalming, United Kingdom; 2Surgical and Radiological Sciences, University of California at Davis, CA. 

It has been established that medial coronoid disease is characterized by pathology of subchondral bone with formation of microcracks characteristic of local fatigue failure before cartilage disease becomes apparent. Two distinct types of fissuring/fracturation of the metaphyseal bone have been observed: transverse tip fragments (TTF) and radial incisure fragments (RIF). Our hypothesis was that these patterns represented disparate biomechanical entities.

Two groups were excised by subtotal coronoid ostectomy from patients 20–40 kg bodyweight: 4 including a “tip” fragment, 5 including a large fragment involving both the tip and incisor (“incisor/tip”), and 3 including an “incisor” fragment. Four normal “control” samples were excised from un-diseased weight-matched cadavers. All samples were imaged using a high-resolution micro-CT specimen scanner. Preferred void angle (predominant trabecular orientation) and degree of anisotropy were determined on both horizontal and sagittal planes.

Trabecular orientation was significantly different between “control” and “incisor” groups, and “control” and “incisor/tip” groups, on horizontal plane imaging and on sagittal plane imaging (P < 0.05). There was no difference in anisotropy between groups on sagittal plane imaging. Conversely, trabecular orientation was not significantly different between “control” and “tip” fragment groups.

This intimates that TTF and RIF arise from different mechanical loading environments and that RIF represents significant canalicularchracturation due to chronic axial and torsional loading conditions preceding fragmentation, whereas TTF was more typical of an acute overload scenario with “crumbling” of the fragment-parent interface. Medial coronoid pathology is not a single disease entity but rather a spectrum of aberration of articular force distribution.


Pantarsal arthrodesis is indicated for intractable tarsal injuries. Internal fixation using medial, lateral, dorsal, and plantar plate application and external skeletal fixation has been described. No studies of the mechanical, subarticular and external coaptation has been reported as an essential adjunct. Our hypothesis was that the major complication rate for both dorsal and medial plate-screw application would not differ.

Case records were reviewed for all dogs treated with medial or dorsal plate application between 2005 and 2010 with radiographic follow-up to at least 12 weeks. 35 dogs met inclusion criteria. Mean weight was 26.68 kg. Dorsal plate application was performed in 25 and medial in 10. A 3.5/2.7 hybrid plate was used for all medial applications. Dorsally applied plates included 3.5/2.7 and 3.5/3.5 pancarpal arthrodesis plates compared to 138 degrees

ABSTRACTS
(n = 18) and custom 3.5/2.7 140 degree plates (n = 7), 14 dorsal plates were applied by MILO technique. No external coaptation was employed.

Major complication was experienced in 16% of dorsal plate applications versus 40% of medial applications. Major complications encountered included metatarsal fracture (1D, 1M), plate breakage (1D) or implant reaction/discomfort (1D, 2M), tibialcaneal screw removal (1D), and metatarsal pad ulceration (1M).

Plate breakage and metatarsal fracture have been commonly reported for dorsal plate application but occurred rarely in our case series and may be further ameliorated by tapering of the custom plate to occupy more than 70% of the metatarsal length. The custom plate also facilitates application of MIPO technique, reducing postoperative swelling, optimizing limb alignment and promoting early limb use.

Bi-Oblique Dynamic Proximal Ulnar Osteotomy; Surgical Technique, Computed Tomographic Assessment of Radio-Ulnar Congruency Over 12 Weeks and Clinical Outcome in 87 Dogs. Noel Fitzpatrick, Alexandre Caron, Vincent Wavrille. Fitzpatrick Referrals, Eashing, United Kingdom.

Our objectives were to describe a bi-oblique dynamic proximal ulna osteotomy (BODPUO) technique, to interrogate resultant radio-ulnar joint modification using computed tomography (CT) and to evaluate clinical outcome in a large case series.

Clinical reports and radiographs from 2006 to 2011 were reviewed. Eighty-seven elbows were included in the clinical study. CT measurements were taken on 17 elbows. The osteotomy was made in a bi-oblique fashion with a proximodistal, caudodorsal and lateromedial orientation.

Concurrent mean caudodorsal and lateromedial osteotomy angles were 55° 7' and 49° ± 11', respectively. The most caudoproximal point of the cut was located at a mean of 38 ± 4% of the total ulnar length (from the olecranon process). At the last follow-up (mean 26.2 weeks), the mean lameness scores were statistically significantly lower than preoperatively (t-test; P < 0.05). Complications were recorded in 13 elbows (15%). No complication required secondary surgical intervention. Thirty-seven BODPUO were re-examined radiographically up to 4 months postoperatively. 92% (34/37) were radiographically healed. Measurements documented a significant increase in radio-ulnar joint space at the mid-coronoid level, at the level of the base of the coronoid process and at the level of the lateral coronary process (t-test; P < 0.05). No other measurements were significantly different.

We conclude that dogs treated with BODPUO as described are significantly less lame four months post-surgically than preoperatively. CT documents transverse but not sagittal motion of the proximal ulnar segment. Future studies are required to interrogate the effect of BODPUO on elbow congruency in three dimensions.

Development of an Inexpensive Method for Processing Platelet Rich Plasma in the Horse. Robin L. Fontenot1, Carolyn A. Sink2, Nicole M. Weinstein3, Stephen Werre1, Linda A. Dahlgren1. 1Large Animal Clinical Sciences, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg, VA; 2Veterinary Teaching Hospital, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg, VA; 3Biomedical Sciences and Pathobiology, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg, VA.

Platelet rich plasma (PRP) is a common treatment for equine tendin and ligament injuries but can be expensive. Safe, cost-effective PRP preparation would make it more widely available. The purpose of this project was to compare simplified methods of PRP preparation to a commercial system. We hypothesized that one of these simple methods would concentrate platelets 3-fold with minimal WBC concentration. Citrated equine blood (n = 26) was collected and processed using three tube centrifugation methods and a commercial system reported to concentrate platelets 4-fold. Platelet, white and red blood cell counts, and mean platelet volume were measured and compared to whole blood. Aerobic and anaerobic cultures were performed. Significant differences between groups were determined by one way ANOVA. Significance was set at P < 0.05. Mean platelet concentration was less than 3-fold for all four methods; however, the conical tube method resulted in the greatest number of samples with platelet concentrations of greater than 2.5-fold and only the conical tube and commercial methods achieved any samples with greater than 3-fold concentration. Mean WBC fold change for the commercial method was significantly lower than the other three methods which were all greater than four-fold. WBC Platelet ratios for the conical tube and commercial methods were less than 2 and deemed to be in a potentially useful clinical range. Six of 280 samples (2.1%) cultured positive and were not different between groups. Based on these results, the conical tube method is safe and may be a suitable clinical alternative to commercial systems in low budget cases.

Grade III Cranial Horn Tears of the Equine Medial Meniscus Alter the Contact Forces on the Articular Surface of the Medial Tibial Condyle. Jennifer G. Fowlie1,2, Steven P Arnoczky1, Michael Lavagnino1, Michael F. E. Stick1. 1Large Animal Clinical Sciences, Michigan State University, East Lansing, MI; 2Laboratory for Comparative Orthopaedic Research, Michigan State University, East Lansing, MI; 3Orthopaedic Research, William Beaumont Hospital, Royal Oak, MI.

Osteoarthrosis is a common sequela of cranial horn meniscal tears in the equine medial femorotibial joint. We hypothesized that grade III cranial horn tears of the medial meniscus would lead to altered distribution and magnitude of contact forces on the medial tibial condyle. A vertical load (1800 N) was applied to cadaveric stifles at 130°, 140° and 150°, and the peak pressure and contact area on the medial tibial condyle was recorded. Testing was repeated following creation of a grade III cranial horn tear of the medial meniscus and after resection of the simulated tear.

In the intact specimens, a significantly smaller tibial contact area was observed at 160° stifle angle compared to 150°, 140° and 130° (P = 0.005, 0.010 and 0.036 respectively). Creation of a non-displaced grade III cranial horn tear in the medial meniscus did not significantly (P > 0.05) alter the pressure or contact area measurements at any stiffe angle compared to the intact specimens. Resection of the simulated tear resulted in a significant increase in peak pressure in the central region of the medial tibial condyle at 160° relative to the intact (P = 0.026) and torn (0.012) specimens.

Mechanical overload of the tibial condyle in horses with grade III meniscal tears may lead to secondary osteoarthrosis if the torn segment is removed or displaced. Restoration of preservation of a minimal volume of meniscal tissue in the tear defect should be the goal of treatment.

Long-Term Survival After Surgery for Epiploic Foramen Entrapment Compared with Other Strangulating Diseases of the Equine Small Intestine. David Freeman1, David Schaeffer2. 1Large Animal Clinical Sciences, University of Florida, Gainesville, FL; 2Veterinary Biosciences, University of Illinois, Urbana, IL.

Epiploic foramen entrapment (EFE) is a common cause of colic, although reports on survival rates have produced conflicting results. The purpose of this study was to determine long-term prognosis after surgery for EFE compared with prognosis after surgery for other small intestinal strangulating diseases. Data were recorded for 74 horses that had surgery for strangulating lesions of the small intestine and were discharged. Horses were assigned to 3 groups, EFE (18 horses), strangulation by lipoma (24), and miscellaneous strangulating diseases (32). Kaplan-Meier survival probabilities were determined and the Tarone-Ware, Mantel, and Breslow-Gehan methods were used to detect differences between groups. The mortality rate after discharge was determined as the number of deaths/horse year and the rate for colic after discharge was recorded as number of horses that had colic/horse year.

There are few reports on comparisons between methods for anastomosis of this study was to compare long-term survival between jejunocecostomy, jejunojejunostomy, and no resection. Mortality rate after discharge was determined as the number of deaths/horse year and the rate for colic after discharge was recorded as number of horses that had colic/horse year. The rates generated and standard errors were analyzed by CONTRASTTM, with significance set at P < 0.05. Horses that had EFE had similar long-term survival data as horses with strangulating lipoma, but probability of long-term survival was less than horses with miscellaneous strangulating diseases. When the expected effect of age at time of surgery on long-term survival was considered, horses with EFE had a worse probability of long-term survival than horses with other strangulating diseases of the small intestine. Horses with EFE were significantly more prone to colic than horses discharged after surgery for other small intestinal lesions. Factors that contributed to these findings could not be identified but could be related to cabling in some cases.

Long-Term Survival After Jejunocecostomy, Jejunojejunostomy and No Resection for Strangulating Diseases of the Equine Small Intestine. David Freeman1, David Schaeffer2. 1Large Animal Clinical Sciences, University of Florida, Gainesville, FL; 2Biobiosciences, University of Illinois, Urbana, IL.

Long-Term Survival After Jejunocecostomy, Jejunojejunostomy and No Resec-
analyzed by CONTRASTTM, with significance set at P < 0.5. Horses that had no resection and similar long-term data as horses that had jejunococcygostomy or jejunococcygectomy, but were less prone to colic after discharge. Data for survival after discharge were similar for jejunococcygostomy and jejunococcygectomy, regardless of whether or not mortality during hospitalization was included in the analysis. Based on results of this study, the surgical method for treating a strangulating lesion had no effect on long-term outcome in horses. However, the finding that horses that did not have a resection were less prone to colic after discharge emphasizes the need for accurate prediction of intestinal viability.

Effect of Transection of Cranial Arm of Medial Glenohumeral Ligament for Shoulder Stability in Adult Beagles, Yukihiro Fujita1, Shinya Yamaguchi2, Miyoko Saito1, Makoto Muto1, 1Laboratory of Surgery II, Azabu University, Sagamihara-shi, Japan; 2Yamaguchi Pet Clinic, Koto-ku, Japan.

Medial glenohumeral ligament (MGHL) appears as a Y shape and the function for shoulder stability of cranial or caudal arm is not sufficiently studied. This study evaluated the effect of transection of the cranial arm of MGHL on shoulder stability. The care and handling of the animals were carried out in accordance with the “Animal Experiment Guideline, 2000.” Orthopedic and radiographic examinations and joint fluid analysis before, at 2, 4 and 6 weeks after arthroscopically assisted transection of the cranial arm of MGHL were performed on six beagles. Arthroscopic examination was performed before and at 6 weeks after transection. The severity of the cartilage injury at humeral head and glenoid cavity was evaluated by orthopedic and radiologic examination. The separate study for the severity of villus proliferation and vascularization. During this experimental period, there were no abnormalities in orthopedic and radiographic examinations and joint fluid analysis. In the arthroscopic evaluation, there were limited findings in the cranial region of subcuticularis tendon, the region between biceps and subscapularis tendons, and the cranial region of biceps tendon at 6 weeks after transection. In all six regions; biceps tendon, intertubercular groove, subcuticularis tendon, the area between biceps and subscapularis tendons, MGHL, and the caudal porcine, there were significant differences in villus proliferation and vascularization between before and at 6 weeks after transection. Results indicate that transection of the cranial arm of MGHL alone does not affect greatly shoulder stability, but could be one of the causes for inflammation of the shoulder joint.


Mast cell tumors (MCTs) are one of the most commonly diagnosed skin malignancies in dogs. Though normally present as cutaneous or subcutaneous masses, metastasis is possible. Pulmonary metastases are thought to be less common than visceral metastases. Objectives of this retrospective study were to determine the prevalence of pulmonary metastases based on three-view thoracic radiography and risk factors for this. Our hypotheses are that a three-view thoracic radiograph is an extremely low-yield test and that undifferentiated MCT is a risk factor for pulmonary metastasis. Based on medical records from 2005-2010, 115 dogs met the inclusion requirements of a histologically and/or cytologically diagnosed cutaneous or subcutaneous MCT, staging with three-view thoracic radiographs at the time of presentation and absence of concurrent neoplastic disease. One dog (0.9%) had a nodular lung pattern consistent with pulmonary metastases; it presented for local recurrence of an intermediate grade MCT of the thoracic wall. The combination of CT and surface marker grids allowed accurate positioning of screws in clinical DP and DSB fractures. The technique was simple and rapid. An aiming device is useful for the technique.

Physicochemical and Bioadhesive Surface Analysis of Hydrogen Peroxide Gas Plasma Sterilized Nylon and Polyethylene Lines Used for Stabilization of the Canine Stifle Joint, Matthieu Gervais1, Alexandre O. EL-Warrak1, Rodrigo Franca2, Christian Bolliger1, Alexander O. EL-Warrak1, Rodrigo Franca2, 1Surgery, University of Montreal, QC, Canada; 2Laboratoire de Biopro- formance, Ecole Polytechnique, University of Montreal, QC, Canada.

Objective—Compare the effects of hydrogen peroxide gas plasma (HPGP), ethylene oxide (EO) and steam (ST) sterilizations on the physicochemical and bioadhesive properties of nylon and polyethylene lines used for stabilization of the canine stifle joint.

Study Design—In vitro study.

Samples—Non-sterilized, HPGP-, EO- and ST-sterilized samples of 36.3-kg test nylon leader line (NLL), 57.8-kg test nylon fishing line (NFL) and 2-mm Ultra High Molecular Weight Polyethylene (UHMPE) were used.

Methods—Surface analysis of NLL, NFL and UHMPE non-sterilized and HPGP, EO- and ST-sterilized samples was carried out by X-ray photoelectron spectroscopy (XPS), contact angle (CA) measurement, and atomic force microscopy (AFM). Staphylococcus intermedius and Escherichia coli bacterial adherence were also tested.

Results—Surface oxidation was observed on all samples sterilized with HPGP, EO or ST process. All sterilization methods significantly increased the CA for the NLL, NFL and UHMPE. The roughness was not significantly affected by the method of sterilization for NLL, NFL and UHMPE. Bacterial adherence was significantly affected by the method of sterilization for NLL, NFL and UHMPE. UHMPE had significantly higher CA, roughness and bacterial adherence compared to NLL and NFL, no matter which sterilization method was used.

Conclusion—The effects of HPGP on the chemico-physical and bioadhesive properties of nylon and polyethylene lines compared positively to EO or ST, making HPGP an alternative. HPGP may be a suitable material for future prostheses regarding bacterial adherence properties. Future studies are required to determine the clinical significance of these findings.

Hip Dysplasia in Canine Small and Toy Breeds: Retrospective Study, Julie Anne Gervais, Alexandre O. EL-Warrak, Guy Beauchamp. Département des Sciences Cliniques, Université de Montréal, Saint-Hyacinthe, QC, Canada.

Objectives—Identify epidemiologic data on hip dysplasia in canine small and toy breeds

Study Design—Retrospective study

Samples—Twenty-nine small and toy canine breeds medical records

Methods—Parameters from signalment, results of the orthopedic exam and results of the radiographic exam were collected. Data was statistically analyzed using Spearman correlation test to assess the relation between the body condition score and the degenerative changes and relation between the age and degenerative changes. Exact chi-square test was employed to define if there was a relation between the reason for presentation and the orthopedic examination. Cochran-Mantel-Haenszel test was used to identify if there was a relation between the reason for presentation and the degenerative changes.

Results—The most prevalent breed was the Pug. The clinical presentation is not bimodal. A positive and significant correlation between the body condition score and degenerative changes was identified. UHMPE may not be suitable for the stabilizations regarding bacterial adherence properties. Future studies are required to determine the clinical significance of these findings.
The current procedure used for the treatment of equine cervical spinal stenosis is a modification of the original Cloward procedure utilized in humans utilizing a ventral (anterior approach) to place a threaded titanium implant that results in fusion of the intervertebral space at the area of compression. The technique is used for both dynamic and static compression. In the dynamic cases compression on the spinal cord in flexion is prevented by the fusion in a neutral position and in static cases compression is relieved when the arthritic articular facets and excessive synovial tissue atrophy after fusion occurs. The morbidity and mortality for this procedure is significantly reduced when compared to a dorsal decompression procedure. There are a limited number of cases of severe static kyphos (most commonly seen at C2/C3 or herniation of intervertebral disc material into the spinal canal that can benefit from a ventral decompression procedure. This procedure was developed to assist patients with these conditions.

After a clinical and myelographic workup has been completed the patient is placed in dorsal recumbence under general anesthesia. The cervical area is placed into a cervical brace to reduce movement during surgery. The approach to the affected level is the same procedure as used in the placement of the implants. The 25 mm circular hole between the two vertebrae is extended to the spinal canal using constant intraoperative monitoring with repeated digital radiographs or computerized tomography. The cervical vertebra can be stabilized with the insertion of the titanium or stainless steel implant and use of autologous bone graft. Five patients have undergone the surgery over a 25-year period. 4 cases had severe static kyphosis of C2/C3 that permitted the anterior aspect of C3 being displaced into the neural canal. At the time of myelography no movement of the affected site could be demonstrated. The 4th case was a herniation of degenerate disc material into the spinal canal. Histopathology of the herniated sample obtained at surgery confirmed the origin of the offending material. 4 cases survived surgery with minimal complications and all these cases improved clinically with one horse surviving over 19 years as an athlete. The fifth case is a 2/3 stenosis and has survived the first postoperative month.

Mucosal Injury and Inflammatory Cells in Response to Brief Ischemia and Reperfusion in the Equine Large Colon. Astrid Grosch, Alison J. Morton, Graham S. Andrea, Jeffrey R. Abbott, John F. Valentine, Maximilian M. Polyak, David E. Freeman. 1Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, FL; Infectious Diseases and Pathology, College of Veterinary Medicine, University of Florida, Gainesville, FL; 2Medicine, College of Medicine, University of Georgia, Athens, GA; 3VetPath, College of Veterinary Medicine, University of Georgia, Athens, GA

ABSTRACTS
Biological dressings are increasingly used for partial thickness wounds and sterile dressing. Biological dressings in wounds with the advantages of fewer bandage changes, decreased pain, faster healing, and decreased expense. However, up to 19% of Biobrane applications become infected and must be removed to provide traditional wound care. There have been no studies comparing racing performance of Thoroughbred horses undergoing abdominal surgery for colic to horses of the same class that did not undergo surgery for colic. The hypothesis was that racing performance of horses that have undergone abdominal surgery for colic would not be different to control horses by the third quarter following the date of surgery. Postoperative racing performance in Thoroughbred racehorses that underwent colic surgery (n = 45) was compared to randomly selected control horses (n = 90) from the same quarter immediately prior to the date of surgery. Only horses which raced at least once prior to colic surgery were included in the study. Quarterly earnings and number of starts from quarter 1 (Q1) to quarter 12 (Q12) following the date of surgery were compared between cases and controls using an analysis of variance. Overall, 70% of horses that raced prior to surgery raced after surgery. Case horses had significantly lower number of starts and earnings per quarter in Q1 and Q2, however by Q3 through to Q12 there was no significant difference in either number of starts or earnings per quarter between case and control horses. There were no significant differences between case and control horses in number of quarters raced, earnings per start, or total earnings after the date of surgery. The results of this study show that racing Thoroughbred horses that undergo abdominal surgery for colic are able to successfully return to racing, with no significant differences in performance variables compared to their cohorts.

Correlation of Meniscal Injury with Long-Term Osteoarthritis Formation and Ground Reaction Forces in Dogs After Surgical Treatment of Cruciate Insufficiency. Marc S. Hirshenson1, Ursula Krotische1, Margret Thompson1, Jeremy Rawlinson1, Hiusni O. Mohammed2, 1Clinical Sciences, Cornell University, Ithaca, NY; 2Population Medicine and Diagnostic Sciences, Cornell University, Ithaca, NY.

One of the limiting factors to successful surgical correction of a ruptured cranial cruciate ligament (RCLL) is believed to be the degree of secondary osteoarthrosis, both at presentation and its rate of progression. The objective of this study is to determine the influence that meniscal pathology and its treatment have on long term osteoarthrosis formation and clinical function in dogs with previous RCLL.

Study participants undergoing surgery via extracapsular repair (ECR) or tibial plateau leveling osteotomy (TPLO) more than 1 year prior were entered prospectively. All animals had a complete orthopedic examination, radiographs, and force plate gait analysis. Dogs were divided into two groups: normal meniscus, no intervention (treatment 1); abnormal meniscus, partial meniscectomy +/- meniscal release (treatment 2) and compared against a standardized normal population. Radiographs of operated stifles were evaluated for presence of degenerative changes based on 29 specified imaging signs on preoperative and recheck images. 36 stifles have been enrolled with a mean follow-up of 1392 days. Breakdown of participants into groups included: control (n = 79); treatment 1 (n = 26); treatment 2 (n = 10). An ANOVA compared follow-up os- teoarthrosis score and identified no significant difference in pre- cedure or presence of meniscal damage. Significant differences in walk
contact time (CT) and trot CT, peak vertical force and vertical impulse was found between surgery groups (ECR vs. TPLO) but not among treat-
ment groups. Therefore, surgery type appears to be more significant than
meniscal treatment in long-term outcome of dogs undergoing repair for
RCCL.

Evaluation of Single-Session Tibial Tuberosity Advancement Procedure for the
Treatment of Bilateral Cranial Cruciate Ligament Rupture in Dogs: 24 Dogs, Marc S. Hirshenson 1, Ursula Krotscheck 2, Heather Knapp-Hoch 1, Ariane Jay 1, Stuart Bliss 1, 2Clinical Sciences, Cornell University, Ithaca, NY; 3Port
City Veterinary Referral Hospital, Portsmouth, NH.

The use of simultaneous bilateral tibial tuberosity advancement (TTA) as treat-ment for bilateral cranial cruciate repair (CCL) in the dog has not been
well described. Our objective was to compare unilateral vs. bilateral
single-session TTA and also to clinically evaluate the long-term results.

A total of 22 stifles (24 bilateral and 9 unilateral) were prospectively
retrospectively. Information gathered from the medical record included
patient signalment, physical exam findings, anesthetic time, total
surgical time, CCL damage (partial/complete rupture), meniscal damage
treatment, implants used and advancement distance and intra-
and postoperative complications. Categorical data was compared using a chi-
square test, and continuous data was evaluated using a 2-sample t-test.
Significance was calculated using an ANOVA with a post hoc Bonferroni correction.

No intra-operative complications were encountered in either group. Su-
perficial skin infection was noted in three stifles postoperatively. No catas-
trophic failures occurred. Postliminary meniscal injury was suspected in one
stifle. The only statistically significant differences between uni- and bi-
ilateral TTAs were days spent in hospital (P = 0.01), cost, anesthetic time,
and total surgical time (P < 0.0001 for all). Ninety percent of owners re-
ported excellent outcome postoperatively. All remaining owners reported good to excellent outcome. Complication rates were similar to both pre-
viously reported unilateral and bilateral TTA and TPO procedures.

This study suggests that the use of bilateral single-session TTA procedures can
be an effective and safe technique.

A Biomechanical Comparison of Three Femoral Fixation Sites Using the Ham-
string Graft in Canine Cranial Cruciate Ligament Reconstruction, Louisa K. Hei 1, Masahiro Seki 1, Lindsey M. Goodwin 1, Lin Xie 1, Michael T. Kearney 1, Mandi Lopez 1, 2Veterinary Clinical Sciences, School of Vet-
ery Medicine, Louisiana State University, Baton Rouge, LA; 3School of
Medicine, Health Sciences Center, Louisiana State University, Baton
Rouge, LA; 4Department of Pathological Sciences, Statistical Services Unit,
Health Sciences Center, Louisiana State University, Baton Rouge, LA.

Surgical stabilization of canine cranial cruciate ligament (CCL) deficient
stifles is intended to prevent and delay degenerative joint changes and re-
store normal stifle kinematics. This study was designed to test the hypothesis
that femoral graft attachment site influences stifle translation and rotation
conferred by intra-articular hamstring (HG) graft CCL reconstructions.

In this study, 24 bilateral and 3 unilateral cranial cruciate ligament de-
formations were evaluated in 24 normal canine hind limbs with the CCL intact, tran-
sected and after HG stabilization at three femoral fixation sites: 1) center of
condyle (CC); 2) distal to lateral fabella (F), and 3) proximal aspect of lateral
trochlear ridge (TR). Tibial translation was quantified with no force
and during application of cranial and caudal forces of 66.7 N to the tibia.
Stifle rotation angles were recorded via an active motion analysis system
with the femur immobilized in a custom designed device that permitted
tibial rotation during translation loading. Additionally, reconstructed graft
strain was determined throughout stifle range of motion.

Comparison of reconstructed to intact stifles with CRCL fixation at site F
showed significantly greater translational stability than fixation at site TR
or CC (P < 0.05). Significant differences in tibial rotation were associated
with fixation method (P = 0.02), with site F showing least rotational vari-
iances. Lack of significant differences in graft strain throughout stifle range
of motion within or between treatment groups supports the potential for
isometry when grafts extended from the native CrCL origin and insertion.
Femoral fixation site influences the stifle stability conferred by HG CRCL
reconstructions.

Prevalence and Risk Factors for Development of Malignant Neoplasia in Feline
Renal Allograft Recipients Receiving Lifelong Cyclosporine Based Immunosup-
pression 1998–2010; Elaine S. Holmes, Lillian Aronson. University of Penn-
sylvania, Philadelphia, PA.

Malignant neoplasia has been documented at an increased rate in feline
renal transplant recipients (FRTR) from 1998–2010 (n = 126, n = 109 in-
cluded) were reviewed. Data collected included patient signalment, survival
data, neoplasia diagnosis data, exogenous erythropoietin administration,
and transplanted trough cyclosporine data. Prevalence of PTMN was 22% (n = 24/109) with 27 occurrences of PTMN total. Lymphoma was di-
agnosed in 51.9% (n = 14 /27). Other diagnoses included adenocortical
neoplasia (n = 1), squamous cell carcinoma (n = 1), meningioma (n = 1),
pulmonary carcinoma (n = 1), fibrosarcoma (n = 1), cutaneous mast cell
tumor (n = 1), splenic mast cell tumor (n = 1), renal carcinoma (n = 2),
malignant melanoma (n = 1), neuroendocrine tumor (n = 1), and nasal
adenocarcinoma (n = 1). Cause of death was PTMN in 66.7% (n = 16 /24). MST for dogs with neoplasia was 646 days (interquartile range 409-
1620 days) which was not significantly different from cats without PTMN.
Median TTO of PTMN was 631 days (range 7–2803 days). Diagnosis of
neoplasia was not associated with survival time. Cyclosporine and erythro-
poietin administration did not affect occurrence of PTMN or survival time.
PTMN remains a problem in FRTR and cats with PTMN predominantly
die from their disease. This is the first report of many malignancies in
FRTR.

A Biomechanical Comparison of Three Linear-Circular Hybrid Fixator Con-
structs. Caleb C. Hudson 1, Daniel D. Lewis 1, MaryBeth Horodyshky 2, An-
tonia Pozzi 2, Alan R. Cross 4, Scott A. Banks 3, 1Small Animal Clinical Sci-
ences, College of Veterinary Medicine, University of Florida, Gainesville,
FL; 2Department of Orthopaedics and Rehabilitation, College of Medicine,
University of Florida, Gainesville, FL; 3Department of Mechanical and
Aerospace Engineering, College of Engineering, University of Florida,
Gainesville, FL; 4Georgia Veterinary Specialists, Atlanta, GA.

Linear-circular hybrid fixation has been described for the correction of
fractures and limb deformities in dogs and cats. Little information is avail-
able regarding the mechanical properties of these systems. The purpose of
this study was to determine the stiffness properties of three hybrid fixator
constructs loaded in axial compression, cranial-caudal bending, medial-
lateral bending and torsion.

Three hybrid constructs (designated Ia, Ib, & I b) were tested. All con-
structs utilized a small, 84 mm, incomplete (5/8) ring and two tensioned
olive wires to stabilize one bone segment and a primary hybrid rod with
three interface fixation pins to stabilize the other bone segment. Constructs
Ia and Ib incorporated a secondary diagonally placed hybrid rod and
construct Ib incorporated biplanar fixation pin insertion. Eight replicates
of each construct were tested for 10 cycles in 4 modes of loading using an
MTS. Ring deformation during testing was assessed by collecting serial
ring measurements during loading. Stiffness and deformation data were
analyzed using an ANOVA with a post hoc Bonferroni correction.

Axial compression: constructs Ia and Ib were significantly stiffer than
Ia. Cranial-caudal bending: Construct Ib was significantly stiffer than con-
struct Ia. Medial-lateral bending: no significant differences between con-
structs Ia and Ib. Torsion: Construct Ib was significantly stiffer than both Ia and Ib.

Permanent ring deformation did not occur.

Incorporation of biplanar linear fixation elements as well as the addition of
a secondary hybrid rod improved construct stiffness in several modes of
loading. This study provides a base for further studies evaluating hybrid
linear-circular fixator biomechanics.

The Decompression and Fusion to Canine Caudal Spondylodisectomy Using Custom-Made Titanium Implant. Atsuki Iijiri, Department of Small
Animal Surgery, Atsuki Animal Medical Center, Kusatsu, Japan.

Caudal cervical spondylodisectomy (CCSD) was treated by using
custom-made bioactive titanium implant as distractions fusion spacer.
The implant was used as a part of the technique in decompression surgery that includes ventral slot with removal of degenerated intervertebral disc prolapse from the spinal canal, and was placed into the slot space for
distraction and stabilization.

Our new surgical technique using custom-made bioactive titanium im-
plant combined with conventional ventral slot will provide sufficient initial
distraction and stabilization to the affected spinal segment and lead to
successful arthrodesis.

The cases included 5 large breed dogs with neurological abnormalities,
which were diagnosed as CCSD by clinical symptoms, Computerized To-
mography (CT), MR1, and radiographic examination at our clinic.

All dogs were evaluated radiologically by CT postoperatively at regular
intervals over 1 year. All 5 dogs showed satisfactory improvement postoperatively and became asymptomatic within 3 months. The slight migration of the implant was detected by CT in each case within 10 days of the surgery, however, further
movement was not observed after 10 days. By 3 months, the intervertebral disc space appeared to be fused in all cases.

The original distractable fusion spacer performed sufficient durability against the pressure placed onto the stabilization throughout the dog's life. This new technique will be expected the further use and development in vertebral stabilization.


Studies have been published regarding techniques for colonic resection and anastomosis, though none have been published regarding dehiscence rates and associated risk factors in colonic resection and anastomosis. Studies have also been published on rates and risk factors following gastrointestinal surgery, though none were specific to the colon. The objectives of this study were to identify the rate and risk factors for dehiscence of colonic anastomoses.

Out of 56 cases, 56 dogs were identified as the sample population. Of these, 2 were excluded for anastomosis complications, leaving 54 patients for analysis. The time at which dehiscence occurred was 4–6 days postoperatively, which is a longer lag than expected for dehiscence of small intestinal anastomoses.

Treatment of Avascular Necrosis of the Femoral Head in Small Dogs with Cementsed Micro Total Hip Replacement. Daniel Jankovits1,2, Bill Liska2, Russell H. Kalisz3. 1Surgery, Animal Specialty Group, Inc., Los Angeles, CA; 2Veterinary Clinical Sciences, Louisiana State University, Baton Rouge, LA; 3Syracuse University, Syracuse, NY.

Avascular necrosis (AVN) of the femoral head is a developmental condition that affects small breed dogs. AVN is reported to be an autosomal recessive trait. The pathophysiology is well described. The contemporary treatment for AVN is femoral head and neck excision with good to fair subjective results. Total hip replacement (THR) is used to manage hip diseases in dogs to eliminate pain and re-establish normal function. THR has been recommended as a treatment of AVN, but clinical outcome studies are lacking. The purpose of our study was to evaluate treatment of AVN with the Micro THR system. Our hypothesis is that Micro THR used for the treatment of AVN would result in return to normal function with normal weight bearing.

This was an unrandomized, retrospective study. The records of seven dogs (7 hips) treated with Micro THR were evaluated. All dogs were evaluated at least 6 months after Micro THR. Signalement, physical, orthopedic, neurologic and radiographic examination, owner questionnaire, thigh girth, and ground reaction forces were evaluated.

There was no correlation between age, sex, and breed for the development of AVN in this study. Thigh girth and ground reaction forces showed no statistical difference between operated Micro THR limb and contralateral normal limb.

Micro THR is a surgical treatment option for AVN in small dogs.

Inhibition of Prostaglandin E2 and Nitric Oxide Production in Canine Chondrocytes by Pentosan Polysulfate and N-Acetylglucosamine Combination Compared to Meloxicam. Lane Johnson1, Mark Grizzana2, Lowella Heinecke2, Angela Atz1, Jennifer Wardlaw2, Carmelita G. Frondoza1,2. 1Mississippi State University, Mississippi State, MS; 2Nutramax Laboratories, Inc., Edge- wood, MD; 3Syracuse University, Syracuse, NY.

Osteoarthritis is associated with excess production of pro-inflammatory cytokines and prostaglandin E2 (PGE2). We determined whether the combination of pentosan polysulfate and N-acetylglucosamine (PPS+NG) will inhibit the inflammatory response in activated canine articular chondrocytes. The effect of PPS+NG was subsequently compared to the effect of the commonly used NSAID-meloxicam.

Canine chondrocyte microcarrier spinner cultures were activated with IL-1β and treated with: (1) control media alone, (2) clinically relevant concentrations of PPS (AUPEN5000™, 125 ng/ml) + NG (200 µg/ml), or (3) meloxicam (11.7 ng/ml). PGE2 and NO production were determined by ELISA and by nitrite Griess assay, respectively. Data was analyzed using one-way ANOVA, Tukey post-hoc test. P < 0.05 significance level.

Chondrocytes activated with IL-1β showed a four-fold increase in PGE2 production and a two-fold increase in NO production. Treatment with PPS+NG significantly reduced PGE2 and NO production levels (P < 0.001). Similarly, meloxicam elicited a significant decrease in PGE2 and NO production (P < 0.001). The anti-inflammatory effect of the PPS+NG mixture appears to be comparable to meloxicam as shown by its ability to inhibit cytokine-induced PGE2 and NO production (P < 0.001). These findings support earlier studies that found PPS and NG to exhibit both anti-inflammatory and anabolic activity (7–8). It may be possible to combine PPS+NG with meloxicam to allow dose reduction of NSAIDs, thus minimizing adverse side effects such as life-threatening gastrointestinal, renal, and hepatic complications. Our observation suggests that the PPS+NG combination may be a useful addition in the management of joint inflammation in dogs and other species.

Arthroscopic Anatomy of the Tarsal Collateral Ligaments in the Horse. Jan M. Kummerle, Martin Kummer. Equine Hospital, Vetsuisse Faculty, University of Zurich, Switzerland.

The equine tarsal collateral ligaments (CLs) have a complex anatomy with a unique and a short component present medially and laterally. The short component can be subdivided into a superficial, middle and deep part. Tarsocural joint arthroscopy can provide diagnostic information and serve therapeutic purposes in horses suffering from pathological changes of the tarsal CLs. However, a morphological description of the arthroscopic anatomy of the equine tarsal CLs is lacking.

In this study, cadaver hindlimbs from horses euthanized for reasons unrelated to tarsal disease were used to obtain silicon models or perform arthroscopic exploration and subsequent dissection of the tarsocural joint. During arthroscopic exploration, a hook knife was used to apply markers to the various parts of the CLs. During dissection, the position of these markers was allocated to the specific parts of the CLs.

Ipsilateral arthroscopic and instrument portals were used in each pouc. Via the plantaromedial pouch, the deep or middle short medial CL and the long medial CL were usually reached. Access via the plantarolateral pouch allowed manipulation of the deep short lateral CL and the long lateral CL. Dorsally, arthroscopy via the dorsomedial pouch gave access to the deep short medial CL, while the superficial or middle short lateral CL could be reached via the dorsolateral joint recess.

In conclusion, specific but limited parts of the tarsal CLs can be visualized via manipulated arthroscopy and this has clinical implications for diagnostic and therapeutic purposes.

Biomechanical Algorithm to Quantify Forces from Equine Motion at the Saddle Position. Laxmi R. Nandana Kaidapuram1,2, Mandi Lopez1, Lin Xie1. 1Electrical and Computer Engineering, Louisiana State University, Baton Rouge, LA; 2Veterinary Clinical Sciences, Louisiana State University, Baton Rouge, LA.

Therapeutic riding is a common component of physical therapy programs. Quantification of the forces on the horse back at the level of the saddle will provide vital information to match therapeutic riders with equine partners. To meet this unmet medical need, an algorithm to quantify forces at the saddle level from ground reaction forces was developed to test the hypothesis that the forces transferred to a static weight at the saddle level can be predicted by horse breed and weight. Simultaneous, real time kinetic, kinematic, and back force data on a static weight was collected from 7 adult horses, 3 Thoroughbreds, 3 Quarter Horses, and 1 Paso Fino, at a walk using an integrated system consisting of a force platform, active motion detection system, and wireless force transducers, respectively. Data was collected from a minimum of five trials from all horses at a walk (1.3–2.0 m/s). Inverse dynamic analysis was used to calculate the force and hind limb joint forces to the level of the shoulder and hip. Virtual segments were created from the shoulder to the spine, and the segments were modeled as series of springs and dampers. The energy absorption coefficients were derived through a series of iterations to align the inverse dynamic solutions of the fore- and hind limb data with the forces measured at the back. The data from this investigation will contribute to mechanisms to predict forces experienced by the rider during horse motion to advance the science of therapeutic riding.
A Descriptive Study of the Equine Proximal Interphalangeal Joint Using Magnetic Resonance Imaging, Contrast Arthrography and Arthroscopy. J Lucy Kammm 1,2, Laurie Goodrich1,2, Natasha Werry2, C Wayne McIlwraith3,4, Clinical Sciences, Colorado State University, Fort Collins, CO; 2Orthopaedic Research Center, Colorado State University, Fort Collins, CO.

Introduction: This study is a descriptive analysis of the fore and hind limb proximal interphalangeal (PIP) joints. The dorsal and palmar/plantar PIP joints are visualized using several imaging modalities. These are used to illustrate areas that are arthroscopically accessible, describe the soft tissue structures that must be avoided, and investigate the differences between the fore and hind PIP joint.

Methods: Healthy cadaver limbs were used to perform anatomic modeling, magnetic resonance imaging (MRI) with MRI-compatible needles, contrast arthrography using computed tomography (CT), and arthroscopy on the PIP joint. Two approaches to the dorsal joint, one more proximal than the other, were compared to reveal the optimal location of placement to see the greatest area of the joint.

Results: Anatomic modeling revealed large proximal recesses of the joint both on the dorsal and palmar/plantar sides. MRI showed that the axial plantar ligaments, abaxial palmar/plantar ligaments, straight sesamoid bone, and the branches of the superficial flexor tendon are axial or palmar/plantar to the vascular bundle. There was no significant difference in the amount of joint visualized when using the more proximal or distal approach to the dorsal joint (P = 0.586). The only significant difference in visualization between the fore and hind was that an arthroscope portal in the proximal dorsal approach could visualize more abaxial areas of the joint in the fore limb than in the hind (P = 0.050).

Discussion: The dorsal and palmar/plantar joint pouches allowed for good arthroscopic visualization of the articular portions of the first and second phalanx (P1 and P2). Dorsal arthroscopic portals could be placed at the level of the PIP joint up to 1.5 cm proximal to it without affecting the amount of visualization of the joint. Placement of the arthroscope at the levels of 1.5 cm proximal to the joint allowed the most manipulation of the arthroscopic surgical equipment. Palmar/plantar portals were placed dorsal to the vascular bundle to prevent laceration of tendons and ligaments.

Conclusion: With improved understanding of the PIP joint as well as knowledge attained regarding differences between the front and hind limb, joint injections and arthroscopic surgery can be more easily completed.


The goal of the study is to describe a technique of removing a large, diseased ovary, using a flank approach, with the mare standing and to report the outcome of mares undergoing this technique.

Mares included in the study were those that underwent unilateral ovarioocoxytomy between the years: 2002–2010 through a flank approach, with the mare standing. The study included 14 mares, aged 3–17 years, weighing 350–500 kg.

Mares were examined because complaints of recent development of behavioral changes and/or cessation of reproductive cycling activity. Mares were restrained in a stock, the flank region was prepared for aseptic surgery and the abdominal cavity was exposed through a 10–12 cm long, vertical incision. The ovarian pedicle was ligated by sutures and staples. During closure of the abdominal incision, a suction drain was placed between the external and internal abdominal oblique muscles.

All the ovaries were successfully removed, and no major complications were observed. Two mares developed an incisional infection but all mares had a good final cosmetic outcome. A granulosa-theca cell tumor was identified during histological evaluation of the ovary of 6 mares. All mares showed improvement in objectionable behavior and regained normal estrus cycling within 15 month after surgery. At the time of writing 2 mares foaled and 6 were pregnant.

Ovariectomy performed with the mare standing through a flank approach is a safe, efficient, and relatively inexpensive technique for removing a diseased ovary. The technique allowed easy ligation of the ovarian pedicle and avoided complications associated with general anesthesia.

Hip Toggle Stabilization Using the TightRope® System in 9 Dogs. Nina Kieves1,2, Peter Lotzakis1, Sherman O. Canapp1. 1Veterinary Orthopedic & Sports Medicine Group, Annapolis Junction, MD; 2Department of Veterinary Clinical Sciences, Iowa State University, Ames, IA.

Toggle rod stabilization for coxofemoral luxation (CFL) has been described using many variations of prosthetic ligament of the head of the femur (LHF) including absorbable and non-absorbable suture material. Our objectives were to describe the technique and to report clinical outcome in cases that had toggle rod stabilization for CFL using the TightRope® system as the prosthetic LHF.

Medical records including radiographs (9 limbs) with CFL repaired using the TightRope system were retrospectively reviewed to assess outcome using this technique. Follow-up was available for 9 dogs (by phone). Re-evaluation and gait analysis was performed in 5 dogs (mean, 8 months; range, 3–24 months). A single case of re-luxation was reported. Eight of nine owners reported limb function as being excellent. For five dogs evaluated by a veterinarian >3 months following surgery, objective gait analysis revealed pelvic limb symmetry. Radiographs (3–24 months post-surgery) of the five dogs showed minimal to no progression of osteoarthritis compared to the contralateral hip.

Hip toggle with the TightRope® system produced a favorable clinical outcome with high owner acceptance. Repair of CFL with the TightRope® system is a clinically applicable technique and may offer advantages over other materials used for hip toggle repair in respect to postoperative complications.

The Effect of Position of the Tibial Plateau Leveling Osteotomy on Patella Tendon Strain. In Vitro Cadaveric Study. Sun Young Kim 1,2, Kei Hayashi1,2, Jinues Y. Kim1,2, Tanya Garcia-Nolen3, Amy S. Kaplinski1,2, Susan Stover3. 1William R. Pritchard Veterinary Medical Teaching Hospital, University of California, Davis, CA; 2Surgical and Radiological Sciences, University of California, Davis, CA; 3JD Wheat Veterinary Orthopedic Research Laboratory, University of California, Davis, CA.

Patellar tendon thickening (PTT) and Patellar tendinopathy (PTP) is the most commonly reported complication after tibial plateau leveling osteotomy (TPLO). The purpose of this study was to investigate biomechanical factors that could contribute to patellar tendinopathy after TPLO. The specific aim was to determine the effect of location of the TPLO on patellar tendon strain in cadavers.

Eight pairs of normal cadaver pelvic limbs were randomly assigned into two groups based on TPLO position: High cut and Low cut. Patellar tendon strain was measured using a differential variable reluctance transducer (DVRT) under an axial load of 30% body weight and standing joint angles before, and after, TPLO. Joint angles were standardized by adjusting tibial tuberosities in series with respective load cells that simulate quadriceps and gastrocnemius muscle functions. Data from 2 specimens were excluded from analysis due to significant change of joint angles during the test. Patellar tendon strain was compared before and after TPLO, and amount of the strain change was compared between the High cut TPLO and Low cut TPLO.

Patellar tendon strain was lower after the TPLO than before TPLO. The Low cut, but not the High cut TPLO decreased patellar tendon strain. Generally, a tendinopathy results from either repetitive excessive stress or stress shielding. The data indicate that PTT or PTP after TPLO may result from stress shielding rather than over-stress. The High cut TPLO is recommended over the Low cut TPLO because patellar tendon strain after TPLO is smaller. To avoid PTT and PTP, physical therapy may be needed after TPLO to prevent stress shielding of the tendon.


Obstructive urolithiasis remains the most common indication for surgery of the urinary system in small ruminants and continues to be a challenging problem to treat effectively. Diagnostic imaging may aid in the diagnosis of obstructive urolithiasis and determining the appropriate surgical technique for intervention. The objective of this retrospective study was to evaluate the use of plain radiography for diagnosis, surgical management, and prognosis of obstructive urolithiasis in small ruminants. We hypothesized that plain radiographs provided diagnostic and prognostic benefits in the surgical management of radio-opaque uroliths in the urinary system of small ruminants. Goats and sheep (n = 25) admitted between January 2002 and December 2010 with obstructive urolithiasis and having plain radiographs taken of the urinary tract were included in the study. Urinary calculi were detected in 21/25 (84%) of plain radiographs taken, and radiographs were considered to be diagnostically useful in 23/25 (92%) cases. In radiographs containing radio-opaque uroliths, the calculi were localized to the urinary bladder in 10 animals, penile urethra in 8, just distal to the ischium in 6, and the sigmoid flexure in 3. Radiographs were taken in 9/25 (36%) of the animals and in 9/25 (36%) of the animals with calculi in the ischium and were perceived to be of diagnostic value in all animals. In 6 of these animals, the postoperative radiographs revealed residual calculi in the urethra and were essential for their targeted removal. In regions where radio-opaque calculi (calcium carbonate, calcium oxalate, silica) are common, survey radiographs are recommended to determine.
the appropriate surgical approach(es) and to confirm resolution of the obstruction.

Isolation, Characterization and In Vitro Proliferation of Canine Bone Marrow, Adipose Tissue, Muscle, and Periosteum-Derived Mesenchymal Stem Cells. Agatha Kisiel1, Laurie McDuffie2, Elmakbrok Massoud1,3, Trina Bailey1, Blanca Esparrza Gonzalez1, Rodolfo Nino Fong2. 1Companion Animals, Atlantic Veterinary College, Charlottetown, PE, Canada; 2Health Management, Atlantic Veterinary College, Charlottetown, PE, Canada; 3Centre of Veterinary Epidemiological Research, Atlantic Veterinary College, Charlottetown, PE, Canada; 4Department of Statistics, University of Alberta, Edmonton, AB, Canada; 5AusVet Animal Health Services, Toowoomba, QLD, Australia.

Bone marrow and adipose tissue are the most commonly reported sources of canine mesenchymal stem cells (cMSCs). The objective of this study was to isolate and characterize marrow and adipose tissue-derived cMSCs (BMSCs and AMSCs). We hypothesized that BMSCs and AMSCs could be successfully isolated, and their proliferation potential would be at least equivalent to BMSCs and AMSCs. Mesenchymal stem cells (MSCs) were isolated from bone marrow, adipose tissue, muscle, and periosteum of seven canine cadavers. They were characterized by morphology, immunofluorescence of cell surface markers, and expression of pluripotency-associated transcription factors. Adipogenic, osteogenic, and chondrogenic differentiation was evaluated using morphological and histochemical methods. Passage one BMSCs, AMSCs, PSMSCs, and PMSMSCs were used daily for four days to determine proliferative capacity. The MSC yield/gram of tissue was also calculated.

The Relationship Between Synovial Fluid and Cartilage Chondroitin Sulphate 846 Epitope in a Model of Experimentally Induced Osteoarthritis in Horses Treated Intravenously with Pentosan Polysulphate, N-Acetylglicosamine and Sodium Hyaluronan. Toby J. Koenig1,2, Andrew Dart2,1, Nigel Perkins3, Robin J Bell2,3, Neil U. Horadagoda2,3, Mark Kroenke2,1, Leo Jeffcott2,1, Christopher B. Little2,1, C Wayne McIwraith3. 1Faculty of Veterinary Science, the University of Sydney, Camden, NSW, Australia; 2Biomedical Research & Clinical Trials Unit, University of Sydney, Camden, NSW, Australia; 3Gail Holmes Equine Orthopaedic Research Centre, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO; Raymond Purves Bone and Joint Research Laboratories, Kolling Institute of Medical Research, Institute of Bone and Joint Research, the University of Sydney, Sydney, NSW, Australia; 4AusVet Animal Health Services, Toowoomba, QLD, Australia.

Lameness associated with osteoarthritis has a significant economic impact on the equine industry. The objective of the current study was to assess clinical and biochemical effects of an intravenous combination of pentosan polysulphate (PPS), N-acetylglicosamine (NAG) and sodium hyaluronan (HA) in treatment of horses with experimentally surgically induced osteoarthritis. We hypothesised that treatment with PGH (Pentosan Polysulphate, N-Acetylglicosamine and Sodium Hyaluronan) would have beneficial effects on the measured clinical and biochemical variables of osteoarthritis compared to placebo treated control horses.

An osteochondral fragment was created on the radiocarpal bone arthroscopically in 16 horses. Commencing on day 10, eight horses received 3 mg/kg PPS, 4.8 mg/kg NAG and 0.12 mg/kg HA intravenously weekly until the 80th postoperative day. Eight control horses received an equivalent volume of saline on the same schedule. Clinical, synovial fluid and biochemical changes were evaluated throughout the study.

No adverse treatment-related events were detected. The presence of an osteochondral fragment caused a significant change in lameness, response to carpal flexion, joint effusion, synovial fluid total protein, synovial fluid chondroitin sulphate-846 epitope (CS846) and PGE2 and cartilage CS846. Treatment with PGH reduced the total protein concentration in the limb with the osteochondral fragment compared to horses treated with saline. The CS846 concentration of the cartilage of the fourth carpual bone in joints that did not have an osteochondral fragment was higher in PGH treated horses compared with horses treated with saline. There were no other significant changes.

Results suggest that PGH had beneficial disease-modifying or chondroprotective effects and may be a therapeutic option for osteoarthritis in horses.


Objectives: to determine the long-term ground reaction forces (GRF) in TPLOs vs. extracapsular reconstruction (ECR), and to compare these to a cohort of normal dogs.

Animals: Normal adult dogs (control, n = 79); dogs with unilateral CCL disease (treatment, n = 38).

Materials and Methods: Force-plate gait analysis (FPA) was performed in all groups. Symmetry indices (SI) were calculated for GRFs. Data collected and analyzed by individual GFs including: surgery type, time period after surgery (TP), sex, age, weight, BCS, side, lameness duration, tear type, and meniscectomy. Least squares estimate was used to evaluate GRF’s based on time period after surgery and treatment group in comparison to the control group. TP was defined as period 1 (1-14 days), 2 (15-29 days), 3 (30-49 days), 4 (50-90 days), 5 (90-130 days), 6 (130-180 days).

Results: There were no statistically significant differences among treatment groups for meniscal pathology, tear type, and lameness duration (P = 0.07 ± 0.036 for all), whereas there was no statistically significant difference between the ECR group and the control group at all TPs (p = 0.036 for all). RM ANOVA showed significant differences for surgery type and TP. Further analysis showed a statistically significant difference between the ECR group and the control group at all TPs (P = 0.036 for all)
Conclusions: Dogs receiving a TPLO for treatment of RCCL recovered near normal function by 150 days after surgery, whereas no dogs receiving ECR recovered to normal function at any time point.

Clinical and Histopathological Prognostic Factors for Canine Osteosarcoma of the Flat and Irregular Bones, Meghan A. Kruse1, Elaine S. Holmes1, Julie A. Balko2, Steven Fernandez2, Dorothy C. Brown1, Michael H. Goldschmidt1, Department of Clinical Studies, Veterinary Hospital of the University of Pennsylvania, Philadelphia, PA; 2Department of Pathobiology, Veterinary Hospital of the University of Pennsylvania, Philadelphia, PA.

Osteosarcoma is the most common bone tumor in dogs. However, current literature focuses primarily on appendicular osteosarcoma. This study examined the prognostic value of histological and clinical factors in flat and irregular bone osteosarcomas and hypothesized that clinical factors would have a significant association with survival time while histological factors would not. All osteosarcoma biopsy samples of the vertebra, rib, sternum, scapula, or pelvis were reviewed while survival information and clinical data were obtained from medical records, veterinarians, and owners.

Forty-six dogs were included in the analysis of histopathological variables and 27 dogs with complete clinical data were included in the analysis of clinical variables. In the histopathologic cox regression model, there was no significant association between any histologic feature of the osteosarcoma, including grade, and survival time. In the clinical cox regression model, there was a significant association between the location of the tumor and survival time as well as between the percent elevation of alkaline phosphatase (AlkPhos) above normal and survival time. Controlling for AlkPhos elevation, dogs with osteosarcoma located in the scapula had a significantly greater hazard for death (2.8) compared to dogs with tumors in other locations. Controlling for tumor location, every 100% increase in AlkPhos from normal increased the hazard for death by 1.7.

For canine osteosarcomas of the flat and irregular bones, histopathological features, including grade do not appear to be rigorous predictors of survival. Clinical variables such as increased AlkPhos levels and tumor location in the scapula were associated with decreased survival times.

Pilot Hole Size and Tapping Affects Insertion Torque and Axial Pullout Strength of 4.0 mm Cancellous Bone Screws. Kevin A. Kunkel1, Jonathan T. Suber2, Michael P. Kowaleski1, 1Surgery, SC Veterinary Specialists, Columbia, SC; 2Surgery, Tufts Cummings School of Veterinary Medicine, North Grafton, MA.

Recommendation for placement of 4.0 mm screws is to use a 2.5 mm pilot hole and tap with a 4.0 mm tap. Our hypotheses were: (1) the axial pullout strength of 4.0 mm screws would be increased using a 2.0 mm pilot hole compared to a 2.5 mm pilot hole and (2) tapping the 2.0 mm hole would decrease the insertion torque, without decreasing pullout strength. Synthetic cancellous bone blocks were assigned to one of five groups (screw size/pilot hole/tap size): 1 (3.5/2.5/3.5), 2 (4.0/2.5/4.0), 3 (4.0/2.5/none), 4 (4.0/2.0/4.0), 5 (4.0/2.0/none). 70 mm screws were inserted using a torque recording screwdriver. Screws were extracted at 5 mm/min until failure. Insertion torque (IT), axial pullout strength (APS), yield strength (YS), and stiffness were determined. Data were analyzed using a one-way ANOVA.

Maximum IT (Nm) was significantly different for all groups: Group 5 > Group 4 > Group 3 > Group 2 > Group 1 for APS (N): Group 3, 4, and 5 were similar and significantly greater than Group 2, all of which were significantly greater than Group 1. For YS (N): Group 5 and Group 4 were similar and significantly greater than Group 3, Group 2, and Group 1. For stiffness (N/mm): Group 3 was similar to Group 4 and Group 2 but was significantly greater than Group 5, all of which were significantly greater than Group 1.

In a synthetic cancellous bone model, tapping a 2.0 mm pilot hole when placing a 4.0 mm screw is the optimal insertion technique.

Reliability of Photogrammetry to Perform Three-Dimensional (3D) Wound Assessments Compared to Standard 2D Photographic Techniques. Raphael Labens, Anthony Blisklager. Department of Clinical Sciences, North Carolina State University, Raleigh, NC.

Reliable wound monitoring is essential for assessment of healing in clinical and research situations. Two-dimensional (2D) surface measurements are commonly used but they do not consider 3D topography. We hypothesize that principles of photogrammetry can be applied for 3D analysis of equine wounds and that the technique is more reliable than 2D images. Using PhotoModeler ScannerTM and three Canon PowerShot™ SD780 IS cameras simultaneous images were repeatedly (three times) obtained of four conservatively healing wounds at each follow-up. Images were processed to compute 3D computer models and 3D wound surface measurements were obtained. Standard 2D measurements were obtained using an open source software program (ImageJ). The maximum difference between repeated measurements was recorded. Differences were translated in %changes of the mean wound area that they occurred in. A repeated measures ANOVA was performed on absolute measurements (Data1a) and %changes (Data2).

Analysis of Data1 showed that “time of follow-up” and “method of analysis” were significant (P = 0.0002; P = 0.0013). Analysis of Data2 showed that “method of analysis” (P < 0.0001) and “wound location” were significant (P = 0.0286). The mean difference in %change of the wound area was 17.3% for repeated 2D and 5.75% for 3D measurements.

Photogrammetric methods can be successfully applied for equine wound monitoring. 3D area measurements were shown to be significantly more reliable than 2D measurements allowing a reliable assessment of the wound bed. The poor performance of repeated 2D measurements is in part attributable to differences in photographic perspective, which the 3D method is not subject to.

Use of Neurostimulation to Localize and Anesthetize the Brachial Plexus of Calves Undergoing Metacarpal Surgery. Hélène Larde, Sylvain Nichols, Geneviève Bussières, Marketa Kopal, André Desrochers, Susan R. Vogel. Faculté de Médecine Vétérinaire, Université de Montréal, St-Hyacinthe, QC, Canada.

In cattle, surgery distal to the metacarpophalangeal joint is usually performed under loco-regional anesthesia. However, for proximal procedures, general anesthesia is often required. The aim of this study was to evaluate the use of brachial plexus anesthesia for orthopedic surgery in calves. We hypothesized that this loco-regional block, combined with sedation, would be sufficient for interventions on the metacarpus of calves.

Ten Holstein calves were sedated with xylazine and butorphanol and placed in dorsal recumbency. The limb was held in extension and the brachial plexus was located by neurostimulation. The plexus was anesthetized with lidocaine. Orthopedic surgery was then performed on the metacarpus and the vital parameters of the calves were monitored. If the vital parameters changed during painful stimulation or if the calves moved excessively, general anesthesia was induced and maintained with a drip of GG4 and ketamine. Daily monitoring was performed for 7 days after surgery.

All ten brachial plexi were detected with neurostimulation. For three calves, surgery was performed without induction of general anesthesia. For the other seven calves, five were induced because of movement not associated with painful stimulation. All calves recovered sensitivity and mobility of their forelimb within 3 hours after surgery and no long-term complications related to the block were observed.

Brachial plexus anesthesia is an effective technique for performing surgery on metacarpal bones of calves. However, general anesthesia should be available in cases of incomplete anesthesia or if complete immobilization of the calf is needed.

Minimally Invasive Approach to the Spinal Canal for Treatment of Intervertebral Disc Herniation in Dogs. Abigail Lockwood1, Dominic J. Griffon2, Wanda Gordon-Evans1, Jodi A. Matheson 1, David J. Schaeffer1. 1Department of Clinical Studies, Veterinary Hospital of the University of Pennsylvania, Philadelphia, PA; 2Department of Pathobiology, Veterinary Hospital of the University of Pennsylvania, Philadelphia, PA.

Use of Neurostimulation to Localize and Anesthetize the Brachial Plexus of Calves Undergoing Metacarpal Surgery. Hélène Larde, Sylvain Nichols, Geneviève Bussières, Marketa Kopal, André Desrochers, Susan R. Vogel. Faculté de Médecine Vétérinaire, Université de Montréal, St-Hyacinthe, QC, Canada.

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In Vivo Application of Novel and Commercially Available Bioabsorbable Implants for Arthroscopic Transossseous Cranial Cruciate Ligament Reconstruction. Bertrand M. Manfredi1, Troy N. Trumble 1, Mary Boyce1, C. Lussier2,3, Jean-Pierre Pelletier 2, Dominique Gauvin1,2, Johanne Martel-Pelletier2, Eric Troncy 1,2. 1Faculty of Veterinary Medicine, Department of Veterinary Biomedicine, University of Montreal, St-Hyacinthe, QC, Canada; 2Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRUCHM), Notre-Dame Hospital, Montreal, QC, Canada; 3Faculty of Veterinary Medicine, Department of Clinical Sciences, University of Montreal, St-Hyacinthe, QC, Canada.

Efficacy of a Plant Extract (Brachysystema Calciumnun D. Don) on the Pain-Related Disability in Dogs with Naturally Occurring Osteoarthritis. Maxim Moreau1,2, Bertrand Lussier2,3, Jean-Pierre Pelletier2, Dominique Gauvin1,2, Johanne Martel-Pelletier2, Eric Toney1,2, 1Faculty of Veterinary Medicine, Department of Veterinary Biomedicine, University of Montreal, St-Hyacinthe, QC, Canada; 2Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRUCHM), Notre-Dame Hospital, Montreal, QC, Canada; 3Faculty of Veterinary Medicine, Department of Clinical Sciences, University of Montreal, St-Hyacinthe, QC, Canada.

Clinical Evaluation of a Vanilloid Receptor Type 1 (TRPV1) Antagonist for Treatment of Osteoarthritis in Dogs. Sarah Malek1, Susanna J. Sample1, Zev Schwartz2, Susan L. Schaeffer2, Jason A. Bleedorn3, Peer B. Jacobson4, Elizabeth Cozz4, Peter Muir5. 1Surgical Sciences, School of Veterinary Medicine, University of Wisconsin, Madison, WI; 2Abbott Laboratories, Abbott Park, IL.

Intravenous Bioabsorbable Devices for Fixation of Canine Cranial Cruciate Ligament (CrCL) Graft Reconstructions are an Alternative to Standard Implants. This study was designed to test the hypothesis that tibial translation, graft incorporation, and mechanical properties of hamstring graft reconstructions stabilized with bioabsorbable screw and washer (BP) are indistinguishable. Hamstring graft reconstructions in 14 normal canine stifles were affixed to the tibia with a GG or a BP (n = 7/implant). Stifle stability was quantified, and kinetic gait analysis, stifle radiographs and computed tomography (CT) performed prior to, 4 and 8 weeks after surgery. Microstructural graft incorporation and graft-tibia construct tensile properties were evaluated 8 weeks postoperatively. Outcomes were not statistically different between implants at any time point. Grafts were robust and intact in 13 dogs. Caudal tibial translation in the BP group was greater 8 weeks after surgery compared to pre-surgical values. Ground reaction forces in treated limbs were lower than preoperative values and control limbs 4 and 8 weeks after surgery, and values in treated limbs lower 4 versus 8 weeks after surgery. All grafts failed mid-substance or at the tibial articular surface during mechanical testing. Graft and bone tunnel volume and area in 3-D CT reconstructions were comparable between treatment groups and time points. Grafts had a comparable thickness, direct and indirect attachments to the bone. On these results, canine hamstring graft CrCL reconstruction fixation with either bioabsorbable implant is an option for treatment of CrCL deficient stifles.

Effect of Post-Arthroscopic Triamcinolone Acetonide Administration on Synovial Fluid and Serum Biomarkers in an Equine Metacarpophalangeal Osteochondral Injury Model. Jane M. Hailey1,2,3,4, Cheryl A. Williams1,2,3,4, Mary Carey1,2, Donna Groesen5,6, Kelly Merritt7, Murray Brown8,9. 1Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota, St Paul, MN; 2Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, FL.

Challenges in managing pain have prompted research into new classes of analgesics. A receptor expressed on sensory neurons, the vanilloid receptor type 1 (TRPV1), is a key component of nociception. We hypothesized that an oral TRPV1-antagonist would induce improvement during treatment of osteoarthrosis-associated pain.

In this study, 36 client-owned dogs with osteoarthrosis were enrolled in a double-blind randomized prospective trial with rescue therapy. Dogs were evaluated on days 1, 5, and 22. After a week of no treatment, dogs were assigned to one of four treatments (TRPV1-antagonist, carprophen, tramadol, placebo) from day 8 for 2 weeks. A key outcome measure was owner questionnaire scoring. Changes in pain and pain interference scores were assessed by a single-sample Student's t test. With Dunn-Sidak correction, results at P < 0.0127 were considered significant.

One dog was withdrawn from the trial because of an unrelated illness. Dogs were generally improved after treatment. Reduction in pain score was influenced by weight (P < 0.05), with heavier dogs showing greater improvement. Dogs treated with tramadol had a significant reduction in pain interference score (P = 0.0005), but not pain score (P = 0.02). In the TRPV1 and carprofen groups, scores were lower after treatment, but not significantly. Scoring was also lower after placebo treatment.

We conclude that all 4 groups showed improvement in CBPI score. Significant clinical improvement was only identified with tramadol treatment. A care-giver placebo effect was also evident; a unique feature of use of client-owned dogs as a model for analgesic trials study.

In Vivo Application of Novel and Commercially Available Bioabsorbable Implants for Arthroscopic Transossseous Cranial Cruciate Ligament Reconstruction. Bertrand M. Manfredi1, Troy N. Trumble 1, Mary Boyce1, C. Lussier2,3, Jean-Pierre Pelletier 2, Dominique Gauvin1,2, Johanne Martel-Pelletier2, Eric Troncy 1,2. 1Faculty of Veterinary Medicine, Department of Veterinary Biomedicine, University of Montreal, St-Hyacinthe, QC, Canada; 2Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRUCHM), Notre-Dame Hospital, Montreal, QC, Canada; 3Faculty of Veterinary Medicine, Department of Clinical Sciences, University of Montreal, St-Hyacinthe, QC, Canada.

As an alternative to treatment of canine osteoarthrosis (OA) with non-steroidal anti-inflammatory drugs, we evaluated, in a randomized, double-blinded, placebo-controlled (CTR) clinical trial, the efficacy of Brachysystema calciumnun D. Don (BCD) over 6 weeks of treatment. Thirty-three dogs with hind limb lameness were included in the study. After baseline, dogs were randomly divided into 2 groups (16 CTR; 17 BCD). Assessment by a validated client-specific outcome measures (CSOM) questionnaire was performed twice weekly, and peak vertical force (PVF) kinetic measurement was repeated after 3 and 6 weeks of treatment. Collar-mounted activity monitors were worn throughout the study by 6 CTR and 7 BCD dogs. Statistical inferences were done under a probability value less than 0.05.

At week 3 [BCD: +2.8 (3.5%); CTR: −0.9 (4.3%); P = 0.03]), and week 6 [BCD: +5.1 (5.1%); CTR: −0.3 (5.6%); P = 0.03]), both averaged change was lower 4 versus weeks after surgery. Both groups presented a significant decrease in pain and pain interference scores were assessed by a single-sample Student's t test. With Dunn-Sidak correction, results at P < 0.0127 were considered significant.

One dog was withdrawn from the trial because of an unrelated illness. Dogs were generally improved after treatment. Reduction in pain score was influenced by weight (P < 0.05), with heavier dogs showing greater improvement. Dogs treated with tramadol had a significant reduction in pain interference score (P = 0.0005), but not pain score (P = 0.02). In the TRPV1 and carprofen groups, scores were lower after treatment, but not significantly. Scoring was also lower after placebo treatment.

We conclude that all 4 groups showed improvement in CBPI score. Significant clinical improvement was only identified with tramadol treatment. A care-giver placebo effect was also evident; a unique feature of use of client-owned dogs as a model for analgesic trials study.

Effect of Post-Arthroscopic Triamcinolone Acetonide Administration on Synovial Fluid and Serum Biomarkers in an Equine Metacarpophalangeal Osteochondral Injury Model. Jane M. Hailey1,2,3,4, Cheryl A. Williams1,2,3,4, Mary Carey1,2, Donna Groesen5,6, Kelly Merritt7, Murray Brown8,9. 1Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota, St Paul, MN; 2Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, FL.

Information about synovial fluid and serum biomarkers after arthroscopic removal of osteochondral fragments is lacking. Often, corticosteroids or hyaluronan are intra-articularly administered postoperatively. The purpose of this study was to investigate the effects of arthroscopic surgery and post-surgical administration of triamcinolone acetonide (TA).

Seven adult Quarter Horses had an experimentally induced osteochondral fragment created on the first phalanx of one metacarpophalangeal joint (MCPJ). Lameness exams, force plate data, and serum and synovial fluid from both MCPJs were collected on weeks 0 (fragment creation), 16 (fragment removal), 17 and 18. After week 17 fluid collection, horses were divided into 2 treatment groups: 10 mg TA (n = 4) and 1 ml saline (n = 3). Serum and injured MCPJ synovial fluid samples were assayed for C2C, C12C, and C2C concentrations were evaluated using ELISAs. Unpaired t-tests were used to evaluate all data (P < 0.05). Horses became more lame at week 17, and by week 18, the TA group demonstrated a trend toward improvement compared to saline controls. In saline control horses at week 18 there was a trend towards increasing synovial fluid concentrations of C2C (P = 0.11), C12C (P = 0.06), and CPII (P = 0.051). In synovial fluid at week 18, horses injected with TA demonstrated significantly increased BAP (P < 0.001), CPII (P = 0.001), and CPIII (P = 0.001) concentrations compared to controls. There were no significant differences in serum concentrations. Intra-articular TA administration after arthroscopic surgery for removal of osteochondral fragments increases metabolism of type II collagen and bone that was balanced between synthesis and degradation.

ABSTRACTS
Characterization of Stromal Cells from Equine Laminae In Vitro. Vanessa Margol1, Frank Andrews1, Jeffrey Gimble2, Mandi Lopez1. 1Veterinary Clinical Sciences, Louisiana State University, Baton Rouge, LA; 2Cell Biology, Pennington Biomedical Research Center, Baton Rouge, LA.

Laminitis is a multifactorial disease for which an effective treatment has yet to be identified. Costs associated with this condition exceed $10 million per year. In vitro models do not allow for the study of disease progression or its impact on laminitis, and progenitor cell alterations may be the reason. Progenitor cells in the equine laminae are largely unexplored. The hypothesis tested in this study was that there are adult multipotent stromal cells (MSCs) in the equine laminae that can be expanded and differentiated into tissue lineages from different embryonic layers in vitro. Nucleated cells were isolated from the laminae of 5 adult horses immediately post mortem. Cells doubling (CD) and doubling times (DT) were determined for passages 1 to 6. Colony forming unit assays (CFU-F) were performed with cell passages 1, 3 and 6. Flow cytometry was used to quantify cell surface markers CD90 and CD44. Passage 3 cells formed calcified colonies with a frequency of 1:58,677 nucleated cells. Passage 2 cells were 72.28% positive for CD90 and 66.63% for CD44. Passage 3 cells were positive for CD90 and 66.63% for CD44. Passage 3 cells formed calcified colonies after 14 days of culture in osteogenic medium. These results indicate that progenitor cells in the equine laminae can be harvested and expanded in vitro. This new information may provide a novel therapy for equine laminitis as well as an in vitro model to study the condition.

Effect of NSAIDs in Combination on the In Vitro Inhibition of Equine Cyclooxygenase Enzymes. John Marshall1, Caitlyn Redding2, Anthony Blilklager2. 1School of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA; 2Clinical Sciences, North Carolina State University, Raleigh, NC.

Flunixin meglumine and phenylbutazone are non-selective cyclooxygenase inhibitors associated with renal failure and right dorsal colitis. Under current competition guidelines the combined administration of flunixin meglumine and phenylbutazone is banned but flrocoxib may be combined with care. Current data exists regarding the effect of combining flrocoxib with other NSADs. We hypothesized that combining flrocoxib with flunixin meglumine or phenylbutazone significantly inhibits both COX-1 and COX-2. An in vitro whole blood model (n = 6 horses) was performed with samples of fresh whole blood with flunixin (10 μg/ml), phenylbutazone (10 μg/ml) or flrocoxib (170 ng/ml) alone at previously described concentrations, or in combination (flunixin/flrocoxib, phenylbutazone/flrocoxib, flunixin/phenylbutazone). Effect of treatment on COX-1 and COX-2 was determined by measuring coagulation-induced thromboxane B2 (TXB2) and lipopolysaccharide (LPS) stimulated prostaglandin E2 (PGE2) respectively. Data was described as mean ± SD and groups compared using one-way ANOVA and Dunn’s test. Baseline mean ± SD serum TXB2 (231 ± 38 pg/ml) increased significantly following coagulation (5653 ± 398 pg/ml). Coagulation induced TXB2 was significantly inhibited in all treatment groups except flrocoxib alone (Fig 1, P < 0.05). Flunixin alone or flunixin/flrocoxib or flunixin/phenylbutazone resulted in significantly less TXB2 production than either phenylbutazone alone or phenylbutazone/flrocoxib (P < 0.05). Baseline mean ± SD plasma PGE2 (1301 ± 20 pg/ml) increased significantly with LPS stimulation (2589 ± 516 pg/ml). PGE2 was significantly lower in all treatment groups than control (Fig 2, P < 0.05). There was no significant difference in PGE2 concentration between treatment groups. This study demonstrates the COX-2 selective effect of flrocoxib alone. However, flrocoxib in combination with other NSAIDs results in significant COX-1 inhibition and cannot be recommended clinically.

Optimization of White Blood Cell Concentration in Platelet Rich Plasma (PRP) for the Treatment of Tendinitis. Taralyn McCarthy1, Tom Minas2, Lisa Fortier3. 1Rood and Riddle Equine Hospital, Lexington, KY; 2Orthopaedic Surgery, Brigham and Women’s Hospital, Boston, MA; 3Clinical Sciences, Cornell University, Ithaca, NY.

Numerous methods are available for PRP generation, but evidence defining the optimal composition is lacking. We hypothesized that leukocyte reduced PRP (lrPRP) will result in lower inflammatory cytokine expression compared to PRP containing a lot of WBC (wbcPRP) and that maintaining the platelet:WBC ratio will compensate for increased WBC concentration. Equine RBC and leukocyte rich PRP were collected. The following PRP groups were generated as media for SDFT explants cultured for 72 hours; standard PRP (sPRP), lrPRP, wbcPRP, and high concentration PRP (hcPRP), with 10% plasma in DMEM as control. PGF2β concentation was quantified by ELISA. Tendon gene expression for COX1A1, COL1A1, COL3A1, MMP-13, IL-1b, and TNF-α were performed. Platelet concentration in hcPRP was higher than all other PRP groups (P < 0.0001). The concentration of PGE2 was highest in wbcPRP and the lowest in lrPRP (P < 0.0001). Platelet and PGF2β concentrations were correlated strongly (r2 = 0.74, P < 0.0001). Expression of COX1A1 and MMP-3 was not different between PRP groups, but COX1A1 and COL3A1 were increased compared to control (P = 0.0027 and P < 0.0001) and MMP-13 was decreased compared to control (P < 0.0001). Expression of IL-1b was lowest in lrPRP and highest in wbcPRP (P = 0.0001). Control and lrPRP had the lowest TNF-α while hcPRP and wbcPRP had the highest expression (P = 0.0224). These results indicate that WBC concentration should be minimized in PRP. Further investigation to confirm this effect results in improved quality of tendon repair in vivo is required.

Plantarolateral Plate Fixation for Management of Distal Tarsal Instability in 5 Horses. Justin McCormick1, Jeffrey Watkins2. 1Large Animal Clinical Sciences, Texas A&M College Station, TX.

To report a novel technique of plate fixation for management of traumatic injury and subsequent instability of the distal tarsus. We hypothesized that plantarolateral plate for disruptive injuries of the distal tarsus provides adequate stability and improves prognosis for healing, and in some horses, return to work.

Medical records of 5 horses undergoing internal fixation of the distal tarsus were reviewed. Stabilization was performed using a broad plantarolateral plate (DCP) or a locking compression plate (LCP) placed plantarolateral extending from the proximal calcaneus to the mid metatarsus. Subject details, clinical presentation, radiographic findings, time to surgery, type of implant, and postoperative management and complications were recorded. Long-term (>1 year) follow-up was obtained for 4 horses.

Four horses were treated using a DCP and 1 with a LCP. Sub-luxation of the proximal intertarsal joint was the most common injury treated (60%). Perioperative complications included peroneus tertius rupture (3 horses) and septic osteoarthritis (1 horse). Four (80%) horses survived to time of discharge, 2 were sound at pasture, 1 was sound and training, and 1 was sound for breeding purposes.

Use of a plantarolateral plate for disruptive injuries of the distal tarsal joints provides adequate stability and improves prognosis for healing, with some horses able to return to work.

Comparison of Inertial Sensor Based System and Traditional Lamenex Exam. Megan J McCracken1, Marco Lopes2, Johann K. Reed2, David A. Wilson3. 1University of Missouri, College of Veterinary Medicine, Columbia, MO; 2Wireless inertial sensor systems objectively detect lameness in horses trotted over natural footing. The purpose of this study was to compare one such inertial sensor based system (Lamenex LocatorTM, Equinosis LLC, Saint Louis, Missouri) to subjective evaluation performed by experienced and nonexperienced practitioners of horses with lameness induced by sole pressure. We hypothesized that the inertial sensor system would identify lameness before a consensus of three experienced equine veterinarians.

Horses were fitted with both clinical andWilcoxon test. The inertial sensors selected the limb with the induced lameness after fewer screw turns than the veterinarians (P < 0.0001). Subjective consensus selected the correct limb before the inertial sensors in 5 trials (83.3%), inertial sensors selected the correct limb before subjective consensus in 35 trials (55.3%), and simultaneous selection occurred in 20 trials (33.3%). The inertial sensor based system was able to identify induced lameness at a lower level of sole pressure than the consensus of three equine veterinarians was compared using the Wilcoxon test.

The role of Cellular Senescence in the Pathogenesis of Canine Osteoarthritis. David Bennett1, Kristina Svensson2, Nancy Z. McGinnis1. 1Division of Small Animal Clinical Sciences, School of Veterinary Medicine, College of Medical, Veterinary and Life Sciences, University of Glasgow, United Kingdom; 2Osteoarthritis (OA) is characterized by degeneration of articular cartilage, including loss of chondrocytes and a subchondral bone cyst. Loss of the synovial lining of the synovial fluid leading to pain and loss of function. It is the commonest of all diseases
The Prevalence of Radiographic Abnormalities of Thoroughbred Horses in 2-Year-Old-in-Training Sales and Associations with Race Performance. Daniel Meagher1, Dennis Meagher1, Susan Stover1, Ian Gardner2. 1Valley Equine Associates, Valley Equine Associates, Ranson, WV; 2Department of Radiology, College of Veterinary Medicine, University of California, Davis, CA; 3J.D. Wheat Veterinary Orthopedic Research Laboratory, School of Veterinary Medicine, University of California, Davis, CA; 4Department of Medicine and Epidemiology, School of Veterinary Medicine, University of California, Davis, CA.

Veterinarians evaluate radiographs of prospective Thoroughbred racehorses for potential buyers. Although the association of yearling radiographic abnormalities on race performance has been studied (Kane, et al), radiographic abnormalities of 2-year-old horses in training have not been studied. Our goals were to identify radiographic abnormalities of 2-year-old Thoroughbred racehorses in training and determine if abnormalities affect future race performance.

Horses were examined at 2-year-old-in-training sales (Barretts Equine Sales Limited, Pomona, CA) from 1997–2001. Radiographs were reviewed for 953 horses; 69% of controls, 31% cases. Lesions were most prevalent in the fetlock. In general, cases were less likely to start a race or earn $25,000 than controls. Specifically, horses with proximal phalangeal articular margin fracture fragments, forelimb proximal sesamoid bone fracture (particularly medial), sesamoids, or tarsal bone fractures were less likely to start a race than controls (χ² = 22.4, P < 0.0001). 55 of 281 horses had at least one abnormality. In additional analyses, horses with radiographic abnormalities were associated with lower race performance. However, none of the individual lesions prevented all affected horses from racing.

Osteochondral Injection of Human Adenoviral BMP-2 or BMP-6 for Bone and Cartilage Regeneration. Maria I. Menendez2,3, Daniel Clark1, Guang Ju1, Michael A. Carlton1, David Tiangam4, Steven Weisbrode4, Michael Knopp5. 1Radiology, College of Medicine; The Ohio State University, Columbus, OH; 2Veterinary Clinical Sciences, College of Veterinary Medicine, The Ohio State University, Columbus, OH; 3Orthopaedics, College of Medicine, The Ohio State University, Columbus, OH; 4Veterinary Biosciences, College of Medicine, The Ohio State University, Columbus, OH;

Osteoarthritic cartilage is a major factor in the progression of OA. Once chondrocytes become senescent, there is a decrease in cartilage matrix production, protein synthesis and potential for repair. In order to investigate if senescence plays a role in the pathogenesis of osteoarthritis quantifiable biomarkers of senescence were measured in osteoarthritic and normal chondrocytes collected from the articular cartilage of femoral heads of canines. Specifically we looked at growth curves of normal and OA cells in monolayer cell culture, staining for senescence associated beta-galactosidase and phosphatase, and computed p16 kinase expression. The growth curves obtained in this study demonstrated that OA cells senesce more quickly and after less population doublings than non-OA cells. OA cells had higher levels of senescence-associated beta-galactosidase staining than non-OA cells. In OA cartilage samples there were a higher percentage of p16 stained chondrocytes compared to normal cartilage samples. Both normal and osteoarthritic senescent chondrocytes contained phosphorylated p38 kinase. These results support the hypothesis that senescence of chondrocytes is a feature of canine osteoarthritis and that senescence is an important component of the pathogenesis of OA. Understanding the factors involved in senescence will help in developing disease modifying therapies for articular disease.

In Vitro Comparison of Proximal Ulnar Osteotomy and Distal Ulnar Osteotomy with Release of the Interosseous Ligament. Kelly R. Mightl, Kimberly A. Hazelkeeper, Joseph B. Case, Colleen G. Duncan, Erick L. Egger, Matthew B. Rooney5, Felix M. Duerr 5. 1Veterinary Clinical Sciences, Washington State University, Fort Collins, CO; 5Aspen Meadow Veterinary Specialists, Escondido, CA; 2Veterinary Clinical Sciences, Colorado State University, Fort Collins, CO; 3Microbiology, Immunology and Pathology, Colorado State University, Fort Collins, CO; 4Aspen Meadow Veterinary Specialists, Longmont, CO.

Proximal ulnar osteotomy is a common procedure utilized to treat elbow dysplasia. The purpose of this study was to determine if distal ulnar osteotomy with release of the interosseous ligament provides equivalent proximal displacement of the proximal ulna when compared to proximal ulnar osteotomy.

The study utilized 2 cadaveric Beagle antebrachial joints with no prior use as a research model. The elbows were completely dissected to remove all soft tissue and leave the bone joints intact. The elbows were then secured using a bone clamp and a wire suture. The elbow joint was marked using an ink pen. The elbows were then subjected to a load of 100 pounds using a digital force gauge. Following release of the interosseous ligament, the elbow joint was subjected to a load of 100 pounds.

The results showed that the interosseous ligament provided significantly greater support to the elbow joint compared to the distal ulnar osteotomy. The interosseous ligament provided an average of 10 mm of proximal displacement of the proximal ulna when compared to the distal ulnar osteotomy.
The Contribution of the Palmar Carpal Ligaments to Antebrachiocarpal Joint Stability. Joshua Milgram, Koret School of Veterinary Medicine, Rehovot, Israel.

The objective of this study was to evaluate the role of the palmar ligaments in the stabilization of the canine antebrachiocarpal (AC) joint. Right carpal joints of the largest carpal ligaments were obtained from 6 large dogs of medium build and prepared for biomechanical testing. The carpal joints with all ligaments intact served as the control group and the carpal joints all the palmar structures sectioned served as the experimental group. Each specimen was aligned in a custom built jig prior to testing. The specimen was then placed into a custom-built joint testing machine and a single motion tracking sensor (Nest of Birds) was fixed to the metacarpal bones. All carpal were tested with 15 degrees of flexion, zero degrees and 15 degrees of extension. Loads ranging between 0.4 kg and 2.0 kg were applied to the MC in 3 directions (axial, mediolateral and craniocaudal) and 2 moments (varus-valgus and supination/pronation). The radius and ulna were held fixed throughout the experiment. There was no difference between the groups in the translations of the AC joint in the, lateral/medial and proximal/distal directions, or in the rotations, varus-valgus and supination/pronation. A significant difference was found in cranial translation under cranial load with the carpus in flexion. The results of this study demonstrate that the palmar structures play a role in stabilization of the AC joint. With increasing flexion there is a decrease in AC joint stability and the palmar structures prevent cranial translation of the first row of carpal bones relative to the distal radius and ulna.

Isometric Points in the Canine Stifle. Joshua Milgram1, Yaron Meiner2, Amir Shapiro3, 1Koret School of Veterinary Medicine, Rehovot, Israel; 2Department of Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel.

The aim of this study was to determine the presence and location of isometric points in the canine stifle joint using a three dimensional kinetic model. A single hind limb was used in this study. A CT scan with a slice thickness of 0.5 mm of the entire specimen was then performed. The specimen was then placed into a joint testing machine without any change in the relative position of the tibia and the femur. Four joint motion sensors were mounted on the tibia via wooden dowels placed prior to the CT scan. The knee was then released and flexed through 80 degrees with measurements taken every 5 degrees. The search for isometric points was limited to periarticular areas on both the femur and the tibia and included the origin and insertion sites of the collateral ligaments. Isometric points were defined as any two points, one on the femur and one on the tibia, where the largest distance between the two points did not exceed the smallest distance between the two points by 0.2 mm throughout the range of motion. Four isometric areas were identified. The area on the lateral femur corresponded to an area on the tibia located at the sulcus extensorius. The area on the medial aspect of the lateral femoral condyle corresponded to an area in the cranial intercondylar area of the tibia. This study confirms the isometric position of the cranial cruciate ligament. We were also able to demonstrate that isometric points exist on the lateral aspect of the stifle.

The Role of the Antebrachiocarpal Ligaments in the Prevention of Hyperextension of the Antebrachiocarpal Joint. Joshua Milgram, Tomer Milshstein, Yaron Meiner. Koret School of Veterinary Medicine, Rehovot, Israel.

The aim of this study was to evaluate the role of the medial collateral ligament, lateral collateral ligament and the palmar carpal ligaments in the prevention of carpal hyperextension. Twenty four forelimbs were collected from 12 healthy mixed breed dogs. Each specimen was radiographed to ensure the carpal joint was free of pathology and assigned to one of 6 groups. The groups were defined by the order in which the ligaments were cut. The antebrachium, carpus and proximal metacarpal bones were stripped from all muscle tissue, preserving the carpal joint capsule. The specimens were prepared for biomechanical testing and placed into a custom made joint testing machine. The manus was loaded using a system of weights and pulleys resulting in the extension of the carpus. The extension was measured using a single motion tracking sensor fixed to the metacarpal bones. All specimens were tested with the ligaments intact and after cutting each of the ligaments. Cutting each of the ligaments resulted in a significant change in the angle of extension of the carpus when compared to the extension of the carpus with the ligaments intact. Cutting the palmar AC ligament in the largest change in the angle of extension and this difference was significantly larger than that seen after cutting the medial and lateral collateral ligaments. Each of the AC ligaments tested contribute to the prevention of hyperextension of the AC joint. Improved understanding of the function of the AC ligaments may result in improved treatment of hyperextension injury.


The objective of this study was to report on 73 dogs undergoing surgical stabilization of radius and ulna (RU) fractures between the years 2003-2010. Medical records were evaluated retrospectively for patients undergoing surgical repair of RU fractures during the study period. Data collected on each case included signalment, cause of injury, concurrent injuries, fracture type, fixation method, time to fixation, time to union, complications, and functional outcome.

Seventy-three dogs underwent surgical repair of 75 antebrachial fractures. Toy and small breed dogs were the most commonly affected (64%). Median age was 2 years (range 2 months–12 years). Sixty-seven fractures (89%) were combined radius and ulna. Five fractures (7%) had been previously managed with external coaptation and were referred for surgical correction. Sixty-six fractures (88%) were repaired within 7 days of diagnosis. Bone plating was the most common fixation method and was used to stabilize 68 fractures (91%).

Complete follow-up was available for 49 fractures (65%). Median time to radiographic union was 8 weeks (range 3–21 weeks). Complications warranting additional surgical treatment occurred in 10 fractures (20%). These included implant removal (n = 7), subsequent fractures (n = 2), and malunion revision (n = 1). Functional outcome was reported by 29 owners to be excellent in 24 cases, fair in 3 cases, and poor in 2 cases.

On these results, surgical stabilization of RU fractures is recommended and may lead to a reduced risk of nonunion and other significant complications compared to historic data using coaptation.

Scapulectomy for Primary Bone Tumors in 42 Dogs: A Veterinary Society of Surgical Oncology (VSSO) Retrospective Study. Vincenzo Montinaro1, Sarah E. Boiston1, Paolo Buracco2, William T. Culp2, Giorgio Romanelli3, Rod Straw4, Stewart Ryan4. 1Department of Clinical Studies, Ontario Veterinary College-University of Guelph, ON, Canada; 2Department of Surgical and Radiological Sciences, School of Veterinary Medicine, University of California, Davis, CA; 3Department of Animal Pathology, School of Veterinary Medicine, University of Turin, Italy; 4Clinica Veterinaria Nerviano, Italy; 5Brescia, Italy; 6Sturtewarde, Australia; 7QLD, Australia; 8Animal Cancer Center, Colorado State University, Fort Collins, CO.

Scapulectomy is an alternative to amputation for tumors arising from the scapula that is not commonly performed. The purpose of this retrospective study was to identify dogs with primary scapular tumors treated with scapulectomy. Inclusion criteria were dogs that had a scapulectomy to treat a primary tumor of the scapula. Cases were submitted by VSSO members. Forty-two dogs met the inclusion criteria. The median age was 8.3 years and median weight was 34.8 kg. In eighteen dogs (42.9%) a subtotal scapulectomy (removal of ≥ 75% of the scapula) was performed. Osteosarcoma was diagnosed in 27 dogs (64.3%). Limb use was evaluated post-surgery in 41/42 dog and it was poor (15), fair (17), good (7) and excellent (2). Information on limb use at other time post 1st, 2st and 3rd months postoperatively was also available in some cases and was good to excellent overall. For the parameters assessed for their effect on survival time (ST) and disease free interval (DFI), only the use of adjunctive chemotherapy had a significant effect on ST (P = .0003) and DFI (P = .0001). Scapulectomy can be performed to remove primary tumors of the scapula and preserve limb function. The most common primary scapular tumor in this study was osteosarcoma. Primarily older, large breed dogs were affected. Although long-term follow-up of limb use was not available in all dogs, limb use was fair to excellent for the majority of dogs in this study. The addition of adjunctive chemotherapy prolonged the DFI and MST.

Cardiovascular Effects of N-Butylscopolammonium Bromide and Xylazine in Horses. Alison J. Morton, Carina E. Moore, Alison K. Deman, Anne M. Kehoe, Alex Grosche. Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, FL.

The objective of this study was to evaluate the effects of intravenous (IV) administration of N-butylscopolammonium bromide (NBB), xylazine, and the combination of NBB and xylazine on heart rate and other commonly measured vital parameters, cardiac rhythm, and blood pressure. Six adult horses of mixed breed and gender were used. In a random cross-over design, each horse was given 0.3 mg/kg bw of NBB IV, 0.25 mg/kg bw xylazine IV, and a combination of 0.3 mg/kg bw NBB and 0.25 mg/kg bw xylazine. Heart rate and other vital parameters, cardiac rhythm, and indirect blood pressure were recorded at timed intervals before and 60 minutes following administration. Heart rate and blood pressure were significantly elevated immediately following administering NBB and NBB with xylazine.
Administration of NBB with xylazine resulted in significantly greater initial and peak blood pressure values than with NBB alone. Administration of xylazine resulted in a decrease in heart rate, with an initial increase in blood pressure followed by a decrease in blood pressure. Sinus tachycardia was seen with NBB, and NBB and xylazine administration. First and second degree atrioventricular block was identified with xylazine administration. Ventricular tachycardia was identified in one horse following NBB and xylazine administration. Results of this study suggest that the effects of administration of NBB alone or in combination with xylazine to horses with colic, especially to those with systemic cardiovascular compromises should be considered carefully to accurately assess condition and predict prognosis, and avoid potential adverse effects.

Development of a Virtual Reality Simulator for Teaching Canine Arthroscopy. Tatiana Motta1, Michael Shaw2, Don Stredney2, Jennifer Au2, Matthew Allen1, 1Clinical Sciences, The Ohio State University, Columbus, OH; 2Interface Laboratory, Ohio Supercomputer Center, Columbus, OH.

Veterinary schools have been under pressure from the public and the students regarding animal use in teaching. Our overall objective is to limit the use of animals or cadavers and prepare students using simulation tools that provide for on-demand practice. Our specific goal is to develop a virtual simulator for performing a canine arthroscopy of the stifle joint, to present our current developments, and describe our future goals to obtain this objective.

We have acquired high-resolution images from a canine stifle joint using computed tomography scans to accurately model the bone. In addition, we have acquired magnetic resonance imaging data to display the soft tissue structures. Currently our simulator provides visualization of the stifle joint and allows for interactive manipulation using a haptic device that simulates surgical tools with force reflection. We are able to view anatomical structures on the bone and highlight the important structures vital for proper orientation to successfully execute this procedure. The simulator allows the surgeon in training to section through the hard and soft tissues providing an additional method for learning the spatial configurations of the regional anatomy.

Our ongoing development includes additional tools to physically investigate the stifle joint; during this stage experts will assist in validating the simulator for its realism and help provide metrics for which trainees can be evaluated. Through these steps, we will move towards our objective of employing simulation technologies to replace cadaver use in the formative development of surgical technique for canine arthroscopy.


Femoral fractures are one of the common fractures seen in bovine neonates. They represent a great challenge in terms of treatment based on the mechanical properties of the bovine neonate bone and the presence of thin cortical structures. The retrospective study describes the etiology, clinical signs, the mechanical properties of the bovine neonate bone and the presence of newborn calves regardless of the location of the fracture. The study objectives were to compare different imaging modalities for the detection of thoracic and bone metastasis in dogs with appendicular OSA. Study design was a retrospective cross-sectional study. Twenty percent of the radiographs negative for metastatic lesions were compared against thoracic CT. Test modalities (survey radiographs, whole body CT scan, nuclear scintigraphy) were assessed against a gold standard for detection of bone metastasis. Discriminatory capacity of the test modalities was assessed using receiver operator characteristic (ROC) analysis. Twenty percent (3/15) of dogs had pulmonary lesions on CT. Three bone lesions (3/15) were identified on scintigraphy and no lesions were identified on survey radiographs or CT. Evaluation for bone metastasis showed that the AUROC characteristics of the different test modalities ranged between 0.76 and 0.86. The AUROC values of radiographs and CT scan was 0.76 and of scintigraphy was 0.86. Differences between the discriminat- ing capacity of the test modalities failed to reach significance. Based on this study, CT identified more lesions than radiographs for thoracic stag- ing. While not statistically significant, this study supports previous findings that scintigraphy is an important part of staging for dogs with OSA. Whole body survey radiographs and CT have not been previously reported as modalities for general staging of dogs with OSA and although these tests do not appear to be useful as alternatives to scintigraphy, they may have some utility as adjunctive diagnostic modalities.

Comparison of Different Concurrent Imaging Modalities in Staging of Dogs with Appendicular Osteosarcoma (OSA). Michelle Connelly1, Sarah H. Boston2, 1College of Veterinary Medicine, The Ohio State University, Wooster, OH; 2College of Veterinary Medicine, Cornell University, Ithaca, NY.

Osteosarcoma (OSA) is the most common canine primary bone tumor. The aim of this study was to report the surgical technique and outcome following standing surgical repair of non-displaced condylar fractures. Thirty seven fractures in Thoroughbred Racehorses. Thomas O’Brien1, Dwayne Rodgerson2, Michael Livesey1. 1Department of Surgical Sciences, University of Wisconsin, Madison, WI; 2Davidson Surgery Center, Hagyard Equine Medical Institute, Lexington, KY.

Excision of the ceratohyoid bone (CB) may be indicated in the treatment of temporohyoid osteoarthropathy (THO) in horses. Affected animals typically have variable degrees of vestibular and facial nerve damage and as such are high-risk anesthetic candidates. The aim of this study was to investigate the feasibility of excising the ceratohyoid in standing sedated horses free from THO.

With the horse sedated and its head and neck supported in extension the surgical site was clipped and aseptically prepared. Local anesthetic solution was then infiltrated along a 10 cm line extending rostrally from 2 cm caudal to the basal hyoid bone (BB) and half way between midline and the mandible. The skin and subcutaneous tissues were incised along that line, exposing the sternohyoideus, omohyoideus and geniohyoid muscles, the fibers of which were bluntly separated, to allow identification of the CB and its articulations with the BB and stylohyoid bone (SB). The CB/BB joint was sharply disarticulated and the ceratohyoid muscle was bluntly separated from its caudal aspect. The CB/CB joint was then sharply disarticulated and the CB removed. Incisions were left open to heal by second intention.

Standing Surgical Repair of Non-Displaced Metacarpal and Metatarsal Condylar Fractures in Thoroughbred Racehorses. Thomas O’Brien1, Robert J. Hunt2, Dwayne Rodgerson2, Michael Spirito2, Jorge Gomez3,2, Michael Livesey1, Jacob T. Goodwin1. 1Department of Surgical Sciences, University of Wisconsin, Madison, WI; 2Davidson Surgery Center, Hagyard Equine Medical Institute, Lexington, KY; 3Jorge Gomez Equine Veterinary Srvs LLC, Wellington, FL.

Surgical repair of condylar fractures of the metacarpus/metatarsus is most commonly performed under general anesthesia. Recently, standing surgical repair of propagating condylar fractures has been reported. The aim of this study was to assess the feasibility of performing surgical repair of non-displaced condylar fractures. Thirty seven Standing Surgical Repair of Non-Displaced Metacarpal and Metatarsal Condylar Fractures in Thoroughbred Racehorses. Thomas O’Brien1, Robert J. Hunt2, Dwayne Rodgerson2, Michael Spirito2, Jorge Gomez3,2, Michael Livesey1, Jacob T. Goodwin1. 1Department of Surgical Sciences, University of Wisconsin, Madison, WI; 2Davidson Surgery Center, Hagyard Equine Medical Institute, Lexington, KY; 3Jorge Gomez Equine Veterinary Srvs LLC, Wellington, FL.

Surgical repair of condylar fractures of the metacarpus/metatarsus is most commonly performed under general anesthesia. Recently, standing surgical repair of propagating condylar fractures has been reported. The aim of this study was to assess the feasibility of performing surgical repair of non-displaced condylar fractures. Thirty seven Thoroughbred racehorses (19 females, 15 geldings and 2 intact males) met criteria for inclusion. In total 37 fractures were repaired, 28 were fractures of the lateral condyle and 9 fractures of the medial condyle. Eight fractures of the medial condyle and 2 fractures of the lateral condyle spiraled proximally. Surgical repair was successfully performed in all cases. Twenty seven horses (73%) raced post-injury. The mean number of days from surgical repair of the fracture until first race was 807 days. Of the horses that raced postoperatively 16 horses maintained the same race class post-injury as pre-injury, 7 horses improved race class and 4 horses decreased race class. For all horses, mean number of starts and race earnings preoperatively was $7,431 and $20,002. For all horses the mean number of starts and earnings postoperatively was $7,431 and $20,002.
Cervical Abscession in the Dog: A Retrospective Study. Adam Ogilvie1, Sarah E. Boston2. 1Small Animal Clinic, Ontario Veterinary College, Guelph, ON, Canada; 2Clinical Studies, Ontario Veterinary College, Guelph, ON, Canada.

Cervical abscession (CA) is commonly caused by oropharyngeal penetrating injuries. The purpose of this study was to describe the signalment, cause, work-up, associated bacteria, treatment, and outcome of consecutive cases of CA in dogs.

Medical records were searched for dogs presenting with CA, and pertinent data recorded. Sixty cases met the inclusion criteria. Ultrasonographic and CT evaluation was performed in ten and two cases, respectively. Aspirates were taken in twelve patients, and cytology was consistent with a CA in ten. Fifteen cases were surgically explored, with a foreign body retrieved in two. A closed suction drain was placed in twelve cases. Fourteen cases were cultured, and three were positive for aerobic and anaerobic bacteria (See Table 2). Postoperative complications were noted in four cases. One patient had long-term impairment of respiratory and swallowing function, and one patient was euthanized due to sepsis.

Diagnosis of CA is based on history, clinical signs, physical examination, and fine needle aspiration. This study supported previous reports that clinical signs noted were associated with the duration of disease. We found a low incidence of surgical complications. Fine needle aspiration of cervical abscess is a practical technique for diagnosis. Aerobic and anaerobic culture and susceptibility of material aspirated from cervical abscess is recommended. This study did not support previous findings in which antibiotic culture and susceptibility of material aspirated from cervical abscessation is commonly performed with a vessel-sealing device.

Comparison of Transvaginal Natural Orifice Transluminal Endoscopic Surgery (NOTES) and Laparoscopy for Elective Bilateral Ovariectomy in Standing Mares. Karine Lafay1, Lynetta Freeman1, Peter D. Constable1, Ching C. Wu2, Paul W. Snyder3, Timothy B. Lescun1. 1Veterinary Clinical Sciences, School of Veterinary Medicine, Purdue University, West Lafayette, IN; 2Comparative Pathobiology, School of Veterinary Medicine, Purdue University, West Lafayette, IN.

Natural Orifice Transluminal Endoscopic surgery (NOTES) is a new surgical technique reported for standing ovariectomy in mares; however, its potential advantages over laparoscopy are unknown. We hypothesized that transvaginal NOTES would improve the clinical outcome after bilateral ovarycetomy in mares by minimizing soft tissue trauma and reducing pain and inflammation when compared to a laparoscopic approach.

Arthroscopy was performed with a vessel-sealing device via transvaginal NOTES (n = 6) using a flexible endoscope and specialized instruments or via laparoscopy (n = 6). Preoperative and postoperative complete blood count (CBC), plasma fibrinogen and serum amyloid (SAA) concentrations, peritoneal nucleated cell count and total protein concentration were compared using repeated measures ANOVA. Surgical times were compared using an unpaired t-test. Mares were monitored for 2 weeks postoperatively and necropsy was performed at 3 weeks (n = 6) or 3 months (n = 6) to assess short and medium-term effects of each procedure. Complication rate, necropsy and bacteriology findings were compared using a Fisher’s exact test. Significance was set at P < 0.05.

All surgical procedures were performed successfully and mares recovered well without any complications. Joint dimensions, surface landmarks, and topographic features were recorded and reported.

Arthroscopic Approach and Intra-Articular Anatomy of the Stifle in South American Camelids. Rebecca L. Pentecost1, Andrew J. Niehaus1, Elizabeth Sanscheg2. Veterinary Clinical Sciences, Ohio State University, Columbus, OH.

The objective of this study is to describe an arthroscopic approach and the intra-articular anatomy of the stifle joint of South American camels. This experimental study utilized 16 cadaveric alpaca hindlimbs which were evaluated arthroscopically to determine appropriate arthroscopic portal location, to describe the anatomic structures visible during arthroscopic examination, and report potential complications associated with arthroscopy. Joint dissection followed examination. A polymethylmethacrylate joint model was created to document joint dimensions, surface landmarks, and topographic anatomy. In addition, two clinical cases were evaluated and described.

Positioning for arthroscopic portals was located approximately 2 cm abaxial to the patellar ligament to either the medial or lateral side of the joint and halfway between the tibial crest and the base of the patella. Joint structures visualized included the suprapatellar pouch, the articular surface of the patella, the trochlear ridges and groove, the femoral condyles, the intercondylar notch, the cruciate ligaments, and the menisci and associated ligaments. Stifle arthroscopy allowed for joint evaluation and therapeutic intervention in one alpaca and one llama with spontaneously occurring stifle disease. Complications were recorded for each procedure.

Arthroscopy allows for a safe and minimally invasive approach for diagnosis and treatment of stifle lesions in South American camels. Diagnostic and therapeutic arthroscopic evaluation of the stifle joint is feasible in llamas and alpacas with orthopedic disease localized to the stifle joint including removal of free osseous fragments, debris, patellar fractures, and cranial or caudal cruciate injury or rupture.

In Vitro Studies of Clindamycin and Erofloxacin Elution from Calcium Sulfate Hemihydrate Beads. Heidi Phillips1, Dawn M. Booth2, Dorothy C. Brown3, R. Avery Bennett4. 1Clinical Studies: Small Animal Surgery, University of Pennsylvania, Philadelphia, PA; 2Clinical Studies: Small Animal Surgery, University of Illinois, Urbana, IL; 3Clinical Pharmacology, Auburn University, Auburn, AL.

This study evaluated the in vitro elution of clindamycin and enrofloxacin from calcium sulfate hemihydrate (CSH) beads. CSH beads were manufactured commercially with the following additives per bead: no antibiotic; 16 mg clindamycin; 16 mg enrofloxacin; or 16 mg of clindamycin with 16 mg of enrofloxacin. Ten beads of each antibiotic/CSH combination were placed in 5 milliliters (mL) of phosphate buffered saline (PBS) at pH 7.4. Additional beads were manufactured to evaluate elution when beads of individual antibiotics were placed into the same eluent vessel. Five beads containing 8 mg clindamycin and 8 mg enrofloxacin, containing 32 mg enrofloxacin/bead were placed in the same eluent vessel with 5 mL PBS at pH 7.4. All beads were made and evaluated in triplicate and maintained at room temperature with constant agitation. Eluent fluid was collected at 14 time points over 30 days and stored at -80°C until assays were performed.
For all bead configurations, clindamycin elution decreased over time while elution of clindamycin remained stable or increased over time. For all bead configurations, clindamycin eluted significantly greater amounts of antibiotic at 24 hours and over the entire study period than did enrofloxacin. Clindamycin elution from calcium sulfate followed the familiar bimodal pattern of release kinetics seen with antibiotic-impregnated polymethylmethacrylate. However, enrofloxacin showed a surprisingly more stable pattern of release, and enrofloxacin concentrations in the eluent fluid remained stable or increased over time in all of the bead configurations. Elution of both antibiotics was effective as defined by the study.

In Vivo Effects of a Single Intra-Articular Injection of 2% Lidocaine or 0.5% Bupivacaine on Articular Cartilage of Normal Horses. Perrine Put, Hélène Richard, Guy Beauchamp, Sheila Laverty. Département des Sciences Cliniques, Faculté de Médecine Vétérinaire, Université de Montréal, Saint-Hyacinthe, QC, Canada.

Results of recent clinical and experimental investigations reveal a dose- and time-dependent toxicity of both lidocaine and bupivacaine on articular cartilage. The goal of our study was to assess the effects of an intra-articular (IA) lidocaine or bupivacaine injection on the concentrations of biomarkers of cartilage metabolism in the synovial fluid (SF) to detect evidence of cartilage insult following injection. The study was a 4-period, 4-treatment, randomized, placebo-controlled double cross-over trial. Two groups of horses (n = 3 each) were randomly assigned to receive either 5 mL of bupivacaine (0.5%) or 0.9% NaCl) IA in their intercarpal joints. Following a 2 week wash-out period, treatments were then reversed. After an additional 2 week period, the same trial design was repeated, but this time in the tarsocural joints and with 15 mL of lidocaine (2%) and placebo IA. SF samples were collected at 0, 6, 12, 24, 48 hours, 7 and 14 days for measurement of biomarkers of cartilage metabolism (CPII, CS846, C2C, C1, 2C).

Bupivacaine IA induced a significant surprising increase in both markers of cartilage matrix synthesis (C2C and C2) and placebo IA, SF samples were collected at 0, 6, 12, 24, 48 hours, 7 and 14 days for measurement of biomarkers of cartilage metabolism (CPII, CS846, C2C, C1, 2C).

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Evaluation of SURGIFLO® Hemostatic Matrix to Control Hemorrhage in an Acute Porcine Laparoscopic Liver BLEEDING Model. Thomas Poandl1, Clarence A. Rawlings2, David Stoloff1, Bababhai Patel1, Richard Hutchinson1, A. Hussni3, David Stoloff1, Bababhai Patel1, Richard Hutchinson1, A. Hussni3. 1Department of Veterinary Surgery and Anesthesiology, School of Veterinary Medicine and Animal Science, UNESP (Univ Estadual Paulista), Botucatu, Brazil; 2Department of Tropical Diseases and Imaging Diagnosis, School of Medicine, UNESP, Botucatu, Brazil; 3Department of Animal Reproduction and Radiology, School of Veterinary Medicine and Animal Science, UNESP, Botucatu, Brazil. The aim of this study was to compare imaging methods for diagnosing thoracolumbar disc disease in dogs. Fifteen dogs (13 dachshunds, 1 poodle, and 1 crosbred), eight males and seven females, weighing 5 to 20 kg, and aged from 3.5 to 8 years were used. All dogs had clinical history and neurological evaluation of spine compression in the thoracolumbar region.

For diagnosis, they were submitted to magnetic resonance imaging (MRI), survey radiography, and myelography. MRI was performed with the dogs positioned in dorsal recumbency. Sagittal T1, T2, and proton density (PD) weighted images and axial T1 and T2* weighted images were used. Survey radiography of the spinal column was performed, followed by myelography after administration of iodized contrast, injected into the cisterna magna. Lateral and ventrodorsal views were obtained. Degenerated, protruding, or extruded discs were seen in MRI sagittal sequences. Calcified discs and narrowed intervertebral spaces were frequently seen by survey radiography. Myelography showed a contrast column failure in the lateral view of all, except for two dogs that showed blocked ventral contrast column and collapsed dorsal contrast column. Coincidence of lateral and ventrodorsal views was found in 80% in relation to blocked contrast column site. Indices of coincidence were 91% to 100% between myelography and MRI data. In conclusion, myelography is a reliable exam for identifying spine compression sites, but MRI is the most accurate method for diagnosis.

Gait Analysis in Clinically Healthy Sheep at Two Different Age Groups. Felipe S. Agostinho, Sheila C. Rahal, Fábio A. Araújo, Renato T. Conceição, Carlos A. Hussani. Surgery and Anesthesiology, School of Veterinary Medicine and Animal Science, UNESP, Botucatu, Brazil.

The aim of this study was to evaluate kinetic and temporal spatial parameters in clinically healthy sheep at two different age groups by using a pressure sensing walkway. Fourteen clinically healthy female Santa Inês sheep were divided into two groups: Group 1 – seven animals weighing 20–33 kg (mean 25.7 kg) and aged from 8 to 12 months. Group 2 – seven animals weighing 32–45 kg (mean 41 kg) and aged from 3 to 5 years. Before data collection, sheep were trained to be lead by halter for a period mean of three weeks. Kinetic data were collected by use of a 1,951 mm x 447 mm pressure-sensitive walkway. The data from the first 6 valid trials were taken for each sheep and analyzed using proprietary software. A trial was considered valid if the sheep walked within the correct velocity (1.1–1.3 m/s) and acceleration (from -0.15 to 0.15 m/s²) parameters. Peak vertical force (PVF), vertical impulse (VI), stance time, gait cycle time, and percentage of body distribution among the four limbs were determined. Within each group, the differences between the right and left limbs in all variables were not significant. No significant differences were observed between G1 and G2 for VI (%BW), and percentage of body distribution. However, PVF (%BW)
was greater in G1 than G2, in both forelimbs and hind limbs, and stance time and gait cycle time (s) were lesser in G1 than G2. In conclusion, younger healthy sheep have differences in some kinetic and tempospatial patterns than older ones walking on a pressure sensing walkway at the same velocity.

Evaluation of Castor Oil-Based Polyurethane Membranes in Rat-Bone Marrow Cell Culture. Sofía A. Cerejo1, Sheila C. Rahal2, João F. Lima Neto3, Fabiana A. Vorweid4, Fernanda C. Landim Alvarenga1. 1Surgery and Anesthesiology, School of Veterinary Medicine and Animal Science, Unesp, Botucatu, Brazil; 2Department of Clinical and Veterinary Surgery, Faculty of Agrarian and Veterinary Sciences, Jaboticabal, Brazil.

The polyurethane derived from the castor oil plant is a polymer with commercial presentations especially as moldable biomass and pre-molded blocks. Since the chemical composition, consistency and format of the polymer may influence cell growth and adhesion to biomaterial, the aim of this study was to evaluate the potential of castor oil polyurethane in membrane format as scaffold to mesenchymal stem cells (MSCs). Four male Wistar rats, aged 20–30 days were used. Bone marrow aspirates from femur and tibia were harvested using DMEM high glucose and heparin, and the cells were cultivated. After 15 days, the 1st passage was made and cell viability was analyzed with Hoescht 33342 and propidium iodide markers. The MSCs were characterized by surface markers with the aid of flow cytometry. After this, three types of castor oil polyurethane membranes associated with the MSCs on the sterile plate on the t-25 plate were analyzed by optical microscopy to confirm cell aggregation and growth. The membranes were composed of isocyanate and a different percentage of castor oil (type 1 = 18%, type 2 = 39.2%, type 3 = 51%). The membranes with a higher percentage of castor oil showed the greatest growth of MSCs, being 90%, type 3, 20% type 2, and 10% type 1. In addition, these membranes had more surface pores than membrane type 1 as observed by scanning electron microscopy. It was concluded that castor oil-based membrane especially type 3 may be used as a scaffold for MSCs.

Safety and Efficacy of the Artificial Urethral Sphincter in 21 Dogs with Acquired or Congenital Urinary Incontinence. Lauren Reeves, Christopher Adin, Mary McLoughlin, Dennis Chew. Veterinary Clinical Sciences, Ohio State University, Columbus, OH.

Urinary incontinence occurs in dogs as an acquired condition or secondary to congenital anomalies. Dogs that are refractory to medical therapy can benefit from surgical intervention. Our group has developed an artificial urethral sphincter (AUS) that has shown promising results in maintaining long term continence in a large series of dogs. All dogs receiving AUS implantation at a single institution between 1/1/09 and 1/31/11 were included. A total of 21 dogs were identified. 12 dogs (10 females and 2 males) had USMI, 3 females had pelvic bladders, and 6 females had failed ectopic ureter repairs. AUS implantation was performed as previously described. Clients scored their dog’s continence before surgery and at follow up using an analogue scale with 1 representing constant leakage and 10 representing perfect continence. Final scores were obtained in 19 of 21 dogs with a median follow up period of 13 (7.5–18.5) months. Median (IQR) continence scores were significantly improved (P = 0.0002) between the preoperative period [2 (1–4)] and last follow up period [9 (7–10)]. Late complications with urinary obstruction developed in two dogs at 5 and 9 months after surgery. Application of the AUS appears to offer an effective method of improving urinary continence in a variety of naturally occurring disease conditions.

The Effect of Blood Contamination on Equine Synovial Fluid Parameters. Jumma Roquet, James Carmalt. Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada.

Synovial fluid (SF) examination is a routine procedure in equine practice. Normal equine SF is transparent and clear with a white blood cell (WBC) count of less than 10,000 cells/μL. Blood contamination of the sample can complicate assessment and has the potential to alter both the TP and WBC. The degree to which SF blood contamination affects these parameters has not been determined. Peripheral venous blood and SF samples were obtained from five horses. The pooled SF sample was separated into 2 mL aliquots, each of which was subsequently contaminated with a known percentage of autogenous blood (0–50%). A complete blood cell count (CBC), packed cell volume, TP, and differential cytological examination were performed in all the samples. Regression analysis was used to generate a model to calculate the non-contaminated synovial WBC and TP concentration (r² = 91%), and synovial neutrophil percentage. Using a further 5 horses these models were applied in blinded fashion to contaminated SF samples. Calculated values were compared to non-contaminated measured values. Model results for WBC and TP were not significantly different from measured values. Calculated synovial TP was significantly different from measured values; however, as the difference was a mean of 0.08 g/dL the clinical significance is questionable. Neutrophil percentage could not be calculated but mirrored that of the contaminating blood. Results suggest that an approximate non-contaminated synovial TP and WBC count can be calculated from contaminated samples but that current models do not allow an accurate determination of absolute numbers.

Viscosupplementation with Carboracer in the Middle Carpals Joint of Four Horses, Julie Rosser, Alberto Serena, Mark Markel, Peter Muir. School of Veterinary Medicine Department of Surgical Sciences, University of Wisconsin, Madison, WI.

Joint viscosupplementation is widely used in the sport horse industry, commonly utilizing hyaluronic acid. Similar to hyaluronic acid, the carboracer molecule has biodegradable and viscoelastic properties, and has been studied for use in human medicine. Carboracer is generally inert biologically, non-irritating, and has been used in humans as injectable depots for time-release medications. Our objective was to describe the outcome of intra-articular viscosupplementation with carboracer in four horses.

Six healthy adult mares were studied. Baseline lameness examinations, aseptic arthrocenteses and synovial fluid analyses were performed. Three mL of 3% carboracer was then injected into each left middle carpal joint. Lameness evaluations were repeated daily for each horse for ten days post-injection or until the time of euthanasia. At euthanasia, synovial fluid analyses were repeated on the left middle carpal joint. Samples of synovium from the left middle carpal joints were submitted for histopathological and articular cartilage of the third carpal bone including subchondral bone was submitted for histology and confocal microscopy.

Carboracer viscosupplementation of the middle carpals joint caused severe lameness in 3/4 mares. The fourth mare developed moderate lameness after injection. Confocal microscopy was negative for cartilaginous defects. Histology of all treated samples revealed varying degrees of small cell inflammatory infiltrate into the subsynovium.

With no abnormal findings in samples of cartilage or subchondral bone, lameness is attributable to severe synovitis, which is consistent with histologic findings of synovium in all cases. The current formulation of carboracer is therefore not suitable for intra-articular viscosupplementation in horses.

Comparison of Closure Technique for Equine Pelvic Flexure Enterotomies with a TA-90 Stapling Device vs. Hand-Sewn Closure: An Ex-Vivo Study. Julie Rosser, Sabrina Brounts, Michael Livesey, Kerri Wiedmeyer. School of Veterinary Medicine Department of Surgical Sciences, University of Wisconsin, Madison, WI.

Pelvic flexure enterotomies of the ascending colon are commonly performed in the horse during surgery of gastrointestinal conditions. Closure of pelvic flexure enterotomies using the thoracoabdominal stapling device (TA-90) was recently described as technically simple and time saving, with a low complication rate.

Our objective was to compare the TA-90 stapled enterotomy closure to the double layer hand-sewn closure, using time to perform each technique, luminal diameter and bursting pressure in ex vivo specimens.

Pelvic flexure enterotomies of thirteen horses euthanized for reasons unrelated to gastrointestinal disease were harvested. All pelvic flexures had one cm antimesenteric enterotomy performed; six were closed using the TA-90 device, while the colon was submerged in warm water.

Time to perform stapled closure was significantly shorter than for hand-sewn closure (P = 0.0001). Post-enterotomy luminal diameters were significantly increased in stapled specimens as compared to hand-sewn (P = 0.025). Percent change in luminal diameter between pre and post-enterotomy was significantly less in stapled specimens (P = 0.034). There was no significant difference in bursting strength between the 2 methods of closure (P = 0.196).

The morbidity associated with equine gastrointestinal surgery is closely correlated to the duration of the procedure. Stapled closure of enterotomy incisions offers significant time savings without compromising biomechanical strength while improving post-enterotomy luminal diameter.
Influence of Plate-Bone Contact on Cyclically Loaded Locking Plate Failure. Randi Rotne1, Nicky Bertollo2, William Walsh3, Katja Voss4, Kenneth Johnson1, Naveesh Dhand1. 1Faculty of Veterinary Science, Surgery Department, University of Sydney, Sydney, NSW, Australia; 2Surgical and Orthopaedic Research Laboratories, Prince of Wales Hospital Clinical School, University of New South Wales, Sydney, NSW, Australia.

Locking plates with threaded locking head screws were developed for biological fracture fixation. The plate can be placed directly against the bone or slightly elevated from the underlying periosteum, preserving blood supply. A potential disadvantage of leaving a large gap under the plate though, is a reduction in fixation stability.

We hypothesized that the in vitro mechanical stability of a locking plate system that relies on a plate-screw conical coupling may be compromised when the plate is elevated 2 mm from the bone and placed under conditions of cyclic loading.

Paired femora (n = 6 pair) were harvested from cadavers and 3.5 series 3 mm thick 3-hole FIXIN plate constructs were applied to the bone either with direct plate to bone contact or with a 2 mm plate to bone gap. The constructs were cyclically loaded in three-point bending. Failure results were compared to constructs that were in direct bone contact.

The mean loads to failure were similar between groups with a slightly higher load to failure in the constructs with a direct plate to bone contact (233 ± 55 Newtons) compared to the constructs placed with a 2 mm gap (213 ± 63 Newtons). However, the failure mode did differ between groups with a conical coupling system 2 mm from the bone did not result in contact failure but reduced overall construct failure fatigue. Further evaluation is required to determine if this is of clinical significance.

Osseseous Sequestration in Llamas and Alpacas: 36 Cases (1999-2010). Maureen Roush1, David Anderson2, Andrew J. Niehaus3, Matt D. Miesner3, Sylvain Nichols4,5. 1Department of Clinical Sciences, Kansas State University, Manhattan, KS; 2Department of Veterinary Clinical Sciences, The Ohio State University, Columbus, OH; 3Département de Sciences Cliniques, Université de Montréal, Saint-Hyacinthe, QC, Canada.

Osseseous sequestration is a recognized but rarely reported cause of lame-ness in alpacas. We hypothesized that osseseous sequestration occurs more often in juvenile camels and that the condition is most often of unknown origin.

Medical records of alpacas and llamas having sequestrations between January 1999 and December 2010 were reviewed. History, signal-ment, physical examination, radiographic abnormalities, treatment, complica-tions, and outcome were recorded from these records. Descriptive statistics were generated from this data. Student’s t-test and Chi-Square were performed when appropriate with P < 0.05 considered significant.

Records of 36 camels (27 alpacas, 9 llamas) were included of which there were 22 intact males, 11 females, and 2 castrated males having a me-dian age of 7.5 months. Most animals were presented for lameness (n = 21) and/or presence of a draining tract (n = 10) with a mean duration of 71 days. The sequestra were of unknown etiology in 29 camels whereas trauma were the cause in 7 animals. Camels having idiopathic bone sequestra were significantly younger than camels with a traumatic injury (P = 0.03). Bones of the proximal extremities were more commonly af-fected by idiopathic sequestrum than traumatic sequestrum (P = 0.0001). Sequestrum was more commonly seen in young animals (P = 0.013).

Six dogs in the GDV group (4%) and 3 dogs in the control group (1%) had a history of previous sequestrum. Conditional logistic regression revealed that controlling for body weight and breed, the odds of GDV in dogs with previous sequestrum were 5.9 times that of dogs without previous sequestrum (P = 0.036). The odds of GDV were significantly greater for Labrador Retrievers, Rottweilers, and mixed breed dogs compared to other breeds (P < 0.05). Odds of developing GDV for the heavier dogs were significantly less than lighter dogs (P = 0.013).

Ovariohysterectomy was performed using a standard open technique. For Group A, the procedure was the same with the exception that ovarian pedicle hemostasis was achieved using ligation. Ovariohysterectomy was performed using a standard open technique. Successful ovariectomy was performed using the techniques described.

There was no significant difference in the IVAS data or the blood parameters between any of the three groups. Surgical time was shortest for Group C and there was no difference between Groups A and B.

Laparoscopic-assisted ovariectomy using either a bipolar vessel seal-ing device or suture ligation can be used to sterilize female cats with the same level of postoperative comfort for the patient as traditional ovariohysterectomy.

Effect of Previous Splenectomy on Incidence of Canine Gastric Dilatation Volvulus. Angela J. Sarto1, Adrienne M. Bentley1, Dorothy C. Brown1. 1Surgery, Veterinary Surgical Associates, Concord, CA; 2Surgery, Veterinary Medical and Surgical Group, Ventura, CA; 3Clinical Studies, College of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA.

The objective of this multi-institutional retrospective case-control study was to evaluate the effect of previous splenectomy on the incidence of gastric dilatation volvulus (GDV). The null hypothesis was that dogs with GDV would not be more likely to have a history of previous splenectomy compared to a control population.

Computerized records were searched and 151 dogs were identified with a history of GDV where the presence or absence of a spleen was verified by an exploratory laparotomy. Data was collected on the presence of a spleen, procedures performed, and outcome. Computerized records were searched for two control cases that were matched with respect to age, weight, sex, neuter status, and breed to each GDV case for a total of 302 control cases. Idemial data was collected for the control cases.

Six dogs in the GDV group (4%) and 3 dogs in the control group (1%) had a history of previous sequestrum. Conditional logistic regression revealed that controlling for body weight and breed, the odds of GDV in dogs with previous sequestrum were 5.9 times that of dogs without previous sequestrum (P = 0.036). The odds of GDV were significantly greater for Labrador Retrievers, Rottweilers, and mixed breed dogs compared to other breeds (P < 0.05). Odds of developing GDV for the heavier dogs were significantly less than lighter dogs (P = 0.013).

Purpose: To investigate the effect of previous splenectomy on the incidence of GDV.

Methods: Retrospective case-control study.

Results: The null hypothesis that dogs with GDV would not be more likely to have a history of previous splenectomy compared to a control population was rejected. Odds of developing GDV for dogs with previous splenectomy were 5.9 times that of dogs without previous splenectomy.

Conclusion: Previous splenectomy increases the risk of GDV.

Surgical Correction of Angular and Torsional Metatarsal Deformity with Cylin-drical Osteotomy and Locking Compression Plates in an Angus Calf. Jennifer A. Schleining1,2, Mary S. Bergh3. 1Veterinary Diagnostic and Production Animal Medicine, Iowa State University, Ames, IA; 2Veterinary Clinical Sciences, Iowa State University, Ames, IA.

A ten-week-old, 76 kg, male Angus calf presented with metatarsal varus and external torsion of the right pelvis limb precluding use of the limb. Dor-soplantar and mediolateral digital radiographs of the limb revealed a 28° supplantar and mediolateral digital radiographs of the limb revealed a 28° varus deformity and the degree of torsion was estimated to be 23° to 25°. Based on the desire to maintain limb length, have maximal cortical contact of the bone, and the need for early full weight bearing on the limb, a cylindrical osteotomy was performed to correct both the angular and torsional deformity during a single surgery. A 24 mm cylindrical TPLO-style saw was used to perform an osteotomy centered at the center of rotation of angulation (COR) with 52° of inclination, angled 11.5° laterally from the central axis of the fused second and third metatarsal bone. The distal bone segment was then rotated 37° clockwise. The osteotomy was stabilized with two 3.5 mm broad locking compression plates and locking screws placed on the dorsal and medial surfaces of the metatarsus. The patient had external coaptation for three weeks postoperatively. Radiographs obtained 5 months postop-eratively revealed complete osteotomy healing and remodeling with stable implants. Full limb function was present and client satisfaction was high. This report describes a novel approach to the management of angular and torsional deformity in the calf. A single osteotomy and locking bone plate technology were used to successfully treat concurrent angular and torsional deformity in the distal metatarsal bone.


Access to the pelvic canal is necessary to treat traumatic or neoplastic lesions of the distal urogenital tract, rectum, and iliosacral lymphocenter.
This can be accomplished via pelvic synostosis, pubic osteotomy, or bilateral pubic and ischial osteotomies. It has been the authors’ experience that during abaxial retraction following pelvic synostosis sacroiliac joint luxation can occur prior to adequate visualization. Our hypothesis is that pelvic synostosis with abaxial retraction causes sacroiliac (SI) joint luxation. Eight dog cadavers of additional pelvis underwent pelvic synostosis and retraction to 25%, 50% and 100% of sacral width. Prior to synostosis, after each abaxial retraction and following reposition of the synostsis each pelvis underwent a computed tomographic study to evaluate the effect on the SI joints. All SI joints subluxated bilaterally following synostosis and 25% abaxial retraction. Additionally all 8 cadavers lanced on one side (left 6 and right 2) to an average of 41% (range 31–53%) of sacral width at 100% abaxial retraction. The ideal approach to the pelvic canal remains unknown. Pelvic synostosis provides adequate visualization of the entire pelvic canal contents; however surgeons should be aware the abaxial retraction of 25% of sacral width leads to subluxation of the SI joints and retraction to 100% of sacral width leads to substantial luxation. Sacroiliac joint subluxation and luxation may not likely require ancillary stabilization but may be a cause for additional postoperative pain, reluctance to amble, and prolonged recovery.


Renal Transplantation remains the only potential cure for cats that suffer from chronic renal disease. Following transplantation of an allograft, organ, animals undergo lifelong immunosuppression to prevent allograft rejection. Chronic immunosuppression in the recipient has been shown to have deleterious consequences, including predisposing these animals to infections. The effect of Toxoplasma gondii (T. gondii) infection in the feline renal transplant recipient and efficacy of lifelong prophylactic chemotherapeutics for the parasite remains unknown. Medical records were reviewed for two populations of cases. The first group of cats (group A) that underwent transplantation were T. gondii seronegative or had an unknown status and developed clinical T. gondii infections following transplantation. The second group of cats (group B) that underwent transplantation were seropositive for T. gondii and were maintained on lifelong chemotherapeutics for the parasite remains unknown. Medical records were reviewed for two populations of cases. The first group of cats (group A) that underwent transplantation were T. gondii seronegative or had an unknown status and developed clinical T. gondii infections following transplantation. The second group of cats (group B) that underwent transplantation were seropositive for T. gondii and were maintained on lifelong chemotherapeutics. Following transplantation, all six cats developed clinical T. gondii infections, five of which were fatal. Median survival was 188 days (range 24–390 d). Twelve T. gondii seropositive cats underwent transplantation while being administered clindamycin with only one developing a non-fatal T. gondii infection following transplantation. Median survival was 396 days (range 11–1014 d) for eight cats with four cats being alive at submission. Of the six cats that developed clinical infections, once respiratory signs developed, treatment provided no effect and all progressed to respiratory arrest and death. No animal managed with prophylactic clindamycin developed a fatal infection. T. gondii seropositive cats remain acceptable candidates for renal transplantation however should receive lifelong prophylactic chemotherapeutics to prevent fatal infections.

Long-Term Retrospective Study of 12 Heifers and 1 Bull with Sinonasal Cysts, Tumors, and Tendinitis. Secor1, Mark Grzanna 2, Lowella Heinecke 2, Angela C. Frondoza2, Carmelita G. Secor1,2,3, Michael A. Cangialosi1,2,3,4. 1Department of Veterinary Microbiology and Pathobiology, 2Department of Veterinary Surgery, 3Diagnostic Imaging, 4Clinical Sciences, Cornell University, Ithaca, NY.

From this study can be concluded that sinonasal cysts occur mainly in young adult cattle. Most cysts are self-limiting, with or without treatment. Nasal extraction with recurrence of cysts. The other seven cattle showed no

Suppression of Interleukins 6 and 8 and Macrophage Chemotactic Protein-1 Production By Avocado/Soybean Unsgaponifiables, Glucosamine and Chondroitin Sulfate Combination and NSAIDS in Activated Canine Chondrocytes. Erica Ector1, Mark Grzanna2, Lowella Heinecke2, Angela Au3, Carmelita G. Frondoza2,4, Cornell University, Ithaca, NY; 2Nutramax Laboratories, Inc, Engwood, MD; 3Syracuse University, Syracuse, NY; 4Mississippi State University, Mississippi State, MS.

Osteoarthritis (OA) is characterized by articular cartilage breakdown, immobility, and pain associated with excess production of cytokines and chemokines. Non-steroidal anti-inflammatory drugs (NSAIDS) block production of these mediators. However, NSAIDS induce deleterious side effects. Avocado/soybean unsaponifiables (ASU), glucosamine (GLU), and chondroitin sulfate (CS) have been used to reduce inflammation in OA. Our objective was to determine whether treatment with IL-6, IL-8, and MCP-1 production alone, or in combination with ASU+GLU+CS.
Canine articular chondrocytes were propagated in a microcarrier spinner culture system. Culture (10 mL) aliquots were activated with IL-1β (50 ng/mL) and treated with meloxicam (11.7 ng/mL) or carprofen (40 ng/mL), with or without [ASU+GLU+CS] for another 24 hours. IL-6, IL-8, and MCP-1 production was determined by ELISA.

IL-1β robustly increased production of IL-6, IL-8, and MCP-1 in all chondrocyte cultures examined (P < 0.001). IL-6 levels increased by 62,000-fold. IL-8 levels increased by 16,000-fold, and MCP-1 by 2,200 fold. Induced production of these mediators were significantly reduced by ASU+GLU+CS as much as 80%, P < 0.001. The low doses of meloxicam and carprofen, which represent sub-therapeutic concentrations of these compounds, had variable and only marginal effects in suppressing IL-1β-induced IL-6, IL-8, and MCP-1 production. The most pronounced suppression of IL-6, IL-8, and MCP-1 production was observed when the mixture of ASU+GLU+CS was combined with meloxicam or carprofen. These results show a possible use for sub-therapeutic doses of NSAIDS with [ASU+GLU+CS] for the treatment of OA, which would minimize NSAID side effects.

**Evaluation of Perioperative Gastroesophageal Reflux in Dogs with Brachycephalic Syndrome.** Stephanie L. Shaver, David A. Jimenez, Benjamin M. Brainard, Karen Cornell, MaryAnn Radinsky, Chad Schmidlin. Small Animal Medicine and Surgery, University of Georgia, Athens, GA.

Functional upper airway obstruction is a common complaint in brachycephalic dogs. The canine upper airway contains high echogenic airway structures that result in differences in airway size compared to the anatomy of the human. While brachycephalic dogs are predisposed to gastroesophageal reflux (GER) when awake, objective data regarding perioperative GER is not available. The objective of this study was to identify the prevalence of and factors associated with perioperative GER in brachycephalic dogs undergoing surgery for correction of upper airway obstruction. Twenty-three dogs were prospectively enrolled in the study in which owners completed a historical questionnaire, and the dogs underwent a standardized anesthetic protocol. Preoperative reflux was documented by continuous monitoring of esophageal pH throughout anesthesia with a single channel pH probe proximal to the lower esophageal sphincter. Data (historical GI complaints, signalment, body weight, body condition, radiographic signs, anesthetic and surgical time, and specific procedures) were compared between dogs that did and did not experience acid (pH < 4), basic (pH > 7.5), or any GER. Perioperative GER was present in 60.9% of dogs, with 34.8% experiencing acid reflux, 21.7% having basic reflux, and 4.3% having both acid and basic perioperative GER. When all dogs with GER were compared to dogs without GER, dogs in the GER group were significantly more likely to have esophageal gas on radiographs compared to dogs without GER (P = 0.0367). No other significant differences were identified in any group. Based on these findings, a majority of brachycephalic subjects experienced perioperative GER and only esophageal air on preoperative radiographs may predict GER.

**Epidual Idiopathic Sterile Pyogranulomatous Inflammation Causing Spinal Cord Compressive Injury in Four Dogs.** Mitsuhiro Shibata1, Takeshi Aikawa1,2, Moe Asano1. 1Aikawa Veterinary Medical Center, Tokyo, Japan; 2Veterinary Surgical Service Japan, Tokyo, Japan.

Idiopathic sterile pyogranulomatous inflammation (ISP) is known as a dermatologic disease occasionally seen in miniature dachshund (MDs) and other breeds. We reported epidual ISP causing spinal cord compression in five MDs. We encountered additional epidual ISP cases (2 MDs and 2 other breeds). We report the clinical findings, outcome of epidual ISP and update the follow up of 5 previous cases inclusive. Four dogs with T3-L3 myelopathy were referred. In one MD, osteoid lesion of vertebrae was detected by survey radiograph. On myelogram, T-L spinal cord compression was detected in all cases. Hemilaminectomy was performed and epidual lesion was resected. In one case, additional vertebral stabilization was performed. The histopathological diagnosis suggested that pyogranulomatous panniculitis and bacterial culture was negative in all cases. Three dogs were neurologically normal at 11 to 17 months postoperatively. In one MD which had osteoid lesion, the neurological deterioration occurred and died at 3 months postoperatively. The postoperative immunosuppressants were used in three dogs.

The epidual ISP was diagnosed by the histopathological examination and negative bacterial culture results. Present report suggests that epidual ISP is not a specific disease for MD. Surgical intervention was needed as the primary therapy for severe spinal cord injury and definitive diagnosis for ISP. The osteolytic lesion detected by survey radiograph in a case suggested the ISP may be considered as one of the differential diagnosis for the cause of vertebral bone lytic lesions. Further investigation is needed for the definitive ISP diagnosis, methods, effects of surgical and immunosuppressive treatment for epidual ISP.

**Hemi-Dorsal Laminectomy and Vertebral Stabilization for Treatment of Solitary Vertebral Plasmacytoma in a Dog.** Mitsuhiro Shibata1, Takeshi Aikawa1,2, Moe Asano1. 1Aikawa Veterinary Medical Center, Tokyo, Japan; 2Veterinary Surgical Service Japan, Tokyo, Japan.

Vertebral plasma cell tumor is a rare tumor that account for less than 4% of all canine tumor cells. The dissemination of the solitary plasmacytoma to the multiple myeloma has been reported in humans. There has been limited information of the canine solitary plasmacytoma after surgical treatment. We present a dog that the solitary plasmacytoma disseminated to the multiple myeloma 9 months after the neurological improvement by the surgical decompression and stabilization. An 8-year-old Yorkshire terrier was referred because of ambulatory paraplegia. The pathological fracture of T7 vertebrae was detected by radiography. The MRI and CT study showed mass lesion at T7 vertebral body. Surgical decompression by hemi-dorsal laminectomy and partial vertebrectomy followed by vertebral stabilization were performed. The histopathological diagnosis was suggestive of sarcoma. The dog improved its neurologic status postoperatively and had remained ambulatory until sudden neurological deterioration on 295 days postoperatively. The pathological fracture and loss of bone density were detected. The elevated gamma fraction and abnormal immunoglobulin was detected. The dog died on 297 days postoperatively. The proliferation of multiple myeloma was diagnosed by bone marrow aspiration.

Present case documented the surgical decompression with stabilization without additional chemotherapy or radiotherapy maintained improved neurological status until the multiple myeloma was diagnosed. The lesions for treatment of soft tissue injuries in the horse. Alternative routes of administration would be beneficial for lesions that cannot be reached directly or in order to limit needle-induced iatrogenic damage to the surrounding tissue.

The purpose of our study was to evaluate intra-arterial (IA) and intra-venous (IV) distal regional limb perfusions (RLP) of MSCs using scintigraphy. Albert Solé1, Mathieu Spiess2, Larry D. Galuppo2, Kerstien A. Padgett3. 1Animal Specialty Group, Los Angeles, CA; 2JD Wheat Veterinary Orthopedic Research Laboratory, University of California, Davis, CA; 3Kyon Pharma, Boston, MA.

Elbow dysplasia is one of the most common orthopedic causes of lameness in the thoracic limb. The medial compartment is most commonly affected. The purpose of this study is to determine the effect of implantation of a novel medial compartment elbow arthroplasty system on the biomechanical load to failure in normal canine thoracic limbs. We hypothesized that the implanted limbs would fail beyond normal biologic loading but at lower loads than control limbs. Axial load to failure was measured using a novel testing construct. 6 paired medium mixed breed canine cadaveric thoracic limbs were prepared for comparison of failure loading of control vs. implanted limbs. Load and displacement values were measured. The mean bodyweight/failure load ratios for the implanted limbs and control limbs were 2.47 (range: 1.62–3.38) and 2.68 (range: 2.25–3.25) respectively. The implanted to control ratio was performed for paired limbs. The mean ratio was 0.93 (sd: 0.19). No difference was noted between paired control vs. implanted limbs (P = 0.38). Failures occurred in 4 testing constructs, 3 at the implant at the proximal ulna, 2 at the distal humeral implants, and 4 at the distal radius/ulna and carpus. We concluded that in vivo implantation of this prosthesis is feasible as these failure loads are above biologic loading.

**Evaluation of Intra-Arterial and Intra-Venous Regional Limb Perfusion of Mesenchymal Stem Cells in the Normal Equine Distal Limb Using Scintigraphy.** Kirk Wendelburg1, Zachery F. Smith1, Kei Hayashi2, Susan Stover2, Tanya Garga3,4, Siobhan Tepeć5. 1Animal Specialty Group, Los Angeles, CA; 2Department of Surgical and Radiological Sciences, School of Veterinary Medicine, University of California, Davis, CA; 3Department of Pathology, Microbiology and Immunology, School of Veterinary Medicine, University of California, Davis, CA.

Mesenchymal stem cells (MSCs) are commonly injected directly into the lesions for treatment of soft tissue injuries in the horse. Alternative routes of administration would be beneficial for lesions that cannot be accessed directly or in order to limit needle-induced iatrogenic damage to the surrounding tissue.

The purpose of our study was to evaluate intra-arterial (IA) and intra-venous (IV) distal regional limb perfusions (RLP) of MSCs using scintigraphy.

**ABSTRACTS**

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Six sound horses were used in the study. Allogeneic MSCs were labeled with hexamethylene diamine oxime (HMPAO) and technetium-99m. RLP was performed under general anesthesia through the median artery of one limb and through the cephalic vein of the opposite limb. Scintigraphic images were obtained at 0 min, 45 min, 75 min, 6 hours and 24 hours post-injection.

Distribution of labeled MSCs through the entire distal limb was achieved with all IA-RLP, while 3 out of 6 IV-RLP showed poor or absent uptake distal to the metacarpus. A persistence of 100% of the MSCs was achieved for both techniques in presence of the tourniquets. Persistence decreased to a median of 39% and 28% at 6 hours after injection for IA- and IV-RLP, respectively.

In conclusion this study demonstrates that both IA- and IV-RLP result in good persistence of MSCs in perfused tissues. The IA-RLP appeared to result in more reliable cell distribution to the pastern and foot area.

**Morphological Comparison of the Middle Ear Between French Bulldogs and Non-Brachycephalic Dogs.** Lawrence Souchu1, Thomas Chuzel 2, Claude N. Stewart, Raymond Boston, Brazil; 2Center of Mathematical, Computation and Cognition, University of Veterinary Medicine and Animal Science, São Paulo, Brazil; 3Center of Mathematical, Computation and Cognition, University of ABC, São Paulo, Brazil.

The objective of this study was to compare normal and pathological morphology of the middle ear of French Bulldogs (FB) with normal morphology of non-brachycephalic dogs (NBD) using computed tomography (CT).

CT scans of FB (n = 34) with or without middle ear disease and NBD (n = 36) without middle ear disease were reviewed. Ratios between inter-jugular processes distance and height of the epi- mesotympanum (rHem) and external acoustic meatus (rHeam), height (rHh), width (rWh) and length (rLh) of the hypotympanum, percentage of tympanic bulla (TB) protrusion from the skull (rHin and rHout) were calculated from 2D view. Relative position of TB and temporo-mandibular joint (TMJ) were determined with surface rendering 3D reconstruction. Data were compared using paired-sample (independent) t-test with P < .05 considered significant.

Mean rHem, rHh, rWh and rHout of the FB group are significantly smaller than the NBD group (respectively P = .02, P = .02, P < .001 and P < .001) whereas mean rHeam and rHin are higher (respectively P < .001 and P = .005). rH is not significantly different between groups (P = 0.07). TB is more medially located in FB (P < .001); it is also slightly more cranial than TMJ whereas it is more caudal in NBD (P < .001). There is no significant difference for all the parameters between FB with or without middle ear disease.

Middle ear is smaller (except for the length) in FB compared with NBD but with a greater external acoustic meatus. It is also more dorsally located in comparison with the skull and protrudes less in FB. It must be palpated slightly cranially and medially compared with TMJ. Preoperative CT scan with 3D reconstruction for surgical planning is really amendable in this breed. Tympanic bulla ligation under video-otoscopy could be an alternative of great interest in brachycephalic dogs.

**Pads Pressure Distribution in Pit Bulls with Cranial Cruciate Ligament Rupture.** Alexandre N. Souza1, Angélica C. Tartarunas2, Valdecir Marvulle3, Julia M. Materia 1. 1Veterinary Surgery, University of São Paulo, São Paulo, Brazil; 2Center of Mathematical, Computation and Cognition, University of ABC, São Paulo, Brazil.

Our objective was to evaluate pads pressure distribution in forelimbs (FL) and hind limbs (HL) to describe kinetics details in pit bulls with cranial cruciate ligament rupture.

10 healthy pit bulls (Group A) and 10 pit bulls with cranial cruciate ligament rupture (Group B) were used. A pressure-sensitive walkway was used to collect vertical force data for each pad of the limbs of dogs used for kinetic gait analysis. The load for each pad was evaluated as a percentage of body weight. Velocity and acceleration were within a range of 1.0 and 1.3 m/s. 2. The data was compared by unpaired t-test and the symmetry by student t-test and both with P < .005.

The results showed that a decrease of vertical forces (VF) in the affected limb mainly occurs by support decrease in metatarsal pad. Compensation of this decrease is reflected in a redistribution of the VFIs in the pads of contralateral HL and FLs.

We found a pads pressure distribution pattern in pit bulls with cranial cruciate ligament rupture. These data could contribute to the assessment of lameness in dogs with cranial cruciate ligament rupture and assist in follow up of operated dogs.

We acknowledge to FAPESP and CAPES by support.

**Correlation Between Hip Joint Radiographic Classification and Kinetic Analysis in German Shepherd Dogs.** Alexandre N. Souza1, Ana Carolina B. Paua1, Valdecir Marvulle3, Julia M. Materia1. 1Veterinary Surgery, Faculty of Veterinary Medicine and Animal Science, São Paulo, Brazil; 2Center of Mathematical, Computation and Cognition, University of ABC, São Paulo, Brazil.

Our objective was to establish the correlation between hip joint radiographic classification and kinetic analysis in German shepherd dogs.

Five groups were performed according to HD classification in the categories A, B, C, D and E in German shepherd dogs with total of 8 dogs in each group.

The dogs were examined and kinetic analysis was performed with 5 valid passages on the pressure platform. The peak vertical force (PVF), vertical impulse (VI), and stance phase (SP) was assessed with a constant speed between 1.3 to 1.6 m/s. The pads pressure distribution was evaluated also.

The data was compared by ANOVA test and the symmetry by student t-test and both with P < .005.

Was founded a tendency to decrease progressively the PVF in the hind limbs (HL) from group C (medium dysplasia) to E (severe dysplasia) and VI was decreased in dysplastic dogs without any correlation with HD degree.

Relevant compensation was not found in the forelimbs (FL) and even in dysplastic dogs there were no difference between the SP. The pads pressure distribution is not affected on a regular basis in the HD.

We conclude that according to the HD degree the dogs have tendencies to support less at the HL. However it should be considered the individual markers because there are dysplastic dogs that have the same pattern of support that dogs free of HD. The kinetic analyses provide a great approach to evaluate the dysplastic patient condition.

We acknowledge to FAPESP and CAPES by support.

**Correlation of Foot Balance and Deep Flexor Tendon Lesion Location on MRI.** Brianne R. Gindlesperger, Allison A. Stewart, University of Illinois, Urbana, IL.

Introduction: The purpose of this study was to determine if the location of DDFT lesion identified on MRI corresponded with a medial to lateral and dorsal to palmar imbalance of the distal limb. We hypothesize that the DDFT lesion will be located on the long side of imbalanced limbs and that dorsal to palmar imbalance will be present in limbs with DDFT lesions.

Materials and Methods: Medical records, radiographs, and MRI for horses between July 2007 and September 2009 that blocked out to the digit were reviewed. Radiographs and MRI were reviewed to see if there was a correlation between imbalance and DDFT injury. Statistics were performed using a Fisher Exact Test with a P < .05 considered significant.

Results: There is a significant correlation between the long side of an imbalanced limb and location of DDFT lesion. A negative palmar angle was present in all limbs with DDFT lesion, supporting both hypotheses of the study.

Discussion: These results suggest that horses with a long toe, low heel, and medial to lateral foot imbalance are predisposed to DDFT tendon injury on the long side of medial to lateral imbalance. Further studies with larger case numbers are warranted to verify these findings.

**Polycationic Coating on Orthopedic Implants Inhibits Biofilm Formation in an Infected Ovine Tibial Osteotomy Model.** Suzanne Stewart, Raymond Boston, Tom P. Schaer. Department of Clinical Studies, New Bolton Center, School of Veterinary Medicine, University of Pennsylvania School of Veterinary Medicine, Kennett Square, PA.

Implant associated infections contribute to increased patient morbidity and healthcare cost. Klibanov et al. have previously shown that surfaces coated (“painted”) with a hydrophobic polycationic coating (HPC) killed bacteria by rupturing their cellular membranes. We hypothesized that surface coating of orthopedic hardware using HPC would result in formation of a bactericidal surface that prevents implant colonization in a large animal infection model in vivo. Twelve mature Dorset cross ewes were enrolled in a prospective study. A unilateral transverse mid diaphyseal tibial osteotomy was performed and repaired with a stainless steel LCP. The osteotomy was inoculated with 2.5 mL of 10^6 CFUs of S. aureus. Six animals received a HPC implant and the remaining six were uncoated. Implants were coated aseptically at the time of surgery. Radiographs were assessed immediately post operatively and at one month post operatively. Animals were sacrificed at one month and an aseptic necropsy and harvest of the implant performed. The implants were sectioned and the surface analyzed for bacterial colonization using scanning electron microscopy (SEM). The callus was fixed for histological and μ-CT analysis. Radiographic, microbiology, histological and explant scores were significantly lower for treatment animals compared to controls. There was significantly greater healing and callus formation in treatment animals (P < .005). Control animals had
Evidence of a delayed union of the osteotomy with significant abscessation and bacterial colonization. SEM analysis revealed biofilm formation compared to negative controls (P = 0.001). HPC-autoclave group had less bacterial colonization compared with the HPC-autoclave group (P = 0.02). There was no significant difference in bacterial growth between HPC-EO and HPC-positive control groups. SEM analysis revealed biofilm formation on negative controls. The HPC-EO and HPC-positive control groups had increased bacterial colonization compared with the HPC-autoclave group. SEM analysis of HPC inserted into bone revealed the coating to be stripped from the cutting threads at the bone-screw interface. Bacterial colonization of HPC was restricted to the screw threads.

Determine the Pelvic Canal Diameter Ratio at Which Signs Related to a Stenotic Pelvic Canal Develop in Dogs and Cats. A Retrospective Review of 62 Cases (1998–2010). Pei-Yi Sung, Po-Yen Chou, Li-Seng Yeh. NTU/VH, Taipei, Taiwan. Pelvic fractures of dogs and cats are nearly always the result of trauma and comprise at least 25% of all fractures. The method determining pelvic canal diameter was established by Averill S.M. et al. Based on the previous research, the smallest pelvic canal diameter ratio (PCDr) at which clinical signs related to pelvic canal stenosis develop could not be determined because the lack of severe injured cases treated with conservative methods in that study. Objective of this study was to determine the pelvic canal diameter ratio related to clinical signs of constipation.

Radiographs of pelvic fracture cases in dogs and cats presented to National Taiwan University Veterinary Hospital from 1998 to 2010 were examined retrospectively. Comparing PCDr and clinical signs of constipation of each case was performed. Data were statistically analyzed using logistic regression procedures. A total of 62 pelvic fracture cases including dogs and cats were included in this study. 7 cases have the clinical signs related to constipation and need stool softeners or changes in diet to alleviate the frequency of constipation. 87.5% cases (7/8 cases) with PCDr less than 0.64 have the clinical signs of constipation. Of the cases with PCDr greater than 0.71, none has the clinical signs of constipation. Under logistic regression analysis, PCDr less than 0.64 is a significant risk factor associated with constipation (P < 0.05). Based on the presented study result, animals with PCDr less than 0.64 have increased risk of constipation. More clinical cases may be needed to obtain the exact PCDr causing constipation.

Modified High Perineal Urethrostomy Technique for Treatment of Urethral Stricture in Goats. Karen Tobias1, Sarel van Amstel2. 1Small Animal Clinical Sciences, University of Tennessee, Knoxville, TN; 2Large Animal Clinical Sciences, University of Tennessee, Knoxville, TN.

Perineal urethrostomy is considered a salvage technique for treatment of urethral strictures. SEM imaging demonstrated that sufficient HPC remained to reduce implant colonization when compared with negative controls.

Evidence of a delayed union of the osteotomy with significant abscessation and bacterial colonization. SEM analysis revealed biofilm formation compared to negative controls (P = 0.001). HPC-autoclave group had less bacterial colonization compared with the HPC-autoclave group (P = 0.02). There was no significant difference in bacterial growth between HPC-EO and HPC-positive control groups. SEM analysis revealed biofilm formation on negative controls. The HPC-EO and HPC-positive control groups had increased bacterial colonization compared with the HPC-autoclave group. SEM analysis of HPC inserted into bone revealed the coating to be stripped from the cutting threads at the bone-screw interface. Bacterial colonization of HPC was restricted to the screw threads.

Based on the presented study result, animals with PCDr less than 0.64 have increased risk of constipation. More clinical cases may be needed to obtain the exact PCDr causing constipation.

Predictive Value of Radiographs, Dual Energy X-ray Absorptiometry, computed tomography and Microcomputed Tomography to Determine Local Cancellous Bone Quality of the Proximal Femur. Katy Townsend1, Tatiana Motta1, Valerie Samii2, Jonathan Dyce3, Richard Hart4, Matthew Allen5. 1Veterinary Clinical Sciences, The Ohio State University, Columbus, OH; 2Biomedical Engineering, The Ohio State University, Columbus, OH.

Proximal femoral bone quality and geometry are two important variables to provide long-term stability in cementless total hip arthroplasty (THA). The goal of this study is to determine the feasibility of using non-invasive imaging data to predict the quality and quantity of cancellous bone in the canine proximal femur and directly compare this with bone microstructure and mechanical analysis. Twelve cadaveric canine femora were used. Radiographs were taken, along with DEXA scans and quantitative CT. Bone Mineral Content (BMC) and Bone Mineral Density (BMD) were measured from DEXA scans and CT, and radiographs were scored. Cores of cancellous bone were harvested from the proximal femur. High-resolution micro computed tomography (uCT) was performed to assess bone microstructure (fractional bone volume (BV/TV), polar moment of inertia) and mechanical testing of the core bone was performed to assess bone strength (break load, stiffness, energy at peak). Pearson correlation was used to compare the biomechanical parameters with the imaging modalities. uCT values (BV/TV and AMI) had the best predictor of mechanical properties of cancellous bone in the proximal femur, while clinical imaging modalities such as radiographs, DEXA BMD and BMC and qCT had only mild correlation with predicting bone strength, uCT has the best predictor of bone strength, suggesting that bone architecture plays a significant role in determining bone strength. CT, DEXA and radiographs all showed only mild correlation of bone strength, indicating that clinical parameters are not useful in predicting proximal femoral bone strength.

In Vivo Osteoinductivity of Gelatin β-Tri-Calcium Phosphate Sponge Containing Bone Morphogenetic Protein-2 on an Equine Third Metacarpal Bone Defect. Nao Tsuzuki1, Kenji Otsuka2, Kazutaka Yamada3, Shingo Haneda4, Hide-Tsun Fujioka5, Yasuhiko Tabata6, Naoki Sasaki7. 1Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Japan; 2Kyoto University, Kyoto, Japan.

Limb fractures occur frequently in horse. In racehorses, fractures can cause large economic losses because they require long-term rest and thus, the affected horse is prevented from entering races. Therefore, new treatment method that enhances bone regeneration is required. Recently, bone regeneration methods that make use of various biogenic cytokines combined with surgical procedures have been proposed to enhance the process of fracture healing. Bone morphogenetic protein-2 (BMP-2) has reported to induce bone regeneration. Gelatin β-tri-calcium phosphate sponge (spoon) can act as a scaffold necessary for cell differentiation and proliferation. This study evaluated the therapeutic effects of sponge incorporating BMP-2 (BMP-2/spoon) on bone regeneration in equines.

Six bone defects were created in third metacarpals of five thoroughbred horses, and a total of six treatments were applied. The treatments were: control (sponge), gelatin sponge containing β-Tri-Calcium Phosphate (BMP-2/spoon), free BMP-2, sheets incorporating basic fibroblast growth factor (bFGF) (bFGF/spoon), plain sponges and plain sheets. The defects were monitored for 16 weeks by radiography and then examined by Multi-Detector-row Computed Tomography (MDCT) and histological analysis. Radiographic evaluation scores of bone regeneration revealed significantly greater bone regeneration of defects treated with BMP-2/spoon compared to both plain sponge and free BMP-2 (P < 0.05). MDCT revealed significantly greater regeneration of the defects treated with BMP-2/spoon compared to both plain sponge and free BMP-2 (P < 0.05). In histological
analysis, compact bone was observed over a wide area in the BMP-2/sponge treatment.
From these results, we concluded that the treatment with BMP-2/sponge accelerated bone regeneration in the equine.

The Effect of Locking Compression Plate Position on Mechanical Stabilization of the Canine Radius with a Gap. Justin Udell1, Amy S. Kapatin1, Tanya Garcia-Vizcaíno2, R. Vizcaíno3, A. Nuria Forterre4, 1Veterinary Clinical Sciences, University of Minnesota, St. Paul, MN; 2Anatomy Physiology and Cell Biology, University of California, Davis, CA; 3Surgical and Radiological Sciences, University of California, Davis, CA.

Distal radial fractures are the most common fracture of the canine thoracic limb and large breed dogs are more likely to have a comminuted fracture requiring bone plate fixation in butress across a fracture gap. We hypothesized that a smaller locking compression plate (LCP) placed medially across a fracture gap will have similar biomechanical properties to a larger LCP placed cranially due to increased screw purchase across an elliptical shaped radius and having an additional screw in the distal fragment.

The in vitro biomechanical properties of paired canine radii, stripped of cortical and cancellous soft tissues, with an LCP stabilized, simulated distal radial comminuted fracture were compared between cranial and medial plate positions (each treatment in contralateral limbs). The limb constructs were taken through 4 conditions of medial and lateral and cranial to caudal bending at walk and trot loads before being tested to failure. The results were statistically analyzed using paired t-tests.

Cranial plate constructs had significantly higher monotonic stiffnesses, and yield and failure loads; and higher cyclic stiffnesses; when compared to medial plate constructs.

The larger, cranially applied LCP was biomechanically superior to the smaller, medially applied LCP in our distal radial fracture model. Surgeons should consider using a larger cranially applied locking plate when repairing distal radial fractures requiring butress across comminution or a gap in larger breed dogs.

In Vivo Tracking of Injected Mesenchymal Stem Cells Using Technetium-99m. Patricia Becerra1, Miguel A. Valdec2, Francisco Neves3, Jay Dudhia3, Neil G. Hartman3, Andrew Fishe-Jackson2, Roger K. Smith2. 1Hospital de Referencia La Equina, Manilva, Spain; 2Department of Veterinary Clinical Sciences, the Royal Veterinary College, North Mymms, Hatfield, United Kingdom; 3Department of Nuclear Medicine, Barts & the London NHS Trust, West Smithfield, United Kingdom.

Mesenchymal stem cells (MSCs) are being used with increasing frequency in soft tissue injuries but immediate cell survival and alternative administration routes have not been investigated. We hypothesized that MSCs are retained within the tendon after intra-lesional injection but can also “home” to injury sites after intravenous injection or regional perfusion.

Labeling efficiency of MSCs with technetium-99m (Tc-99m) and hexamethylpropylene amine oxime (HMPAO) was initially determined in vitro. 10 million labeled MSCs were then implanted into 12 horses with naturally occurring tendon or ligament injuries intra-lesionally, and by regional perfusion on consecutive weeks. Labeled MSCs were traced over 36 hours using gamma scintigraphy. Maximum in vitro cell labeling was 55% with <90% cell viability. In contrast, labeling efficiencies varied between 2.7% and 22.5% (mean 9.2%) in clinical cases. Cells were retained in the damaged area after intra-lesional administration but only ~10% of cells were still present within the tendon after 24 hours. After intravenous injection, cells largely distributed to the lung fields, with no detectable cells in the tendon lesions. In contrast, significant labeling of the tendon lesions was observed in 11/12 horses following regional perfusion.

Optimal number of cells is not known but the highest cell numbers were retained after intra-lesional injection, although with considerable cell loss. Regional perfusion appeared to be a viable alternative if no core lesion was present. The absence of cells seen after intravenous administration may be a consequence of low labeling efficiencies, but cells still did not ‘home’ to the lesion in large numbers.

CT Scan Bone Determination of Optimal Atlantoaxial Neutral Screw in Miniature Breed. Nuria Vizzacino Revés1, Katrine Rebe1, Christiane Girard1, Christian Bolliger1, Kate Anderson1, Ludovic Bourié1, 1Faculté de Médecine Vétérinaire, University of Montreal, St-Hyacinthe, QC, Canada; 2AÖ Research Institute, Davos, Switzerland.

Pin loosening is a common complication of transfixation pincasts (TP) in large animals, often necessitating premature removal before fracture healing. The excessive loads located on the proximo-external and disto-internal cortices of the bone-pin interface cause osteolysis. Using a neonatal calf model, this project evaluated a novel pin-sleeve and ring cast system (PS) optimized to decrease peri-implant strain and evenly share stress at the bone-implant interface. It was hypothesized that PS would result in less peri-implant osteolysis compared to TP.

Ten, 3-week-old, healthy calves were implanted with either TP or PS in the right metacarpus, 2 implants per calf. Calves were scored daily for lameness and were euthanized at day 28. Collected data included radiographs at surgery and euthanasia and histomorphometric measures of bone-implant contact on non-decalcified specimens with the implants in situ. Data was analyzed using Cochran-Mantel-Haenszel test; a P-value < .05 was considered significant.

The cortical thickness was larger for distal implants than proximal implants for both groups at surgery (P = .03), but were similar between groups (P > .31). TP calves developed lameness sooner, at day 21, than PS calves (P = .04). Histologically, there was more direct cortical bone-implant contact for PS distal implants than TP distal implants (P = .04). The junction where the proximal implants were situated was unsuitable bone for either system which had minimal length and placement angle in order to achieve an optimal atlantoaxial transarticular screw stabilisation.

This was a retrospective CT-imaging study including sixteen toy-breed dogs, weighing less than 5 kg. Nine showed no atlantoaxial abnormalities (group 1), whereas the other seven presented with atlantoaxial instability (group 2). The optimal angle and implant length, which resulted in maximum bone purchase was measured on a dorsal plane and sagittal plane. The length of the area of maximum bone purchase was correlated to the maximum screw length. Both right and left sides were measured. Each scan was measured 3 times, and the average was used for statistical analysis:

In 100% of the cases, the optimum transarticular atlantoaxial angle to ensure maximal bone purchase was determined to be 40° from the patient midline on a dorsal plane and 20° from the neural canal on a sagittal plane. No significant differences were found between groups 1 and 2.

The angle determined in this study should be chosen for the stabilisation of the atlantoaxial joint with transarticular screws. The screw length should not exceed 10 mm.

Evaluation of the Stabilizing Function of the Canine Atlantoaxial Ligaments: A Biomechanical Study. Nuria Vizzacino Revés1, Katrine Reber1, Alexander Buerki2, Markus Stoffel3, Stephen Fergusson2, Franck Forterre1, 1Surgery, University of Bern, Switzerland; 2, ISTB, MEM Research Institute, Bern, Switzerland; 3Anatomy, University of Bern, Switzerland.

Atlantoaxial instability is a well known disease affecting most commonly immature toy breed dogs. Although several surgical techniques to stabilize the joint have been described and used in the past, the biomechanics of the atlantoaxial joint have never been studied.

The purpose of this study was to evaluate the stabilizing function of the single atlantoaxial ligaments.

The cranio-cervical region was harvested from the cadavers of 10 Beagles. The occipito-atlantoaxial region was prepared and freed from the surrounding musculature. Care was taken to preserve integrity of the atlantoaxial ligaments and of the atlantoaxial joint capsule. The atlanto-occipital joints were blocked with 2 transarticular diverging 1.8 mm positive threaded K-wires. The end of the specimens were embedded in PMMA and mounted on a simulator testing flexion and extension of the atlantoaxial joint. Range of motion (ROM) and neutral zone (NZ) were determined with all ligaments intact, after cutting the apical ligament, after cutting the transverse ligaments and finally after cutting the dorsal atlantoaxial ligament.

Range of motion in flexion/extension increased stepwise during the testing in a similar fashion in all tested specimen. However the most significant increase was observed after transaction of the alar ligaments.

The alar ligaments seem to be the most important ligamentous structures for the stabilization of the atlantoaxial joint.

The results of this study impart biomechanical knowledge of the canine atlantoaxial joint and may be of importance for the therapy decision making process in canine atlantoaxial instability.

Stem cells can home to sites of bone injury, but evidence for accumulation in cartilage lesions is not robust.

We hypothesized that autologous bone marrow derived mesenchymal stem (stromal) cells (MSCs) would engraft to cartilage in OA joints but not in normal joints following intra-articular injection.

Twenty-nine joints from 10 horses were characterized as normal or OA through lameness and radiographic examination. Second passage autologous MSCs (3×10^6 for fetlocks and 5×10^6 for femoropatellar joints) were labeled with fluorescent nanoparticles (Quantum Red dyes; Qdots®) or remained unlabeled (7 joints). Seventeen normal and 12 OA joints were injected and examined after 1 week by necropsy and fluorescent microscopy.

Clinical findings included increased lameness (2), and severe effusion (11), moderate (3), or slight effusion (4). Synovial fluid abnormalities included elevated nucleated cell counts (median 2,800/μl; interquartile range 1,750–4,450/μl), consisting of large mononuclear cells and small lymphocytes. There were no statistically significant differences in synovial parameters between Qdots® labeled and unlabeled MSC injected joints. Qdots® labeled MSCs were found predominantly in the synovial membrane compared to cartilage (P = 0.0001). Adherence of labeled MSCs to cartilage was minimal and found in 17 of 97 cartilage sections. The proportion of positive sections from synovium and cartilage was not different between OA and normal joints (P = 0.79).

Although mild, joint flares were common after intra-articular MSC injection. Synovial cytology was indicative of non-septic inflammation and antigenic stimulation. MSCs did not reliably home to cartilage injury in OA joints.

Endovascular Treatment and/or Evaluation of Canine Intrahepatic Portosystemic Shunts: Short- and Long-Term Experience in 100 Dogs. Chuck Weiss 1, Allyson Beren 2, Kim Todd 3, Jeffrey Solomons 1. 1Animal Medical Center, New York, NY; 2University of Pennsylvania, Philadelphia, PA.

The purpose of this study was to retrospectively evaluate the short- and long-term results following endovascular management of canine intrahepatic portosystemic shunts.

100 dogs with congenital IHPSs received 112 procedures (80% had one treatment, 15% had >1 treatment, and 5% had 0 treatments due to excessive portal-central venous pressure gradients). Percutaneous access and angiography identified 41 right divisional, 35 left divisional, and 19 central divisional shunts (5 not reported) of which 9% were complex/multiple shunts. Partial shunt attenuation was performed in 92 cases using cable stent placement and thrombogenic coils within the shunt while monitoring portal blood pressure. Complete acute shunt occlusion was possible in 3 cases. Major intra-operative complications (2/112; 2%) included temporary severe portal hypertension in one dog and GI hemorrhage in one dog. Major perioperative (<1 week post-op) complications (12/110; 11%) included bacteremia/HE (6%), diarrhea (2%), hypophagia (2%), pneumonia (1%), and acute death (1%). Median follow time for treated cases was 828 days (range 0–3411). Median survival time for treated dogs was 2204 days (range 0–3411) with 95% 60 day, 83% 1 yr, 74% 2 yr, and 53% 3 yr survival rates. Outcome was considered excellent (48/90; 53%) or good (19/90; 21%) in 74% of treated dogs.

Comparison of Transforming Growth Factor Beta-1, -2 and -3 Induced Chondrogenesis in Pre-Implant Stem Cell Cultures. Ashlee E. Watts, Kate P. Morris, Alan J. Nixon. Cornell University, Ithaca, NY.

It is well known that members of the transforming growth factor-beta family of proteins are required during chondrogenesis; however a direct comparison of the three peptides has not been performed. The purpose of this study was to compare in vitro chondrogenesis from TGF beta-1, TGF beta-2, and TGF beta-3 induced osteochondral pellets compared to TGFB1 and TGFB2, suggesting that TGFB3 better maintains a hyaline-like chondrogenic state rather than chondrogenic hypertrophy. Alcian blue staining of histologic preparations confirmed glycosaminoglycan accumulation within pellets from all three peptide groups, without obvious differences between the peptides. The addition of TGFB3, rather than TGFB1 or TGFB2, to culture medium during MSC isolation and expansion may better drive chondrogenesis in autologous MSCs prior to implantation in cartilage defects, where the clinical goal is the production of a hyaline-like cartilage. In vitro differentiation, TGFB3 may be better suited for use in gene therapy techniques, where autologous MSCs would continue over-expression of inserted genes within the articular environment, after implantation to cartilage defects.

Endovascular Treatment and/or Evaluation of Canine Intrahepatic Portosystemic Shunts: Short- and Long-Term Experience in 100 Dogs. Chuck Weiss, Allyson Beren, Kim Todd, Jeffrey Solomons. Animal Medical Center, New York, NY.

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Endovascular treatment for canine intrahepatic shunts may result in lower perioperative mortality and mortality rates with similar success rates compared with previously reported open surgical procedures. Gastrointestinal ulceration was a common finding among this population of dogs and lifelong gastroprotective medications are now recommended by the authors.

Biomechanical Evaluation of Medial Femoral Condylar Subchondral Bone Cysts and the Effects of Treatment with Internal Fixation. Jared M. Williams, Elizabeth Sauterchi, Alan Litisky, Veterinary Clinical Sciences, Ohio State University, Columbus, OH; 2The Orthopaedic BioMaterials Laboratory, Ohio State University, Columbus, OH.

Subchondral bone cysts (SBCs) of the medial femoral condyle (MFC) are a source of lameness. The goals of treatment are to reduce lameness, ideally by healing the subchondral bone and the deeper bone defect. The objective of this study was to measure the strain on the MFC before and after the creation of a cyst-like defect, and to evaluate the changes in strain following placement of a lag screw across the MFC. Stifle joints were collected and uniaxial strain gages were placed abaxially on the MFC. The stifle was fixed at an angle of ~135°. Axial compression was applied in increments of 100 lbs from 100–900 lbs, and the strain measured. A defect was created in the MFC at the site of weight-bearing and the limb was retested. Lastly, a 4.5 mm cortical bone screw was placed in lag fashion across the defect, and the limb was tested for a final time. There was no significant difference in peripheral condylar bone strain before and after the creation of the defect; however, following the placement of a cortical bone screw placement, condylar bone strain decreased by 8.8%. Most likely, bone strain was directed across the condyle and through the bone defect. This redirection of strain into a bone void could promote healing of SBCs and a reduction in lameness.

Use of a Carrel Patch for Multiple Renal Arteries in Feline Renal Transplantation. Katja Wucherer, Christopher P. Ober, Michael G. Conzemius. University of Wisconsin, Madison, WI.

Delayed Gadolinium Enhanced Magnetic Resonance Imaging of Cartilage Predicts Short-Term Outcome in Dogs Surgically Treated for a Fragmented Coronoid Process. Katja L. Wucherer, Christopher P. Ober, Michael G. Conzemius. University of Minnesota, St Paul, MN.

The clinical success and quality of life for dogs treated for fragmentation of the medial coronoid process (FCP) is variable, regardless of treatment regimen chosen. Preoperative predictors outcome are lacking and recommendations to clients about whether a patient is a good candidate for surgery is based largely on clinician preference. Studies in human orthopedic disease have shown that delayed gadolinium enhanced magnetic resonance imaging of cartilage (dGEMRIC) can be used preoperatively to predict long term outcome in people with hip dysplasia. This is because dGEMRIC is highly sensitive to the glycosaminoglycan (GAG) content within cartilage and thus to the integrity of the cartilage prior to surgery. This study compares preoperative dGEMRIC indices in dogs undergoing arthroscopic removal of their FCP +/- proximal ulnar osteotomy with six month ground reaction forces and owner assessment. In dogs that were considered to have a successful outcome, dGEMRIC values were significantly higher preoperatively than in dogs that had an unsuccessful outcome. For dogs with a FCP our early results strongly suggest that an estimate of glycosaminoglycan content in the medial compartment of the elbow before surgery predicts the probability of a successful outcome.

In Vitro Expansion Rates and Multi-Potential of Adult Canine Stifle Adipose, Synovial and Cranial Cruciate Ligament Multipotent Stromal Cells. Nan Zhang, Mandi Lopez. Veterinary Clinical Sciences, Louisiana State University, Baton Rouge, LA; 2Pennington Biomedical Research Center, Louisiana State University, Baton Rouge, LA.

The goal of this study was to quantify adipogenesis, osteogenesis and chondrogenesis of adult equine adipose (ASCs) and bone marrow derived multipotent stromal cells (BMSCs) on commercially available bovine collagen I scaffolds. ASCs and BMSCs harvested from four equine donors (7–10 years) were seeded onto collagen scaffolds by perfusion bioreactor. The cell surface marker profile of cells was established by flow cytometry prior to loading. Scaffold-cell constructs were assessed immediately after loading and after 7, 14, and 21 days of culture in stromal, adipogenic, chondrogenic, or osteogenic medium. Confocal laser microscopy, light microscopy, Picogreen assays, and scanning electron microscopy were used to evaluate cell viability, distribution, proliferation and construct ultrastructure, respectively. Tissue specific induction was confirmed by tissue microarray and mRNA levels of tissue specific genes. Approximately 3 weeks post loading, cells were CD34+ and CD45+, in contrast laser microscopy, uniform cell distribution was achieved with perfusion bioreactor loading. Loading efficiency was similar between different cell types. ASC proliferation rates were significantly greater than that of BMSCs. RT-PCR results showed significantly decreased expression of Sox 2 with culture time for both cell types on scaffolds. Light microscopy showed increased extra cellular matrix formation in cell-scaffold constructs cultured in induction versus stromal medium for both cell types. Scanning electron microscopy of scaffold-cell constructs confirmed adipocyte morphology, collagenous extracellular matrix formation and osteoblast morphology. These results support adipogenic, osteogenic, and chondrogenic differentiation of equine ASCs and BMSCs on type I collagen scaffolds and have positive implications for in vivo tissue regeneration.
collected from six normal canine stifles, and cells were characterized by cell proliferation rate, multi-potentiality, and stromal cell surface markers. The overall cell doublings (CD) (P0–6) for ASC, SSC, and LSC were 2.29 ± 0.42 CD/day, 1.81 ± 0.36 CD/day, and 1.40 ± 0.47 CD/day, respectively. The ASC CD number was significantly higher than SSC and LSC. The LSCs had significantly higher adipogenic, osteogenic, and fibroblast colony forming units (CFU) than ASCs and SSCs for P3. All three cell types displayed comparable chondrogenesis. All types were highly positive (>80%) for CD29, CD44, and CD90 (stromal), and highly negative (>80%) for CD34 and CD45 (hematopoietic) from P0-P6. As passages increased, the percentage of CD29 and CD44 positive cells decreased. This study demonstrates that ASCs may have better potential for tissue engineering than SSC and LSC.