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ABSTRACT

Scientific Presentation Abstracts: 2019 European College Veterinary Surgeons 28th Annual Scientific Meeting, July 2–4, 2019 – Budapest, Hungary

LARGE ANIMAL**RESIDENT'S FORUM - LARGE ANIMAL**

SERUM AMYLOID A AND PLASMA FIBRINOGEN CONCENTRATIONS IN HORSES FOLLOWING EMERGENCY EXPLORATORY CELIOTOMY

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Introduction: Acute-phase proteins may help to assess the nature and severity of lesions and outcome in horses undergoing colic surgery

The aim of this study was to compare SAA and fibrinogen concentrations in the immediate post-operative period after exploratory celiotomy, and to determine their value in assessment of post-operative complications and survival to discharge.

Materials & Methods: This was a prospective, observational study. Horses over 1 year of age undergoing exploratory celiotomy were included. Surgical procedures, lesions, post-operative care, complications and survival to discharge were recorded. SAA and fibrinogen were measured prior to surgery, and post-operatively for 5 days. Statistical analyses included Yate's chi-square test, linear mixed effect model, Mann-Whitney U test and logistic regression.

Results: Of 300 horses, 52.0% developed complications and 83.7% survived to discharge, with a significantly reduced chance of survival in horses that developed complications ($P < 0.01$). Logistic regression revealed post-operative complications to be associated with strangulating lesions (OR 2.35, 95%CI 1.41–3.91, $P < 0.001$) and higher

fibrinogen at admission (OR 1.21, 95%CI 1.00–1.45, $P < 0.05$), and survival to discharge to be associated with lower SAA at 5 days post-operatively (OR 0.965, 95%CI 0.94–0.99, $P < 0.001$).

Discussion/ Conclusions: Horses that develop complications have increased magnitude and duration of acute-phase protein responses compared to those that do not develop complications. This was also seen for horses that did not survive to discharge. Measuring SAA daily and fibrinogen at admission may help in predicting development of post-operative complications.

AN ALTERNATIVE SINGLE-STAGE TECHNIQUE FOR THE RECONSTRUCTION OF THIRD DEGREE PERINEAL LACERATIONS IN HORSES: "UTRECHT REPAIR TECHNIQUE"

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Introduction: Lacerations of the perineal region frequently occur in mares at the time of foaling. Tears that involve the perineal septum, anal sphincter, rectal submucosa and rectal mucosa are referred to as third degree perineal lacerations (TDPL). The goal of surgical repair is to create a new division between the vestibulum and rectum along with functional reconstruction of the perineal body. The purpose of this study was to describe the perioperative management, surgical procedure and outcome of an alternative single-stage repair technique, the Utrecht Repair Technique (URT), for the correction of third degree perineal lacerations (TDPL) in mares.

Materials and Methods: Medical records of mares ($n = 20$) that had undergone reconstruction of a TDPL using the URT were reviewed to assess the likelihood of surgical success and to report postoperative complications in detail.

Results: The age of the mares ranged from 3.5 to 11 years. In 18/20 (90%) successful reconstruction of the recto-vestibular shelf was achieved after a single surgical

[Correction added on 1 July 2019, after first online publication: the title was changed from "28th Annual Scientific Meeting July 2-4, 2019 - Budapest, Hungary, Budapest Congress Centre BCC" to "Scientific Presentation Abstracts: 2019 European College Veterinary Surgeons 28th Annual Scientific Meeting, July 2–4, 2019 – Budapest, Hungary"]

procedure. In 2/20 (10%) mares, a small rectovestibular fistula remained after the initial repair, which was successfully repaired with a second surgical procedure. Other postoperative complications included postanesthetic myositis, facial nerve paralysis, oesophageal obstruction, rectal impaction, partial perineal dehiscence and perineal wind-sucking. Postoperative fertility was good; 86% mares subsequently rebred became pregnant.

Discussion/Conclusions: The present study describes an alternative single-stage repair technique for the reconstruction of TDPL in mares. Successful repair after a single surgery was recorded in 90% of cases. No major complications related directly to the technique developed.

TIME OF PEAK CONCENTRATION OF AMIKACIN IN THE ANTEBRACHIOCARPAL JOINT FOLLOWING REGIONAL LIMB PERFUSION OF THE CEPHALIC VEIN IN STANDING HORSES

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Introduction: Regional limb perfusion is a well-known method for delivering high concentrations of antimicrobials to distal limb synovial structures in horses. The typically applied tourniquet time is 30 minutes, although several studies concluded that an application time of 10-15 minutes may be sufficient. Decreasing the application time can reduce repeated sedation and discomfort. The objective of this study was to determine the time (Tmax) to maximum concentration (Cmax) of amikacin in the antebrachiocarpal (ABC) joint following cephalic intravenous regional limb perfusion (IVRLP).

Materials and Methods: Six adult horses underwent IVRLP with 2g of amikacin diluted in 100ml of NaCl 0.9%. A wide rubber tourniquet was applied for 30 minutes and the antibiotic solution was injected through a 23G catheter. Synovial fluid was sampled from the ABC joint at 0, 5, 10, 15, 20, 25 and 30 minutes after IVRLP. Synovial amikacin concentrations were determined by liquid chromatography/tandem mass spectrometry. Statistical calculations were performed using computer programs (Stata14 and SPSS24).

Results: Mean Tmax was at 15 minutes (range 10-20 minutes) and mean Cmax was 1153 µg/mL (range 588-1950

µg/mL). None of the horses had Tmax value at later than 20 minutes tourniquet application time.

Discussion/Conclusions: Although mean Tmax was calculated to be 15 minutes, 2/6 horses had Tmax at 20 minutes. Additionally, the highest mean and median Cmax were obtained at the 20 minutes time point. In conclusion, a tourniquet application time of 20 minutes is sufficient for IVRLP to reach Cmax of amikacin in the ABC joint in standing horses.

EX VIVO MODELLING OF THE AIRFLOW DYNAMICS AND TWO- AND THREE-DIMENSIONAL BIOMECHANICS OF PROSTHETIC LARYNGOPLASTY SUTURE PLACEMENTS IN THE EQUINE LARYNX

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Introduction: The objectives of this study were to identify the level of arytenoid abduction required to optimise laryngeal airflow mechanics, to investigate the two and three-dimensional biomechanical effects on arytenoid cartilage movement during prosthetic laryngoplasty (PL) and, to determine the influence of altered suture position within the muscular process on these parameters.

Materials and Methods: Seven cadaver equine larynges were harvested. PL was performed on the left arytenoid at 12 abduction levels. Craniocaudal and mediolateral arytenoid suture positions were compared. At each level, flow, translaryngeal pressure (TP) and translaryngeal impedance (TI) were measured. Left : right arytenoid angle quotients and glottic cross-sectional area were determined. Serial computed tomographic images were obtained at alternate abduction levels. Three-dimensional reconstruction of external markers attached to the arytenoid and cricoid cartilage landmarks allowed calculation of roll, pitch and yaw for the left arytenoid relative to the cricoid, using Euler angles.

Results: The major arytenoid cartilage motion was pitch and yaw. The greatest change in flow and TP occurred between 17% and 42% of maximal abduction force and for TI between 17 and 25% of maximal force. The major left arytenoid cartilage motion was pitch. Fifty percent of maximal force resulted in a mean left angle of 27° for the mediolateral suture, and 29° for the craniocaudal suture.

Discussion/Conclusions: Abduction of the left arytenoid to 30° is sufficient for normalising airway mechanics during a routine PL in a cadaveric model. To optimise the 3D biomechanics of the larynx, a suture which mimics the action of the lateral muscle belly is recommended

EVALUATION OF FOUR TECHNIQUES FOR INJECTION OF THE PROXIMAL INTERPHALANGEAL JOINT (PIPJ) IN HORSES

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Introduction: Injection of the proximal interphalangeal joint (PIPJ) is challenging, with accuracy rates of 36-48% using traditional approaches. The objectives of this study were to describe and evaluate dorsolateral flexed (DLF) and dorsoproximal midline standing approaches (DPM) for PIPJ injection, and to compare them to established palmaroproximal (PP) and dorsolateral standing (DLS) techniques.

Materials and Methods: Sixty cadaver thoracic limbs were divided into four groups (n = 15); DLF, DPM, PP and DLS. For each technique, three operators injected contrast and methylene blue into the PIPJ in five limbs. The number of attempts required were recorded. Successful injection was confirmed by radiographic presence of contrast. Iatrogenic cartilage damage was assessed by gross visualisation. Statistical analysis was performed by the Wilcoxon signed-rank test (P < 0.05).

Results: The overall success rates were 86.6% - 93.3%. Although there was no difference in success rate, the frequency of needle repositioning was influenced by operator experience (P = 0.033) and injection technique (P = 0.009). DPM had the lowest mean ± SD value of attempts needed to insert the needle in the joint space (1.31 ± 0.85); DLS had the highest (2.62 ± 1.94). Injection technique influenced cartilage damage (P = 0.025), with the highest frequency recorded for DLS.

Discussion: All four techniques had a high success rate for successful injection of the PIPJ; DLS required the highest number of needle repositionings with greater iatrogenic cartilage damage. DLF and DLM have comparable success rates to the traditional techniques, with lower complications in cadaver limbs. DLF should be evaluated in clinical cases.

NEUROVASCULAR VARIATIONS IN THE PROXIMAL PLANTAR METATARSAL REGION OF THE HORSE

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Introduction: There is a paucity of information on neurovascular variation in the proximal plantar metatarsal region of the horse. This study describes the neurovascular relationships in this region.

Materials and Methods: Measurements in 16 paired cadaver limbs included the deep branch of the lateral plantar nerve (DBPLN), suspensory ligament (SL) length, DBPLN branches

on SL entry and distance to the SL fascia. DBPLN relationship to the deep plantar arch and accessory ligament of the deep digital flexor tendon (ALDDFT) was described. Data were recorded as mean (±SD) or median (plus range). A paired student's t-test was used to test left/right differences.

Results: DBPLN length was 6.0 ± 2.1cm with a median of 3 branches (range 2-6) entering the SL. Distance from the head of MtIV to the SL fascia proximal border was 2.5 ± 0.4 cm. There were no left/right differences (P > 0.05). The deep plantar arch coursed over the DBPLN in 8/16 whereas in 7/16 the DBPLN passed between the deep plantar arch. In 1/16 the DBPLN ran superficial to the deep plantar arch. In 13/16 the DBPLN was superficial to the ALDDFT. In one limb an additional branch from the LPN was noted. In another limb the ALDDFT obscured the proximal margin of the SL fascia and plantar arch. **Discussion/Conclusions:** Neurovascular variation was not uncommon between horses and between limbs of the same horse, particularly in relation of the DBPLN to the plantar arch and ALDDFT. These could be important considerations when undertaking surgical approaches to this region.

RETROPERITONEOSCOPY IN THE HORSE: ANATOMICAL STUDY OF THE RETROPERITONEAL SPACE AND DESCRIPTION OF A SURGICAL APPROACH

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Introduction: Surgical approaches to the kidneys and perirenal structures are uncommonly performed in horses and several complications have been described with current procedures. The aims of this prospective study were to describe the anatomy of the perirenal retroperitoneal space and to investigate a retroperitoneal, minimally invasive approach to access the kidney and perirenal structures in horses.

Materials and Methods: Twelve horses euthanized for other reasons than renal disease were included in this study. Three equine cadavers were dissected to describe the retroperitoneal anatomy and to develop the surgical approach. Nine cadaveric horses underwent either left side (n = 9) or right side (n = 4) retroperitoneoscopy. Anatomic landmarks, working space and access to the renal hilus and perirenal structures were evaluated.

Results: The retroperitoneoscopic portal was placed at the level of the dorsal aspect of the tuber coxae, 3cm caudal to the last rib for the left side and 2cm caudal to the last rib for the right side. Retroperitoneal access and working space establishment with CO₂ insufflation were successfully performed in all horses. The standing position allowed easier dissection than lateral recumbency. Division of the perirenal fat allowed access to the kidney and adrenal glands as well as identification of renal vessels and the ureter in the renal hilus.

Discussion/Conclusions: This prospective study describes the anatomy of the equine retroperitoneal space and provides a surgical approach for retroperitoneoscopy in horses.

EVALUATION OF RANGE OF MOTION OF ADJACENT CERVICAL VERTEBRAL SEGMENTS AFTER SURGICAL FUSION OF C3/4 IN THE HORSE USING 3D AND 4D COMPUTED TOMOGRAPHY

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Introduction: Surgical fusion of vertebral segments is a treatment option for horses with cervical stenotic myelopathy or cervical fracture. Degeneration of the adjacent vertebral segments (ASs) is a reported complication in other species, termed adjacent segment disease. This condition is thought to be a consequence of the fusion rather than undetected pathology at the AS. The aim of this study was to evaluate the biomechanical impact of cervical spinal fusion on ASs in the horse. Materials and Methods: Neck-specimens of twelve horses were assessed using a CT that allows 3D/4D visualization. Range of motion (ROM) was determined by measuring the maximum flexion, extension and lateral bending between C2-C5. C3/4 was subsequently fused using a standard LCP plate and locking screws and CT scans and ROM measurements were repeated.

Results: ROM measurements of C3/4 decreased significantly after fusion ($P=0.002$). ROM of the AS (C2/3/C4/5) did not change significantly after fusion. Prior to fusion a significant increase in ROM along the ASs from cranial to caudal was observed.

Discussion/Conclusion: Fusion of one cervical intervertebral joint did not affect the ROM of the ASs. Apart from an increase in ROM of ASs, adjacent degenerative disc disease is commonly diagnosed in human patients after vertebral fusion. Further research investigating the implications of vertebral fusion on the intervertebral pressure in the equine patient is indicated.

THE OCCURRENCE OF RADIOCARPAL JOINT PERFORATION DURING CARPAL SHEATH TENOSCOPY USING TWO DIFFERENT TENOSCOPIC APPROACHES

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Introduction: The carpal sheath (CS) lies in close proximity to the palmarolateral pouch of the radiocarpal joint (RCJ) at

the level of the radial physal remnant (PR), but communication between them has not been described. A proximolateral tenoscopic approach to the CS is commonly performed in this area. The study objective was to evaluate the occurrence of RCJ perforation using two different proximolateral CS approaches and to investigate whether a natural communication between the RCJ and CS could exist.

Materials and Methods: Proximolateral CS tenoscopy was performed on both carpi of 11 horses under general anaesthesia, centering the distal instrument portal at the level of the PR (Group 1) or 2 cm proximal to the PR (Group 2). These groups were randomly assigned. After tenoscopy, dye-coloured fluid was instilled arthroscopically into the dorsolateral RCJ and the open tenoscopic portals were evaluated for leakage. Twelve cadaver front limbs were examined for RCJ and CS communication using contrast CT. Statistical analysis was performed using McNemars test for two matched proportions.

Results: In group 1, 10/11 RCJ were perforated during tenoscopy and in group 2, 4/11 RCJ were perforated ($P=0.03$). No limbs had diffusion of contrast from the RCJ to the CS in the CT studies.

Discussion/Conclusions: This study indicates a high occurrence of RCJ perforation when using CS tenoscopy portals at the level of the PR. Our findings suggest that tenoscopic portals should be placed ≥ 2 cm proximal to the PR to avoid RCJ perforation. Natural communication between the RCJ and CS was not observed.

THE EFFECT OF XYLAZINE AND LIDOCAINE ON ISCHEMIA-REPERFUSION INJURY IN AN EXPERIMENTAL MODEL OF EQUINE JEJUNAL ISCHEMIA

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Introduction: Pharmacological preconditioning effects of dexmedetomidine on small intestinal ischemia/reperfusion (I/R) injury have been reported in different animal models including horses. The objective of this study was to assess if xylazine and lidocaine have a preconditioning effect in an established experimental model of equine jejunal ischemia.

Materials and Methods: Ten horses under general anaesthesia were either preconditioned with xylazine (group X; $n = 5$) or lidocaine (group L; $n = 5$). A historical untreated control group (group C) was used for comparison. An established experimental model of low-flow ischemia of the equine jejunum was applied, and intestinal samples were taken pre-ischemia, and after ischemia and reperfusion. Histomorphological examination was performed using a modified Chiu score. The degree of apoptosis was assessed by immunohistochemical

staining for cleaved-caspase-3 and terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL). For the statistical analysis non-parametric tests were performed using commercial software.

Results: In all groups, mucosal injury did not progress from ischemia to reperfusion and there were no significant histomorphological differences between the groups. After ischemia, group X had less caspase positive cells compared to the control group. All groups showed an increase in caspase positive cells during reperfusion. In group C and L, a significant increase in TUNEL positive cells during ischemia was noted, as was a decrease after reperfusion.

Discussion/Conclusions: The increase of apoptotic cells after reperfusion indicates significant reperfusion injury. The lower increase of caspase positive cells in group X after ischemia suggests a protective effect of xylazine on I/R injury.

SCIENTIFIC SESSION - ORAL - LARGE ANIMAL GENERAL

USE OF POSITIVE CONTRAST RADIOGRAPHY TO ASSESS FOR SYNOVIAL INFECTION IN HORSES WITH LIMB WOUNDS

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Introduction: Timely surgical treatment of infected joints is important. The diagnostic value of positive contrast radiography (PCR) in the work-up of suspected synovial infection (SI) in horses with limb wounds near synovial structures has yet to be systematically evaluated. The objective of this study was to determine the specificity, sensitivity and predictive values of PCR for identification of SI in horses with limb wounds.

Materials & Methods: Records of horses presented between 2010 and 2015 with limb wounds in close proximity to synovial structures were analysed. Synovial fluid cytology was the gold standard to categorise synovial structures as infected or non-infected. PCR results were compared between infected and non-infected groups. Sensitivity, specificity, positive and negative predictive values of PCR were calculated.

Results: Fifty horses with 66 synovial structures were investigated. PCR had a high specificity (86.4%), but only a moderate sensitivity (59.1%) for identification of SI. A low positive predictive value (68.4%) and a high negative predictive value (80.9%) were observed.

Discussion/Conclusions: PCR should be used for the investigation of potential SI in horses with limb wounds,

particularly if no synovial fluid for laboratory analysis can be obtained. However, it appears that PCR is best used in combination with other tests to ensure a correct and timely diagnosis is made. Sensitivity, specificity and predictive values differ between different synovial structures and cases. As sensitivity and specificity of PCR may be influenced by technique and characteristics of individual cases, different conclusions could be drawn from results in different populations.

RECURRENT NEPHROSPLenic ENTRAPPEMENT : COMPARISON OF SHORT-TERM AND LONG-TERM OUTCOME OF LAPAROSCOPIC NEPHROSPLenic SPACE CLOSURE WITH BARBED KNOTLESS SUTURE IN HORSES WITH (6) OR WITHOUT (6) NEPHROSPLenic ENTRAPPEMENT AT THE TIME OF SURGERY

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Introduction: Laparoscopic closure of the nephrosplenic space (NSC) with barbed knotless sutures have been proven to dramatically decrease surgery time. The aim of this study was to compare management of horses having a laparoscopic NSC with or without a displaced large colon. The colon would not be replaced manually or with laparoscopic instruments.

Materials and Methods: Standard preparation and portals for NSC were performed. If the colon was displaced in the NS space, abdominal insufflation moved the colon ventrally and resulted in NS space visualisation. The NS space was sutured using a simple continuous pattern of barbed V-LOC 0 Polybutester. Horses with NSE were assessed per rectum 2 weeks later to check positioning of the large colon.

Results: Five mares and 7 geldings with a median age of 11 years (4-15 years) met the inclusion criteria. At the time of surgery, 6 horses had NSE. Total surgery time and NSC were 49 (+/- 16) and 32 (+/- 7.5) minutes respectively. Two horses with NSE showed mild colic signs within the first 48h. All horses with NSE had normal positioning of the colon at 15 days post-operatively. At long-term follow-up, 11 horses had not had any episodes of colic and 1 horse had exhibited several mild colic episodes that were unrelated to NSE.

Discussion/Conclusions: NSE during NSC did not lead to adhesions between the colon and the NS space. The colon reverted to its normal position on its own without complications. None of the 12 horses had a subsequent episode of NSE. There is no need to convert laparoscopy into hand-assisted laparotomy if the large colon is entrapped at NSC.

IN-VITRO EVALUATION OF ADJUSTABLE PROSTHESIS WITH STRESS REDUCING WASHERS FOR ARYTENOID CARTILAGE ABDUCTION IN HORSES

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Introduction: Prosthetic laryngoplasty is the most commonly performed surgical procedure to stabilize the arytenoid cartilage (AC). To our knowledge no previous studies have been performed to assess the degree of abduction of the AC when applying stress reducing washers (SRW). We hypothesized that the SRW would achieve similar abduction of the AC for a given force when compared to the standard braided suture.

Materials and Methods: Three constructs [10mm diameter SRW with a 2.2 mm wide nylon cable tie; 6 mm diameter SRW with a 2.2 mm wide nylon cable tie; and #5 braided polyester) were mounted in a caudomedial to craniolateral orientation on the left AC in 15 grossly normal larynges. Forces of 0N, 5N, 10N, 15N, 20N and 25N were applied caudally. The left to right quotient angle ratio (LRQ) was measured for each force and statistically compared between constructs.

Results: No cartilage failure was seen for any construct at any applied force. No significant differences were found between the three tested constructs. There were no differences between the 2 SRW at any load throughout the study ($P > 0.05$).

Discussion/Conclusion: Use of STR in the AC should be further explored in in-vivo. The adjustable nature of the constructs with STR tested in the current study could facilitate re-tightening in case of post-operative loss of abduction. Limitations are associated with image analysis in two dimensions. Both STR showed similar properties to the suture prosthesis commonly used. Further in-vivo studies are warranted to assess the ease of mounting these constructs in live horses.

HIGH MULTI-DRUG RESISTANCE IN CATHETER-RELATED INFECTIONS, SURGICAL SITE INFECTIONS AND SKIN WOUNDS FROM HORSES

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Introduction: Multidrug resistance (MDR, resistance to ≥ 3 antimicrobial classes) can restrict treatment options for

clinical infections in horses. This study aimed to determine the bacterial isolates and their antimicrobial resistance patterns from catheter-related infections (CRIs), surgical site infections (SSIs) and skin wounds from surveillance studies in the UK.

Materials and Methods: SSIs from five contributing hospitals were sampled and processed according to standard laboratory methods (November 2016-October 2018). Additionally, data on bacterial cultures were collected from five large equine diagnostic laboratories (January-June 2018, total $n = 2420$) and submissions stating CRIs, SSIs and skin wounds were collected.

Results: CRIs accounted for 27 submissions (38 isolates); *Enterococcus* spp were present in 66.7%, *Enterobacteriaceae* spp in 25.9% and *Staphylococcus* spp in 22.2% samples. MDR was present in 31/38 isolates (81.2%) from CRIs. SSIs accounted for 109 submissions (210 isolates); *Enterobacteriaceae* spp were present in 78.9% (60.0% *E. coli*), *Staphylococcus* spp in 42.2% (40.0% *S. aureus*) and *Enterococcus* spp in 18.3% samples. MDR was present in 150/210 isolates (71.4%) from SSIs. There were 131 wound swab submissions (233 isolates); *Streptococcus* spp were present in 48.9%, *Enterobacteriaceae* spp in 47.3% (67.7% *E. coli*) and *Staphylococcus* spp in 37.4% samples (71.4% *S. aureus*). MDR was present in 111/233 isolates (47.6%) from wounds.

Discussion/Conclusion: This study demonstrated a high prevalence of MDR bacteria from clinical submissions especially from CRIs and SSIs. Knowledge of bacterial isolates in infections and their resistance patterns are important for hospital audit and promoting good antimicrobial stewardship.

EVALUATION OF THE SIGNIFICANCE OF ARTHROPATHY OF THE CERVICAL FACET JOINTS IN HORSES

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Introduction: The clinical significance of diagnosing “cervical facet arthropathy” (CFA) on radiographs in horses is undetermined and there is limited literature investigating the prevalence of this arthropathy in clinically normal horses.

Materials & Methods: Medical records of all horses that received cervical spine radiographs and were diagnosed with cervical facet arthropathy were reviewed. Horses were included in the study if ultrasound guided treatment of CFA was performed and clinical signs of CFA were present. Each horse from the treatment group was matched

by age, sex, breed, and sport performed with a healthy actively competing mature horse. Control horses were examined for lameness and neurological health and cervical radiographs were taken. Two board-certified radiologists, blinded to group, reviewed the cervical spine radiographs for each horse and measured intra- and inter-vertebral ratios. CFA was graded as previously described on a scale of 1 to 5.

Results: No significant difference was found between treated (n = 30) and control group (n = 30) for the degree of articular facet osteoarthritis present on radiographs or neck stiffness, or atrophy present on clinical examination. Right front lameness grade differed significantly between the control and treatment groups, with higher grades being more likely to be found in treated horses and in treated horses with smaller inter- and intra-vertebral ratios. Following intra-articular corticosteroid treatment, 62% of horses returned to their previous level of performance.

Discussion/Conclusions: Mild CFA is present in the cervical spine of both healthy horses and horses presented for clinical signs of CFA. Dressage horses are more affected than other breeds.

TOPICAL SKIN ADHESIVE AND KNOTLESS BARBED ABSORBABLE MATERIAL FOR VENTRAL EQUINE ABDOMINOPLASTY: A COMPARATIVE CLINICAL STUDY

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Introduction: We assessed whether combined use of knotless barbed absorbable suture material and a topical skin adhesive achieved a proper seal and avoided suture material removal after 14 days.

Materials and Methods: This was a prospective clinical study of 42 horses that were randomly assigned to two groups (G1 and G2). Standard subcutaneous laparotomy suture material and skin staples were used in the 22 horses in G1 and spiral knotless barbed suture material in combination with a skin mesh adhesive were used in 20 horses in G2.

Results: Average time for skin closure (expressed as centimeters per minute) was 1.8 for G1 and 1.1 for G2. At Day 3, G1 horses showed partial wound dehiscence in 2 individuals and 1 horse had major edema; in G2, partial wound dehiscence was observed in 2 horses. At Day 10, 5 horses in G1 developed partial wound dehiscence, 1 developed total dehiscence and 1 exhibited oedema. In G2 horses, 4 developed partial wound dehiscence.

All cases of partial wound dehiscence healed uneventfully by second intention.

Discussion and Conclusion: Closure time was increased in G2, but it did not affect the total surgery time or the anesthesia risk. Knotless barbed suture and skin mesh adhesive resulted in a proper skin seal in horses. This technique is an innovative alternative in foals and in adult horses to reduce discomfort and potential physical injury to veterinarians when it is time to remove skin material from a ventral abdominoplasty.

USEFULNESS OF A SHORT MAGNETIC RESONANCE IMAGING PROTOCOL AS A SURGICAL PLANNING TOOL FOR DENTAL AND SINONASAL DISEASES IN THE HORSE

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Introduction: The introduction of standing computed tomography (CT) is progressively replacing diagnostic procedures performed under general anaesthesia. However, the availability of this equipment is limited and there are clinics where only magnetic resonance imaging is available. Although magnetic resonance is less sensitive for evaluating the skull and dental structures, it has an important role in the diagnosis of sinonasal diseases. The objective was to compare the diagnostic information obtained from complete vs. short magnetic resonance protocols of different head diseases in terms of surgical planning.

Materials & Methods: This was a retrospective study. Inclusion criteria included horses with dental and sinus diseases that underwent magnetic resonance examination. Fifteen horses met the criteria; 5 horses underwent a short magnetic resonance protocol and 10 underwent a long magnetic resonance imaging protocol.

Results: The results demonstrated the feasibility of performing a short magnetic resonance imaging protocol and a subsequent surgical procedure under the same anaesthetic. The information obtained from the images was sufficient to identify the cause of the clinical signs, determine paranasal sinus involvement and extension of any disease. The T1W gradient-recalled echo sequence with thin slice thickness and 50% slice overlap in the short protocol allowed multiplanar reconstruction of the maxillary and mandibular arcades to be performed, improving the evaluation of dental structures.

Discussion/Conclusions: Use of a short magnetic resonance protocol is useful as a surgical planning tool for dental and sinonasal diseases in horses when CT is not available. It also allows subsequent surgery to be performed under the same anaesthetic without significantly increasing anaesthesia time.

INCISIONAL COMPLICATIONS IN POST-CELIOTOMY EQUINE PATIENTS: CAN ULTRASONOGRAPHY AID EARLY DIAGNOSIS?

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Introduction: Surgical site infection (SSI) is an important cause of postoperative morbidity after colic surgery. No studies on early diagnosis of SSI have been reported. This study aimed to investigate ultrasonography as tool for early detection of SSI.

Materials & Methods: Data were obtained from horses that had undergone exploratory laparotomy over 5-year period (2013-2017). SSI was defined as at least two parameters from fever, pain on palpation, drainage or positive bacterial culture. Horses were divided into no SSI (group I) and SSI present (group NI). Ultrasonographic examination was performed at 5- and 10-days post-operatively. The ultrasonographic parameters evaluated (presence/absence) were: oedema (E), focal pocket fluid collection (PFC), heterogeneous fluid collection (HC), fistulae (F) and hyperechoic spots (S). Descriptive statistics were generated. Univariable followed by multivariable logistic regression was performed for models at 5 and 10 days post-operatively. Accuracy, sensitivity, specificity, positive and negative predictive values were calculated.

Results: Seventy-eight horses were included, 59 in Group I and 19 in Group NI. Statistical analysis revealed that HC at 5d and F and S at 10d were significant variables. Correlation was found between 5d and 10d parameters at 5d (E-HC; PFC-PFC; HC-HC; HC-S; S-S) and at 10d (PFC-HC; F-HC; S-HC; F-S). Highest accuracy, sensitivity, specificity and positive predictive values for SSI were HC at 5d and S at 10d.

Discussion/Conclusions: HC at 5-day was associated with increased likelihood of SSI. S and F at 10d are reliable predictive features. These data demonstrate that ultrasonography is a useful tool to predict diagnosis of SSI and informs development of preventive or control strategies.

EVALUATION OF TWO SURGICAL HAND DISINFECTION PROCEDURES IN A UNIVERSITY EQUINE HOSPITAL

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Introduction: Glove perforation occurs in $\geq 65\%$ of surgical interventions in large animal surgery. Hence, surgical hand disinfection represents one crucial aspect to prevent surgical

site infections (SSI). We therefore evaluated the effectiveness of the routine hand antiseptics technique in reducing bacterial hand flora compared to a standardized protocol (SP).

Materials and Methods: Three surgeons and 45 assistants participated in a total of 53 surgical interventions. First, routine hand antiseptics was evaluated. For the SP, hands were washed for 1 minute and disinfected over 3 minutes. Forty-three participants used an alcohol-based hand rub (AHR) while five used povidone iodine (PVP). Total bacterial counts were determined before and after washing, after disinfection and after surgery. Additionally, samples were screened for bacteria known to cause SSI. Moreover, gloves were tested for perforations.

Results: Before washing, bacterial counts generally ranged between 10^2 and 10^5 colony-forming units (CFU)/ml. Routine hand antiseptics revealed a maximum count of 10^3 CFU/ml after disinfection. The SP revealed counts of 10^2 CFU/ml (AHR) and 10^3 CFU/ml (PVP), respectively. Overall, the highest \log_{10} -reduction (LR = 3.32) in bacteria was achieved with the SP using AHR. Nine participants harbored MRSA which were efficiently reduced by the SP-disinfection but were occasionally isolated at the end of surgery. *Citrobacter koseri* was isolated consistently from one participant at each step of testing. Glove perforation was detected in 81.6% (surgeons) and 23% (assistants) of gloves, respectively.

Discussion/Conclusions: Standardized hand disinfection procedures using AHR are highly efficient in eliminating bacteria including MRSA thereby reducing the risk of SSI.

A MINIMALLY INVASIVE TECHNIQUE TO RESOLVE IMPACTIONS OF THE SMALL COLON

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Introduction: Simple obstructions of the small colon (SC) represent the most common condition affecting this portion of horses' hindgut. Exteriorization of the SC through a standard laparotomy incision is limited and at best enterotomies must be performed within the surgical field. Enterotomies and enemas have been described to resolve SC impactions, although similar to the technique described here, there is a lack of clear description in the equine literature.

Materials & Methods: This study included eight horses that underwent laparotomy to treat small colon impactions (SCI) that had not resolved with medical treatment. Reasons for exploratory laparotomy included uncontrollable pain, as well as moderate to severe abdominal distension. Concurrent secondary findings were seen in 3 horses. After the impacted region was exteriorized, additional small colon was exteriorized and a sterile spinal needle was attached to a long extension fluid line. The needle was inserted through the antimesenteric

taenia into the lumen aboral to the impaction. A non-sterile assistant injected sterile saline, while the surgeon carefully performed extraluminal massage. Once the impaction had been softened, the content was pushed to the rectal ampulla or was massaged through the small colon.

Results: All horses survived following hospital discharge. Only 2 had colic signs, following recurrent SCI, but resolved with medical treatment. Six horses developed a transient fever.

Discussion/Conclusion: The reported technique allows efficient and rapid resolution of SCI. It also avoids the complications of enterotomies and rectal trauma that may occur during enemas. SCI can be resolved at exploratory laparotomy using a minimally invasive technique.

PRELIMINARY ASSESSMENT OF RISK FACTORS FOR POST ANAESTHETIC PULMONARY OEDEMA IN ADULT HORSES

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Introduction: Post anesthetic pulmonary edema (PAPE) is a poorly reported life-threatening pathological condition in horses. One of many potential causes for PAPE is upper airway obstruction. Our goal was to determine risk factors and short-term outcome for PAPE in horses.

Materials & Methods: Medical records of clinical cases of PAPE and controls over a period of 4.6 years were reviewed. Analysis was performed using the IBM Statistics SPSS.

Results: Seventeen cases and 54 controls were recorded. The prevalence of ascarid impactions in PAPE cases was significantly higher than in controls ($P = 0.026$). Gastric reflux on admission and bleeding during anesthesia were significantly more prevalent in the PAPE cases ($P = 0.015$ and $P = 0.042$, respectively). Total solids and sodium levels before anesthesia were significantly lower within PAPE cases ($P = 0.022$ and $P = 0.025$, respectively). Treatment with intravenous crystalloids before admission was significantly higher in PAPE cases also ($P = 0.006$). Horses treated with colloids, including fresh frozen plasma (FFP) and hydroxyethyl starch, were more likely to suffer from pulmonary edema ($P = 0.001$ and $P = 0.032$, respectively). Gastric reflux on admission (OR = 4.8), FFP treatment during anesthesia (OR = 5.26) and crystalloid treatment before admission (OR = 5.26) were predictive factors for PAPE. There was no significant difference in outcome between cases and controls.

Discussion/Conclusions: Gastric reflux is a strong predictive factor for PAPE and should be taken into consideration during anesthesia. Plasma may cause transfusion-related acute lung injury, as reported in humans. *Parascaris equorum* may be associated with PAPE due to presence of pneumonia. The small number of cases reported limits data interpretation.

Clinicians should consider factors, associated with PAPE, in order to prevent this syndrome.

MONITORING OF ROUTINE HYGIENE MANAGEMENT IN AN EQUINE HOSPITAL

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Introduction: Patients are often already colonized by multi-drug resistant bacteria at hospital admission. Proper hygiene management is needed to eradicate these agents from clinical settings and to prevent nosocomial outbreaks. To get an overview regarding the routine hygiene management and to elucidate potential infection sources, the Department for Horses at our faculty was surveyed over a period of one year.

Materials and Methods: Routine hygiene management was recorded using a questionnaire. Bacterial investigations were carried out at selected parts of the hospital and included air sampling. Total bacterial counts were determined and samples were screened for Enterobacteria, ESBL-producing bacteria, *Acinetobacter baumannii* (AB), MRSA, *Rhodococcus equi* (RE), *Streptococcus equi* ssp. *equi* (SEE), and *Streptococcus zooepidemicus* (SEZ).

Results: Regarding hygiene management, some standard operating procedures were existent but a hygiene plan was not implemented. Minor weaknesses in cleaning and disinfection were detected. Bacterial counts were lowest in the operating room and were highest in the stables. Most samples revealed coliform bacteria and *E. coli*. MRSA and ESBL-bacteria were isolated sporadically and SEZ only once. AB, SEE, and RE were not detected in any samples.

Discussion/Conclusions: A hygiene plan is required where animals are medically examined, treated or hospitalised as it ensures a targeted hygiene management with clear responsibilities. In our study, a hygiene plan was not existent but basic hygiene requirements were met. Nevertheless, minor weaknesses in cleaning and disinfection and detection of MRSA on twitches highlighted the necessity for well-defined hygiene measures. Finally, a hygiene concept was implemented.

BIDIRECTIONAL KNOTLESS BARBED VERSUS CONVENTIONAL SMOOTH SUTURE FOR CLOSURE OF SURGICAL WOUNDS IN INGUINAL CASTRATION IN HORSES

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Introduction: When castrations are performed under general anesthesia, wounds are commonly sutured for primary

healing. In recent years knotless barbed suture (KBS) materials have been introduced. Manufacturer's claims state that KBS enhances speed and security of wound closure. We thus hypothesized that closure of surgical wounds after castration would be faster with KBS than with smooth suture (SS) and that the incidence of adverse effects would be similar in wounds sutured with KBS and SS.

Materials and Methods: Thirty normal or inguinal cryptorchid stallions were included in the study. All stallions were castrated by the inguinal procedure using the closed technique; 6 surgeons performed the surgeries. All wounds were closed in two layers using either a KBS (Quill) or a SS (Monocryl). Suturing time was recorded as duration in seconds divided by wound length in centimeters. Short-term complications were assessed by clinical examination during hospitalization and long-term complications were assessed based on owner interviews obtained 1.5-11 months after discharge.

Results: Wound closure was achieved significantly faster with KBS than with SS ($P=0.0068$); all surgeons closed wounds faster with KBS than SS. No dehiscence occurred in any of the horses sutured with KBS. There was no difference in complication rates between the KBS and SS.

Discussion/Conclusion: Wound closure was faster with KBS than with SS in equine bilateral inguinal castration. Use of the KBS suture did not result in increased occurrence of postoperative complications. Generally, suture costs are higher for barbed sutures compared with conventional sutures, which may limit its use.

ARTHRODESIS OF THE EQUINE PROXIMAL INTERPHALANGEAL JOINT: A BIOMECHANICAL COMPARISON OF TWO DIFFERENT SYSTEMS CONTAINING AN AXIAL LOCKING COMPRESSION PLATE AND TWO ABAXIAL TRANSARTICULAR CORTICAL SCREWS

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Introduction: The aim of this study was to compare the mechanical stability and surgical usability of two locking plate systems (Kyon ALPS-20 and Synthes LCP system) for equine PIJ arthrodesis.

Materials and Methods: This was an experimental ex-vivo study using six pairs of distal limbs from adult Warmblood horses ($n = 12$). Of the 12 limbs collected, 3 left and 3 right distal limb specimens were randomly assigned to each system for implantation. Two abaxial 4.5-mm cortical screws

were inserted transarticularly in all cases. Both systems were implanted according to the manufacturer's instructions. The LCP systems were implanted axially using two 5-mm locking screws in the proximal and distal positions, with a standard 4.5-mm cortical screw inserted in the middle position. The ALPS-20 systems were implanted using Kyon B-6.4-mm monocortical locking screws in all positions. Uniaxial mechanical loading was applied via a servohydraulic test system at a test speed of 50 mm/s, up to a maximum displacement of 80 mm. The resulting load-displacement curves were used to calculate yield point, stiffness, and maximum force for each construct.

Results: Mechanical properties were not significantly different ($P < 0.05$) between the two systems across all parameters measured. The ALPS-20 implants did not deform, whereas LCPs showed deformation in the long axis. Complete failure of the LCP was seen in two cases.

Discussion/Conclusions: The ALPS-20 demonstrates comparable mechanical properties to the LCP system in the present study's ex-vivo test model for equine PIJ arthrodesis. The Kyon ALPS-20 may be a good alternative to the Synthes LCP for equine proximal interphalangeal joint arthrodesis.

SCIENTIFIC SESSION - ORAL - LARGE ANIMAL ORTHOPAEDICS

COMPUTED TOMOGRAPHIC ASSESSMENT OF 110 FRACTURES OF THE DISTAL CONDYLES OF THE THIRD METACARPAL/METATARSAL BONES (CONDYLAR FRACTURES) IN A CLINICAL SETTING IN 103 THOROUGHBRED RACEHORSES

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Introduction: The attributes of computed tomography (CT), and practicality of new light-weight portable scanners, offer potential advantages for pre-operative evaluation of condylar fractures. To date there have been no studies on the contribution of CT in the evaluation of parasagittal fractures to the distal condyles of the third metacarpal/metatarsal bones. The aim of this study was to descriptively evaluate CT imaging of condylar fractures in a clinical setting.

Materials and Methods: A retrospective review of clinical cases was performed. CT images of all horses diagnosed radiographically (CR) with a condylar fracture, admitted to Newmarket Equine Hospital between January 2014 and October 2017 were reviewed.

Results: A total of 110 fractures were evaluated during the study period. CT provided detailed information on fracture configuration. Articular comminution was identified more frequently on CT (41%) compared with CR (11%). CT allowed fracture propagation to be appreciated more proximally compared with CR and this was found to be clinically significant in 21 cases where surgical planning required adjustment of screw placement

Discussion/Conclusions: CT enables a detailed assessment of fracture configuration in TB racehorses with condylar fractures. Features identified on CT images may not be apparent radiographically. Pre-operative CT evaluation, using a portable scanner, offers potential advantages to case management in a clinical setting.

TEARING OF THE PALMAR ASPECT OF THE INTERSESAMOIDEAN LIGAMENT AS PRIMARY PATHOLOGY OF THE DIGITAL TENDON SHEATH: AN ENDOSCOPIC DIAGNOSIS IN TWO HORSES

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Introduction: Imaging techniques frequently fail to diagnose digital tendon sheath (DTS) pathology, thus diagnostic endoscopy is often employed. Ultrasonographic detection of proximal scutum pathology has been reported, but there are no published reports of endoscopic abnormalities. The aim of this case report is to describe palmar intersesamoidean ligament (IL) pathology, to raise awareness of this as a differential diagnosis.

Materials and Methods: Retrospective case report of 2 cases.

Results: Case 1: 11yo Thoroughbred (TB) eventer gelding with RF lameness localised to the foot and DTS, which failed to respond to medical management. Ultrasound and standing MRI showed only mild PAL thickening. DTS endoscopic examination revealed horizontal tearing of palmar aspect of the IL, distal to distal margin of manica flexoria. This was debrided using synovial resectors. No other pathology was evident. The PAL was transected. After 8 months field rest the horse resumed work and has competed successfully for two seasons with no lameness.

Case 2: 13yo TBX eventer gelding with RF lameness localised to the foot and DTS, which failed to respond to medical management. Ultrasound showed mild PAL desmitis. There were negative findings on a positive contrast DTS study. Endoscopic examination, findings and treatment were as in Case 1. The horse is in the early stages of rehabilitation.

Discussion: The two cases are remarkably similar with concurrent foot pathology and mild PAL findings. Foot problems are common, so may be a coincidence. There is possibly an association between PAL and IL pathology.

The long term soundness of Case 1 is prognostically encouraging for this condition.

A SIMPLIFIED ARTHROSCOPIC APPROACH TO THE CAUDAL POUCHES OF THE EQUINE LATERAL FEMOROTIBIAL JOINT

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Introduction: Arthroscopic examination of the caudal lateral femorotibial joint is technically difficult. Complete examination requires an approach through the popliteal tendon; the peroneal nerve is potentially damaged. The aim of this study is to report a simpler approach.

Materials and Methods: From the cranial lateral femorotibial joint an arthroscope was advanced underneath the long digital extensor tendon exposing the popliteus tendon. Using needle guidance, a portal was established in the popliteal canal. The arthroscope followed the distal margin of the popliteus into the caudal distal pocket. A septum from the lateral meniscus to the popliteus was elevated with a probe, allowing entry to the proximal pocket.

This technique was developed during surgery. The technique was used on cadaver limbs, including a freshly euthanased horse, and the arthroscopic margins were marked using a radiofrequency probe.

Results: The technique was used on five clinical cases. Visualisation of the lateral meniscus was achieved; no abnormalities were identified in 4 cases and a tear was identified and resected in one. The approach was used on eight cadavers. Successful entry to the caudal pouch was achieved, confirmed by radiofrequency marks in one horse.

Discussion/Conclusions: We describe a simple and less traumatic approach to the caudal pouch of the lateral femorotibial joint. There is limited overlying tissue, and no neurovascular structures of concern. A portal is established under arthroscopic guidance, which is more controlled than a conventional "blind" approach.

FIBROMODULIN NEO-EPITOPE ASSAY IS A SENSITIVE INDICATOR OF JOINT DISEASE IN HORSES

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Introduction: The aims of this study were to quantify the concentration of fibromodulin neo-epitopes in the synovial fluid from horses with different joint diseases commonly

seen and to evaluate if changes in this biomarker are capable of distinguishing pathological joints from normal for a variety of specific diseases, and to assess their relationship to the inflammatory cytokines, TNF α and IL-1RA.

Materials and Methods: The study population consisted of joint fluid from 50 client-owned horses placed into 6 groups – control uninjured joints, joints with intraarticular fractures, joints with infection, osteoarthritic joints, joints with osteochondrosis (OCD) prior to surgical removal of intraarticular fragments and from OCD joints after surgical treatment. The fibromodulin neo-epitope (NeoFM) assay was a competitive inhibition assay using an established assay developed to detect the new C-terminus after MMP-13 cleavage. The concentrations of TNF α and IL-1RA were determined using commercially available ELISA kits.

Results: The concentration of NeoFM in synovial fluid harvested from joints with fracture, infection, and osteoarthritic joints was significantly higher than the concentration of NeoFM in synovial fluid harvested from controls, with p-values of 0.01, 0.03 and 0.02, respectively. NeoFM was correlated to the concentration of IL-1RA with correlation coefficient of 66% (P < 0.0001). No significant correlation was observed between TNF α and NeoFM (P = 0.20).

Conclusions: Our results showed that the concentrations of NeoFM increase substantially in diseased joints. Based on this study, NeoFM appears to be a sensitive marker and may, therefore be useful in identifying early onset of arthritis.

COMPARISON OF TWO DIFFERENT TECHNIQUES FOR ANALGESIA OF THE DEEP BRANCH OF THE LATERAL PLANTAR NERVE IN HORSES

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Introduction: Accurate diagnosis of hind limb proximal suspensory desmopathy (PSD) can be challenging and desensitisation of the deep branch of the lateral plantar nerve (DBLPN) is a key aspect of the orthopaedic evaluation. This procedure is usually performed with the leg flexed. However, in selected cases the use of a weight-bearing technique may be preferred. The aim of the study was to compare the diffusion pattern of the above-mentioned techniques in vivo.

Materials and Methods: Eight mature horses were enrolled. The study was approved by the Ethical Committee of University of Turin. Perineural injection of the DBLPN was performed by injecting 3ml of radiopaque contrast medium (CM; iohexol) using a standing or nonweight-bearing technique. Radiographic evaluation was performed after 5, 15 and 30 minutes. The diffusion of CM was evaluated independently

by 2 blind readers including the extension of the main CM bulk and the maximum diffusion in both proximal and distal directions. The data were assessed using 2-way independent measures ANOVA (P < 0.05).

Results: One injection (weight-bearing technique) was inadvertently performed inside the tarsal sheath. Diffusion between the two techniques was similar except at 30 minutes (T30) when the weight-bearing technique resulted in significantly more cumulative proximal diffusion of CM (P = 0.02).

Discussion/Conclusion: The nonweight-bearing technique resulted in significantly less proximal diffusion of CM after 30 minutes.

A COMPARATIVE STUDY OF THE ULTRASONOGRAPHIC EXAMINATION, MAGNETIC RESONANCE IMAGING AND HISTOLOGY OF THE EQUINE MENISCUS - PRELIMINARY FINDINGS

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Introduction: Magnetic resonance imaging (MRI) is the gold standard for diagnosing meniscal disease in people, but its availability for horses is limited. Alternatively, ultrasonographic (US) examination is useful for diagnosing equine meniscal disease but interpretation of some images remains challenging. The objective of this investigation was to compare the US appearance of equine menisci with MRI and histology.

Material and Methods: Menisci (n = 26) were harvested from donated horses (n = 13) and were frozen for later analysis. After thawing, the menisci were scored for macroscopic lesions in the cranial and caudal horns and body regions of interest (ROIs, n = 78). FSE Dual T2 PD, SPGR 3D (1.5T) MRI and US images of site-matched ROIs were acquired. Sections of 5 micrometers were then cut from each ROI and were stained with hematoxylin-eosin-phloxin-saffron (HEPS) for morphology and picosirius red to reveal the collagen network. The images were then compared.

Results: A full-thickness tear of the meniscal body was successfully identified with MRI and US but disease of the inner meniscal border was difficult to visualize. Imaging tears in the cranial and caudal horns was also a challenge with both modalities. Radial tie-fibers observed on US and MRI corresponded to collagen bundles histologically, consistent with the so-called "artefactual" linear striations.

Discussion/Conclusions: This is the first study comparing US, MRI and histology for the assessment of equine meniscal structure and tears. Caution is warranted when interpreting horizontal tears from the meniscal outer border, on both MRI and US, as normal radial tie-fibers can create a similar image.

18F-SODIUM FLUORIDE POSITRON EMISSION TOMOGRAPHY FINDINGS OF THE EQUINE TARSAL AND PROXIMAL METATARSAL REGIONS

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Introduction: The tarsal and proximal metatarsal regions are commonly associated with hind limb lameness. Imaging findings often poorly correlate with the clinical presentation. Positron emission tomography (PET), as a functional imaging method, has the potential to improve clinical correlation. **Materials and Methods:** All lameness cases that underwent 18F-NaF PET of the tarsal and/or proximal metatarsal area between August 2016 and November 2017 were included in the study. All available imaging was reviewed and clinical information was retrieved from the medical records.

Results: A total of 16 tarsi and proximal metatarsi from 9 horses were included in the study. Clinically relevant changes seen on PET scan included osteoarthritis of the distal tarsal joints (n = 7), active bone remodeling at the origin of the suspensory ligament (n = 4), subchondral bone cystic lesion of the third tarsal bone (n = 2), subchondral bone remodeling at the medial cochlea of the distal tibia (n = 2) and osteoarthritis of the talo-calcaneal joint (n = 1). Scintigraphy failed to detect the abnormal uptake identified with 18F-NaF PET scan at the proximal metatarsal region. For the two cases with abnormal uptake at the medial cochlea of the distal tibia, scintigraphy showed a diffuse, ill-defined pattern of uptake at the distal and medial region of the tibia.

Discussion/Conclusions: PET helped to further characterize lesions identified on scintigraphy and determined the level of activity of abnormalities detected on radiographs or computed tomography (CT). The functional information provided by PET was useful to better understand the source of the lameness and choose the optimal therapy.

BILATERAL CHANGE IN PRESSURE DISTRIBUTION IN HORSES WITH UNILATERAL FORELIMB LAMENESS BEFORE AND AFTER POSITIVE DIAGNOSTIC ANAESTHESIA - A CASE STUDY

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Introduction: Lameness examination is subject to individual and thereby subjective assessment. In recent years, several computerized systems have been introduced to objectify the degree of lameness and to characterize gait patterns during

lameness examinations. The aim of this study was to objectify the effect of diagnostic anaesthesia on pressure distribution of front hooves on the ground in horses with unilateral forelimb lameness by using the HoofScan®-System in the lame and the contralateral sound limb. Furthermore subjective visual evaluation of the lameness was compared to the objective results of the HoofScan-System®.

Material and Methods: Pressure distribution was measured with the HoofScan®-System in both forelimbs during locomotion before and after positive diagnostic anaesthesia of the lame forelimb.

Results: The results are demonstrated by 4 representative orthopaedic patients showing a supporting limb lameness grade 2/5. Diagnostic anaesthesia was fully positive in two cases and was positive with rest in one case. These horses showed a significant increase of load on the lame limb during breakover (88%), whereas the load during mid-stance and landing increased by only 19% and 5%. In the fourth case diagnostic anaesthesia was positive with subsequent lameness on the contralateral limb. The load on the anesthetized limb remained nearly the same. The contralateral limb showed a distinct load reduction after diagnostic anaesthesia of the lame limb, with breakover being affected most (39%). **Conclusion:** The HoofScan®-System can be used successfully to objectify lameness examinations. Preliminary results suggest that the greatest increase of load after diagnostic anaesthesia is seen during breakover.

THE USE OF AN AIMING DEVICE AND COMPUTED TOMOGRAPHY FOR TREATMENT OF ARTICULAR PEDAL BONE FRACTURES IN HORSES

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Introduction: Fractures of the distal phalanx are a common cause of lameness. The objective of the present study was to describe the use of a commercially available aiming device (AD) for CT-guided internal fixation of articular pedal bone fractures, and to report the outcome in 14 horses.

Materials and Methods: Horses with an articular pedal bone fracture referred for CT-guided internal fixation were included in the study. All horses were positioned in lateral recumbency and were operated on under general anaesthesia. For pre-operative planning and intra-operative guidance by means of CT, an AD was used.

Results: Fourteen horses met the inclusion criteria. The majority of pedal bone fractures were type III (9/14), 4 were type II and one was type V. Thirteen fractures were treated with a single 4.5 mm cortex screw, whereas in one horse two 4.5 mm cortex screws were used. Reduction of the

fracture gap was evident in all horses. Outcome was excellent in 11, good in 4 and poor in 1 horse. Recovery time ranged from 90 to 270 days (median, 138.2 days). Complications occurred in 5 horses: 2 horses showed acute and one delayed infection. Three horses showed persistent lameness. Overall, 6/14 developed OA in the distal inter-phalangeal joint (DIPJ).

Discussion/Conclusions: The use of an AD in combination with CT allowed precise fixation of all pedal bone fractures and led to compression of the fracture gap in all cases, leading to a favourable outcome in 13/14 horses. Implant infection and lameness were the most common complications following surgical treatment.

NEUTROPHIL GELATINASE-ASSOCIATED LIPOCALIN (NGAL) FOR DETECTION OF SEPTIC AND ASEPTIC JOINT INFLAMMATION

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Introduction: A few previous studies (n = 4) in man have investigated neutrophil gelatinase-associated lipocalin (NGAL) in joint disease and suggested it to be a useful marker of joint inflammation/infection.

Material and Methods: Blood and synovial fluid (SF) samples were available from horses with experimentally induced joint inflammation (intraarticular injection of lipopolysaccharide (LPS) [n = 7], lidocaine [n = 6] or mepivacaine [n = 6]) and horses with (n = 10) and without (n = 10) spontaneous septic arthritis. Concentrations of NGAL were assessed in a commercially available ELISA. The experimental protocol was preapproved by the ethical committee of the Large Animal Teaching Hospital of University of Copenhagen and by the Danish Animal Experiments Inspectorate.

Results: Experimental induction of moderate (intraarticular lidocaine) and severe (intraarticular LPS) joint inflammation caused significant increases in SF concentrations of NGAL. Severe inflammation also caused significant changes in serum concentrations of NGAL. Concentrations of NGAL were higher in SF than in the corresponding serum samples, and they reflected intensity of inflammation. In horses with septic arthritis, SF concentrations of NGAL were significantly higher than those found in SF obtained from horses without septic arthritis.

Discussion/Conclusions: A NGAL response is elicited in the inflamed joint compartment in horses. As this response is of great magnitude, and concentrations of NGAL in healthy SF are low, NGAL may prove to be a highly sensitive biomarker of joint inflammation in horses. The ELISA test format is not useful for routine analyses, and a horse-side test must be developed.

TIBIAL FRACTURE REPAIR USING AN ANGLE-STABLE INTERLOCKING NAIL IN TWO CALVES

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Introduction: Tibial fractures are common in all age groups of cattle. However, with high complication rates following traditional fixation, neonatal bovine fractures often carry a guarded prognosis. While interlocking nail (ILN) fixation has been successful in small animals, to our knowledge, clinical use of an angle-stable ILN (AS-ILN) in production animals has not yet been reported.

Materials and Methods: A 50kg Holstein calf with a proximal juxtametaphyseal comminuted tibial fracture with a tibial tuberosity slab fracture underwent surgical treatment using an 8mm – 160mm AS-ILN and two cortical lag screws. In an 89kg Beefalo calf, a long oblique mid-diaphyseal tibial fracture with proximal and distal fissures, was repaired using an 8mm – 185mm AS-ILN and 5 double loop cerclage wires.

Results: In both cases, clinical union without complications was recorded at 4 weeks post-operatively. Both calves had continued axial growth with no evidence of angular limb deformity at 7 and 6-month follow-up, respectively.

Discussion/Conclusions: Unique biomechanical features of each fracture rendered treatment using traditional osteosynthesis methods such as external coaptation or plate fixation challenging, if at all

possible. Hence, treatment using an AS-ILN was selected. Although the proximal tibial physis was violated in both calves, comprehensive surgical planning and careful modification of a surgical technique commonly used in small animals allowed for normal axial growth without complications or continued lameness. Our results suggest that interlocking nailing with an AS-ILN provides an effective and safe osteosynthesis option in young calves with tibial fractures.

OSTEOCHONDRAL FRAGMENTATION OF THE CERVICAL ARTICULAR PROCESS JOINTS IN A POPULATION OF HORSES WITH CERVICAL PAIN AND/OR ATAXIA

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Introduction: There is limited information on the prevalence of osteochondral fragmentation (OF) of the cervical articular process joints (CAPJ) in horses with cervical pain and/or ataxia.

Materials and Methods: Horses undergoing computed tomography (CT) scanning of the cervical region at the Liphook

Equine Hospital from April 2016-October 2018 were assessed for the presence of OF. Fragments that were not associated with the CAPJ or that were secondary to fracture of the CAPJ were excluded.

Results: A total of 31 horses met the inclusion criteria, of which OF was detected in 32% (n = 10). Horses underwent CT scanning to investigate ataxia (n = 15), cervical pain (n = 12) or both pain and ataxia (n = 4). Mean fragment size was 1.76cm³ (range 0.08-5.4cm³). In the 10 horses in which OF was detected, 7 had a single fragment, 2 had two fragments and 1 had four fragments. In 8/10 cases a single joint was affected; the other 2 horses had fragments in two joints. Complete radiographic examination of the cervical spine was available for review in 9/10 horses with OF, and the fragments were correctly identified in only 2 horses. In 5/10 horses OF was considered to be the primary lesion; in the remaining 5 cases there was additional pathology which was considered of equal or greater clinical significance. Fragment removal under general anaesthesia was successfully performed in 2 horses.

Discussion/Conclusions: Osteochondral fragmentation of the CAPJ was a frequent finding in this case series. Further investigation is required to determine the aetiology of these fragments and explore appropriate treatment options.

INTER-EVALUATOR AND INTRA-EVALUATOR RELIABILITY OF KINEMATIC VARIABLES OBTAINED BY AN EXTREMITY-MOUNTED INERTIAL MEASUREMENT UNIT SYSTEM IN SOUND HORSES AT THE TROT UNDER SOFT AND HARD GROUND CONDITIONS AND TREADMILL EXERCISE

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Introduction: Electronic lameness detection systems try to overcome the subjectivity of visual gait analysis objectively capturing gait events that the human eye is unable to do. The objective of this study was to assess the inter-evaluator and intra-evaluator reliability of kinematic variables measures by an extremity-mounted inertial measurement unit.

Material and Methods: Thirty adult, sound and healthy stallions were used in this study which was approved by the Institutional animal care committee. Data collection was performed with six IMUs strapped to the 4 extremities of every horse. Per surface (treadmill, soft and hard ground) 10 stallions were trotted 3 times. The analysis was done by six evaluators (3 experienced, 3 inexperienced) using proprietary software and the data were blinded and copied 3 times. To

assess the intra- and inter-evaluator reliability, a selection of gait variables were used to calculate intra and inter correlation coefficients (ICCs) as well as variance partitioning coefficients (VPCs).

Results: All of the tested gait variables showed high levels of reliability. There was no mentionable difference considering the correlation coefficients between the intra and inter reliability as well as between the three different surfaces. The experience of the evaluator had no influence on the results.

Discussion/Conclusions: The extremity-mounted inertial measurement unit system tested in this study has a high inter- and intra-evaluator reliability under the chosen conditions for the selected variables and acts independently of the ground situation and the experience of the evaluator. It can become a clinically relevant and reliable gait analysis tool.

SUBJECTIVE SCORING OF EQUINE BACK MOBILITY: INTER-RATER RELIABILITY

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Introduction: In the classic lameness examination, gait quality is assessed by subjective scoring, which is known to have poor inter-observer agreement. This is one of the reasons why the use of objective, quantitative gait analysis techniques is rapidly gaining momentum. Little is known about inter-rater agreement of evaluation of back motion, for which no clinically applicable objective assessment technique is available thus far.

Materials and Methods: A total of 70 equine professionals (veterinarians and physiotherapists) and veterinary students evaluated videos of 12 healthy horses at walk and trot on a hard surface in a straight line. Nine parameters were scored: general mobility, thoracic, lumbar, lumbosacral flexion and extension and left and right thoracolumbar latero-flexion.

Results: Inter-rater reliability, estimated with intra-class correlation coefficients of scores, for all parameters, were very poor (<0.2) and did not improve when correcting for the profession or expertise. Out of 15,120 scores (70 observers, 12 horses, gaits, 9 parameters), 37.2% were scored as having pathology.

Discussion/Conclusions: All horses were in regular use and were deemed healthy, but participants suspected pathology in a large proportion of these. This may be due to undetected disorders, but is most likely caused by expectation bias. The very low inter-rater reliability scores indicate the high degree of subjectivity in scoring back mobility and stresses the need

for the introduction of more objective and reproducible techniques than simple visual assessment.

ARTHROSCOPIC ARTICULAR CARTILAGE RESURFACING WITH SELF-ATTACHING IN-SITU FORMING CONJUGATED HYDROGELS: IN-VITRO RESEARCH MODEL DEVELOPMENT IN THE HORSE

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Introduction: Articular cartilage defects could be treated with debridement in conjunction with filling. A cell-free injectable might act as a future scaffold to aid articular cartilage regeneration.

Materials and Methods: Cadaver material from 4 skeletally mature horses was used. Articular cartilage defects were created in the stifle, fetlock and carpal joints under arthroscopic guidance. Defects were filled with a hydrogel or fibrin glue. Repeat arthroscopic examination was performed after the joints were flexed and extended 25 times mimicking exercise. Post-operatively a transcutaneous ultrasound examination was performed.

Results: Out of the 47 defects created, 39 were filled with hydrogel and 8 with fibrin glue. Nine defects had simultaneous micro fracturing. After flexion and extension, the fibrin glue filled defects were empty. However the hydrogel filled defects stayed filled, apart from the 2 defects that had drilling beyond the subchondral bone-plate. Ultrasound could not differentiate whether the defects had been filled or not.

Discussion/Conclusions: Arthroscopic and ultrasound imaging results show superiority of the implantation techniques (Hydrogel) compared with defects with fibrin glue alone. Given these results with the hydrogel procedure, testing in an in-vivo equine model is the next logical step and has proceeded from this work.

MRI-FINDINGS IN RELATION TO DIAGNOSTIC ANESTHESIA - OBSERVATIONS IN 88 CASES OF DISTAL LIMB PATHOLOGY

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Introduction: Recently, accuracy of perineural anesthesia has been questioned and is thought to be inconclusive for localizing distal limb pathology (DLP). We analyzed horses partially positive to palmar digital (PPD) but completely sound to abaxial nerve anesthesia (CPAA) that underwent MRI-examinations of the entire foot-fetlock-region (FFR). We hypothesized that

CPAA after PPD may also obliterate fetlock-region-pathology (FRP) requiring routine/simultaneous MRI-scanning of the entire FFR to optimize treatment success/prognosis.

Materials and Methods: Medical records of 43 horses undergoing MRI-scanning of FFR after PPD-/CPAA and with inconclusive results on conventional diagnostics were reviewed retrospectively for breed/age/gender/clinical findings, degree/duration of lameness, MRI-anesthesia time/-findings and treatment/management. In lateral recumbency, limbs were placed horizontally into the MRI-Gantry and different sequences/several planes of FFRs were acquired in the same anesthetic.

Results: All FFR were completely MR-imaged without complications in an average-time of 101min. Right limbs were more often affected than the left. Lameness duration/grade was 20weeks/grade=2.5. In 96% of limbs, FRP was detected in addition to foot-pathology(FP). Typical FRP included metacarpal-/sesamoidean-/P1-/P2-scleroses,-edema,-fissures,-cysts; collateral-/annular-/suspensory-/sesamoidean desmitis; SDF-/DDFTendonitis and/or manica flexoria-/flexor tears/tendovaginitis. Based on clinical-/MRI-findings, treatment of FRP was required in 67% using shockwave/orthobiologics/bisphosphonates/shoeing (30%), osteosynthesis/arthroscopy/neurectomies (28%) or a combination thereof (42%).

Discussion/Conclusions: Our results suggest that CPAA after PPD may not only obliterate FP but also FRP requiring routine/simultaneous MRI-scanning of foot and fetlock region and thus, additional/different treatment/management. Our MRI-protocol is safe,easy and rapid to perform, may avoid missing additional FRP. Therefore it may be a promising approach for better understanding/management/treatment and prognosis of DLP.

DO LOCALLY ADMINISTERED ANTIBIOTICS REACH GROWTH CARTILAGE CANALS?

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Introduction: Bacterial infection and destruction of cartilage canals in growth cartilage have been described in piglets and foals with septic arthritis/osteomyelitis, with ischemic chondronecrosis and osteochondral lesions as a potential long-term complications. Joint injections and regional perfusion are common methods for local delivery of high concentrations of antibiotics in cases of distal limb infections in foals. Most available studies have been done in adult horses, without any growth cartilage or cartilage canals. The aim of the study was to evaluate whether medications administered by joint injection and regional intravenous/intraosseous perfusion reaches cartilage canals in the tibiotarsal joint.

Materials and Methods: For this initial study, nine healthy piglets aged 52-71 days were used due to the accessibility of

pigs as research subjects. Both hind limbs were removed after euthanasia. Regional perfusion with dyes of two different colors was done in the saphenous vein of one limb and intraosseously in the distal tibia of the other limb. Dye of a third color was injected into the tibiotarsal joint of all limbs. Samples from the distal intermediate ridge of the tibia and the talus underwent histological examination for presence of dye in cartilage canals.

Results: Dye injected intraarticularly was present in 6/462 (1.3%) cartilage canals, 20/232 (8.6%) canals after intraosseous perfusion and 134/230 (58.3%) canals after intravenous perfusion.

Discussion/Conclusions: The consequences of bacterial infection of cartilage canals warrant local antimicrobial treatment of these. This study found that regional intravenous perfusion was the best of the examined methods, subject to confirmation by studies in live foals.

POSTERS: LARGE ANIMAL

INVESTIGATION OF THE LOAD DISTRIBUTION PATTERN IN LAMINITIC HORSES USING THE HOOF™ SYSTEM

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Introduction: The objective of this study was to describe the load distribution pattern in horses with laminitis.

Materials and Methods: Thirty-eight client-owned laminitic horses presented at the university were included in this study. The horses were allocated into two groups; Group 1: laminitic horses immediately after the clinical signs of acute laminitis had subsided; Group 2: chronic laminitic horses presented for orthopedic shoeing. Additionally 16 sound, unshod horses (control group) were also included. Both forelimbs were equipped with the Hoof™ System. For each measurement, loading and timing variables were analysed.

Results: The time to peak vertical force (TPVF) in the toe region in Group 1 and Group 2 occurred at $89 \pm 8.5\%$ and $85 \pm 6.5\%$ of stance phase duration respectively, whereas the TPVF in the control group occurred at $76\% \pm 6$. The percentage of vertical force (VF) in the heel region in Group 1 (40%) and Group 2 (39%) was the highest compared to other regions, while the VF in the toe region in the control group (46%) was the highest. The VF in the toe region in Group 2 increased about 3% compared to Group 1.

Discussion/Conclusions: In horses with laminitis, the load in the heel region is the highest compared to other regions. Increasing the load of the toe region in Group 2 compared to Group 1 can potentially be attributed to progression of the

healing process in the damaged lamellae. The highest load of the toe region in laminitic horses occurred during the break-over phase.

THE USE OF COMPUTER-ASSISTED EQUINE LOCOMOTOR ASSESSMENT IN BREED-RELATED DIFFERENCES IN CLINICAL PRESENTATION OF PROXIMAL SUSPENSORY DESMITIS

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Introduction: The use of quantitative gait analysis systems is currently increasing and there is discussion about breed-related reference value intervals for specific types of lameness. The most frequent owner-reported lameness in dressage horses is proximal suspensory desmitis (PSD). Significant differences in tendon characteristics have been reported between Friesian and Warmblood horses. Therefore, the aim of this study was to objectively compare symmetry values of horses of these breeds diagnosed with hind PSD using an Optical Motion Capture system (200Hz; n = 18 InfraRed camera's; Qhorse®).

Materials and Methods: The degree of symmetry at trot of a group of 33 adult sports horses (Mean \pm SD 11.2 ± 3.9 years), n = 7 Friesian horses (FH) and n = 25 Warmblood horses (WB), suffering from US confirmed hind PSD was compared before and after blocking their desmitis region (GLM; $P < 0.05$).

Results: Before blocking, the mean difference in absolute minimum Vertical Pelvis Movement symmetry (MinDiff-P) for FH was 12.1 ± 12.0 mm and for WB 7.8 ± 6.9 mm, while after blocking this was 7.3 ± 12.1 mm for FH, respectively 3.0 ± 4.8 mm for WB ($P < 0.05$). That breed difference response after blocking was even higher for the mean difference in relative upwards Vertical Pelvis Movement symmetry (RUD-P: 12.3 ± 22.4 mm for FH, respectively 6.1 ± 10.2 mm for WB).

Discussion/Conclusions: The study showed that in absolute terms, the decrease of asymmetry after the blocks was similar, but that the initially higher asymmetry in Friesian horses was retained after the blocks. This suggests that, as in the tissue characteristics of the tendons, there is also a breed-related difference in clinical presentation of PSD.

POSTOPERATIVE FEVER IN HORSES: HOW TO KNOW IF IT IS PIROPLASMOSIS?

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Introduction: Equine piroplasmosis is an endemic disease in many countries and it can remain subclinical until a state of

immune suppression is reached. Surgery appears to be sufficient to induce clinical disease. Differentiating clinical signs (fever) from other causes of post-operative fever can be challenging. The aim of this study was to identify early markers that might distinguish piroplasmosis from surgical site infection.

Material and Methods: Blood samples from horses with post-operative fever were submitted for qPCR for *T. equi* and *B. caballi* detection. Each blood sample also underwent hematological analysis for determination of total protein (TP), Serum Amyloid A (SAA), plasma fibrinogen and plasma iron. Additionally, we recorded how long (days) it took for the first fever episode to develop.

Results: qPCR detected 6 positive horses (55%) to *T. equi*. Five were deemed negative (45%) for piroplasmosis. The most significant parameters ($P < 0.05$) between positive and negative horses were leucocytes ($11,1 \pm 2.82 \times 10^3$ vs $5.92 \pm 2.53 \times 10^3$ cells/ μ L), and days to fever (7.67 ± 4.08 vs $2.20 \pm 2.68 \times 10^3$ cells/ μ L), respectively. AP markers did not show significant differences between groups.

Discussion/Conclusions: Equine piroplasmosis should be considered as a cause of post-operative fever. We highlight the usefulness of qPCR in the diagnosis of this disease. However, differentiating piroplasmosis from other causes post-operative fever based on hematological and AP markers is challenging. The time to develop fever and the total WBC seem to be best indicators for the clinician when making decisions about the origin of the fever.

DEVELOPMENT OF A STANDARDIZED AND REPEATABLE PROTOCOL TO OBTAIN HIGHLY CONCENTRATED PLATELET RICH PLASMA FOR HORSES

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Introduction: Platelet rich plasma (PRP) is widely used in the equine industry. With platelet degranulation, a great number of growth factors contained in the alpha granules are released which are responsible for initiating and maintaining the healing process, such as platelet derived growth factor (PDGF). The objective of this work was to validate the conditions for PRP preparation using a closed kit.

Materials and Methods: PRP was prepared using a double centrifugation protocol. Five research horses were used. For the first centrifugation step, five different conditions were evaluated (1497, 2104, 2456, 2839, 3659 x accumulated gravity force (g.min)) and four for the second centrifugation (839, 3659, 4677, 5760 x g.min). Validation of the process was done using five other horses.

Results: The first centrifugation was set up at 3052 g.min, and the second centrifugation established at 5040 g.min. These settings allowed us to obtain a highly concentrated PRP with platelet, leucocyte and red blood cell concentrations of $756 \pm 143 \times 10^6$ /mL; $3.7 \pm 1.8 \times 10^6$ /mL; $0.01 \pm 0.01 \times 10^9$ /mL, respectively. The mean platelet concentration factor obtained was $6.4x \pm 1.3$. PDGF was quantified, with a mean concentration of 37ng/ml.

Discussion/Conclusions: This study shows the establishment of a repeatable and standardized method to obtain highly concentrated ($6.4x \pm 1.3$) leuco-reduced PRP.

PROGNOSIS AND COMPLICATIONS AFTER AUTOLOGOUS IMPLANTATION AS A TREATMENT FOR AGGRESSIVE EQUINE SARCOIDS (35 HORSES): THREE CASES OF SARCOID GROWTH AT IMPLANTATION SITE

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Introduction: Sarcoids are the most common skin neoplasm in equids and are induced mainly by Bovine Papilloma Virus 1. The overall described success rate is 75%. The aim of this study was to determine the success rate (SR) and complications after Autologous Implantation (AI) for treatment of sarcoids.

Materials & Methods: All horses that received AI alone or combined in 2015-18 were included. If possible, a large excision was performed electrosurgically. The sarcoid was cut into pieces and was submerged in liquid nitrogen before being reimplanted subcutaneously in the neck. In a few cases, pieces were not submerged in liquid nitrogen as an attempt to increase efficacy of treatment. Follow-up was performed by telephone.

Results: A total of 35 horses were included. Long-term follow-up was at a median 12 months (5-39). SR was observed in 24 horses (68.5%) or in 130 sarcoids (70%). If AI was the first treatment, SR was observed in 14 horses (93%) but only 50% as second. Three horses (where sarcoid was not submerged into nitrogen) had a regrowth of sarcoid at the AI site.

Discussion/ Conclusions: The overall SR (68.5%) was comparable to those reported. If "acceptable results" are included, the score reaches 94%. The very high SR (93%) in horses treated the first time and in sarcoids treated by AI only (6 horses;100%), might prove that AI alone as a first treatment is interesting. Three horses developed new sarcoids at AI when sarcoid pieces were not submerged in liquid nitrogen. Skipping this step is therefore dangerous. This study shows that AI and therefore immunity stimulation plays a part in sarcoid treatment.

PARTIAL ANEURYSMECTOMY AND AUTOLOGOUS PATCH VENOPLASTY OF THE JUGULAR VEIN IN A HORSE

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Introduction: Experience with vascular surgery is limited in horses and autologous vein grafts have only been used for treatment of thrombophlebitis. In human surgery several venoplasty techniques are commonly used. The aim was to describe treatment of a jugular vein pseudo-aneurysm using an autologous saphenous vein patch technique to create an isodiametric lumen and minimize thrombus formation.

Materials and Methods: Case report of a 3-year-old female pony presented with an intermittent local swelling of the left jugular vein following previous thrombophlebitis and resultant exercise intolerance. Ultrasonographic examination revealed a large pseudo-aneurysm. Treatment consisted of a partial aneurysmectomy preserving part of the vein wall. The saphenous vein was harvested and was cut longitudinally to increase the surface of the patch, which was then sutured to the remaining jugular vein wall. Anticoagulants, antimicrobial and anti-inflammatory drugs were administered post-operatively. Follow-up ultrasound examination showed narrowing (0.7cm) of the caudal part of the graft.

Results: At 2 and 8 months post-operatively, no external deformation of the jugular vein was visible. Ultrasonography revealed patent blood flow with limited lumen narrowing (1.5cm) and a homogeneous vein wall, except for some remaining sutures.

Discussion/Conclusions: The patch venoplasty proved a viable surgical technique for jugular vein reconstruction resulting in an isodiametric lumen, no thrombus formation and a good cosmetic outcome. Additional research is needed to evaluate other venoplasty techniques for treating vascular pathology in horses.

SUBLUXATION OF THE ELBOW JOINT IN CATTLE - A CASE SERIES

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Introduction: Joint luxation or subluxation in cattle is an uncommon condition. As there are no reports of elbow joint subluxation in cattle in the literature, our aim was to describe the clinical signs, results of diagnostic imaging, and treatment of radioulnar subluxation in cattle, and to present the short- and long-term prognosis.

Materials and Methods: Case series involving: a 3-year-old, 7 months pregnant Red Holstein dairy cow; a 2-year-old,

1 month post-partum Red Holstein dairy cow; and a 9-month-old Holstein heifer. They presented with acute, 4/5 grade, mixed lameness of one forelimb. There was a painful effusion of the elbow joint and radiographs as well as ultrasonography demonstrated radio-ulnar subluxation with lateral displacement of the radius and ulna.

Results: All 3 cows were treated conservatively. With the animals under general anaesthesia and in lateral recumbency with the affected leg uppermost, the elbow joint was manually reduced with flexion and rotation of the limb. No additional devices were necessary. After reduction, no internal or external fixation was provided. Recovery from anaesthesia and the short-term clinical course were uneventful in all 3 cases. At follow-up, between 7 months and 1 year after reduction, the animals were completely sound and were housed normally.

Discussion/Conclusions: Successful treatment of radio-ulnar subluxation in cattle can be achieved with closed reduction. Complete clinical and radiographic healing was documented after 2 to 4 months of box stall confinement and the animals were re-introduced into the herd with pasture access.

DIAGNOSTIC AND SURGICAL APPROACH FOR REMOVAL OF METALLIC FOREIGN BODIES IN THE TONGUE OF HORSES

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Introduction: Foreign bodies (CA = corpus alienum) in the tongues of horses are often metallic, making them easier to find using diagnostic imaging. Even when the CA is found on a radiograph or computed tomography (CT) scan, removing it can be challenging.

Material and Methods: Retrospective review of case records identified two horses with metallic foreign bodies in the tongue. **Results:** The first clinical signs were fever, difficulty eating and salivation. Later, severe swelling resulted in an inability to eat or drink. The CT scans of both horses showed thin, 4 cm-long metallic foreign bodies at the level of the 308-310. In Horse 1 the CA was removed using an oral approach. In Horse 2 an intermandibular approach was used and the CA was removed using 5 mm laparoscopic grasping forceps. Follow-up showed that both horses made a full recovery.

Discussion/Conclusions: When the CA is a needle or thin piece of wire, the entrance wound is usually not apparent and the attendant infection will lead to severe swelling of the tongue. If the CA is not too dorsal in the tongue, an approach from the intermandibular space may be better than an oral approach. The small width between the mandibles may be a drawback. In the case of Horse 2, a 5 mm laparoscopic grasping forceps was successfully used. The successful use of a mandibular symphysiotomy for better exposure has also been

described. Once the foreign body has been removed, the prognosis for return to full function is excellent.

META-ANALYSIS OF THE EFFECT OF TREATMENT OPTIONS ON THE SURVIVAL OF HORSES WITH NEPHROSPLenic ENTRAPMENT

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Introduction: Several manuscripts evaluate the different treatment options for nephrosplenic entrapment, however, many of these manuscripts provide contradictory results. The objective was to provide a systematic meta-analytic assessment of the efficacy of the use of different treatment options in medical and surgical treatment of horses with confirmed or suspected nephrosplenic entrapment.

Materials and Methods: A literature search utilised PubMed/MEDLINE from January 1970 to January 2017. Retrospective studies involving horses with confirmed and suspected nephrosplenic entrapment were included. A meta-analysis was performed using a random effects model, with the effect size calculated as an odds ratio (OR) with 95% confidence intervals (CI). Statistical significance was $P < 0.05$.

Results: Out of 84 peer reviewed publications that met the search criteria, 19 relevant studies were identified. Using an OR as the effect size, the meta-analysis noted phenylephrine to have no significant effect on the success of medical therapy, (OR: 3.683; 95%CI: 0.330-41.147; $P = 0.290$). The meta-analysis also found no significant differences in the success rates of the rolling or jogging procedures (OR: 1.737; 95% CI: 0.765-3.954; $P = 0.187$).

Discussion/Conclusion: In this meta-analysis, treatment choice was not demonstrated to have an ability to enhance the success of medical therapy or survival. Limitations include the small size of some comparison groups and the known difficulties with diagnosis of nephrosplenic entrapment.

ACCUMULATION OF AMIKACIN IN SYNOVIAL FLUID WHEN GIVEN IN COMBINATION WITH DEXAMETHASONE IN INTRAVENOUS REGIONAL LIMB PERFUSION IN STANDING HORSES

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Introduction: Septic synovitis in horses is a life-threatening infection accompanied by an inflammatory response creating

oedema, heat and pain in the region of the affected synovial structure. Dexamethasone is a long-acting corticosteroid known to reduce inflammation and pain, hence it is widely used in combination with antimicrobials in treatment of human joint disorders. The aim of this study was to evaluate amikacin pharmacokinetics in the metacarpophalangeal joint when given in combination with dexamethasone through intra-venous-regional-limb-perfusion (IVRLP) compared to matched controls receiving solely amikacin.

Material and Methods: Eight ($n = 8$) horses underwent cephalic IVRLP with an esmarch tourniquet for 30 minutes on two occasions, once with 2g of amikacin and 10mg of dexamethasone dispensed into 0.9% NaCl to a total volume of 100ml and, after a 2- week washout period, the same protocol was used but without dexamethasone. Samples of synovial fluid and serum were obtained at $T = 0, 30\text{minutes}, 2\text{hours}, 6\text{hours}, 12\text{hours}, 24\text{hours}$ and 36hours . Amikacin concentration was determined using a liquid chromatography/tandem mass spectrometer system. Computer programs (Stata 14 and SPSS 24) were utilized for statistical calculations.

Results: No significant difference was found between the treatment and control group using a t-test ($P = 0.513$) and in linear mixed effects ($P = 0.597$), after controlling for the variability between horses.

Discussion/Conclusions: Dexamethasone can be used in combination with amikacin in IVRLP in cases of septic synovitis without influencing amikacin concentration in the synovial structures. The efficacy of such treatment should be studied further prior to recommendation for clinical use being given.

ACCUMULATION OF METRONIDAZOLE IN SYNOVIAL FLUID FOLLOWING REGIONAL LIMB PERFUSION IN STANDING HORSES

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Introduction: Metronidazole is a bactericidal antimicrobial used for treatment of anaerobic bacteria including *Bacteroides* spp, an identified agent in synovial sepsis in horses. *Bacteroides* spp. are generally resistant against commonly used antibacterial drugs including cephalosporins and aminoglycosides but are highly susceptible to metronidazole. Intra-venous-regional-limb-perfusion (IVRLP) is an established method for delivering high concentrations of antimicrobials to synovial structures of the distal limb in horses. The objective of this study was to evaluate the pharmacokinetic properties of metronidazole in synovial fluid following IVRLP in standing horses.

Materials and Methods: Seven adult horses underwent IVRLP with 500mg of metronidazole dispensed with 0.9% NaCl to a total volume of 108ml. Synovial fluid was collected from the distal interphalangeal joint at time (T) 0, 15 and 30 minutes and at 2, 12 and 24 hours. Synovial metronidazole concentrations were determined by liquid chromatography/tandem mass spectrometry. Statistical calculations were made using computer software programmes (Stata14 and SPSS24).

Results: Mean and median Cmax were 327 and 259 µg/ml. Mean and median Tmax were at 26 and 30 minutes. The concentration decreased quickly below therapeutic levels and only time points 15min and 30min were significantly different from the synovial concentrations at T = 0.

Discussion/Conclusions: Although metronidazole IVRLP results in high synovial concentration in the initial 30 minutes, concentrations decrease quickly to below therapeutic levels making it unsuitable for single therapy. Nevertheless, IVRLP with metronidazole can be considered pre-operatively in penetrating foot injuries but, for further treatment of anaerobic infections, IVRLP with metronidazole seems ineffective and other routes of administration should be explored.

THE USE OF MEDICAL GRADE HONEY AS A PROPHYLACTIC LOCAL ANTIMICROBIAL IN EQUINE LONG BONE FRACTURE REPAIR

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Introduction: Equine long bone fractures are associated with high morbidity and mortality. Factors associated with a successful outcome include young age, male gender, closed fractures and the absence of surgical site infection (SSI). SSI is significantly associated with an increased risk of failure of fracture healing and euthanasia. Systemic antimicrobial drugs remain the first line treatment for SSI prevention; however, current developments for orthopedic patients are shifting from systemic to targeted local delivery. The use of sterile medical grade honey (MGH) has previously been described in established infections. In this case we describe the use of sterile L-mesitran gel as a local prophylactic antimicrobial agent in a long bone plated repair.

Materials and Methods: Case description. A 4.5-year-old 530 kg Quarter horse mare was diagnosed with an open mid-diaphyseal comminuted fracture of the left hind limb. Prior to referral the wound was cleaned, lavaged and the

open wound was injected with 10ml of sterile L-mesitran honey gel. The fracture was repaired using open reduction and internal fixation with two 5.5 locking compression plates. Sterile L-mesitran honey was applied directly on the implants (10 ml on each plate), before closing the skin.

Results: Post-operative follow-up and evaluation was performed through repeated radiographs. The mare recovered successfully despite the presence of multiple negative predictive factors.

Discussion/Conclusions: The current study involves a single case only. However the successful outcome in this case, combined with the potentially devastating effects of SSI in equine orthopedic surgery, may warrant further evaluation of intra-wound application of MGH in equine orthopedic surgery.

EAR CANAL STENOSIS IN A FOAL: CT EVALUATION AND ZEPP SURGERY

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Introduction: Diseases of the external ear canal in the horse are uncommon. Congenital malformations such as atresia affecting the external ear canal have been reported in humans and dogs. To the authors' knowledge, congenital atresia or stenosis has not been reported in horses.

Materials and Methods: Case description of a 2-month old Portuguese foal presented at the clinic for evaluation of the left ear due to a purulent discharge.

Results: Otoscopic evaluation was performed, revealing narrowing of the distal part of the external ear canal. Marked narrowing of the middle aspect of the distal portion of the left external ear canal was seen. A Zepp procedure (lateral wall resection of the ear canal) was performed as treatment. The cosmetic and functional result when the foal was 6-months old was excellent.

Discussion/Conclusions: Otitis externa was secondary to stenosis or an almost fully atresic ear canal. This partial atresia was located at the distal part of the ear canal as an otoscopic examination revealed. This kind of congenital malformation has not been described in the equine literature. We performed the Zepp technique in the foal in order to communicate the proximal part of the ear canal with the outer and to improve ventilation. In this way, secondary otitis externa was resolved. To our knowledge this is the first description of a stenosis of the distal portion of the ear canal in the horse, and the lateral wall resection (Zepp procedure) is an appropriate treatment.

LOCOMOTOR PATTERN OF HORSES AFTER A CONSTANT RATE INFUSION OF MEDETOMIDINE ALONE OR COMBINED WITH MORPHINE AND/OR KETAMINE FOR STANDING PROCEDURES

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Introduction: The aim of the present study was to determine if the addition of ketamine and/or morphine to a constant rate infusion of medetomidine affects ataxia and the recovery time for a normal locomotor pattern to return. Six mature horses were used in a prospective, randomised crossover study.

Material and methods: Four treatments were administered during 120 minutes in all horses (medetomidine; medetomidine-morphine; medetomidine-ketamine; medetomidine-morphine-ketamine). The Equimetrix[®] gait analysis system was used, and accelerometric recordings were obtained prior to the administration of any drug and 6 times after CRI discontinuation (Time 130, 145, 160, 175, 190, 205 minutes). Variables included were speed, stride frequency, stride length, regularity, dorsoventral activity, propulsion power, mediolateral power, total power, force of acceleration and the three parts of the power.

Results: Significant differences were observed between treatment groups over time for all variables. Significant differences in regularity values were longer following CRI in the medetomidine group whereas, for the other three treatments, differences lasted only 10 minutes. Total power and force values showed significant reductions lasting up to 55 minutes in both groups where morphine was added and at all subsequent measuring intervals in the medetomidine-ketamine group.

Discussion/Conclusions: Importantly, this study demonstrates that when adding morphine and/or ketamine to a medetomidine based constant rate infusion, stride to stride stability is recovered sooner, which may be especially useful for orthopaedic standing procedures. Sedation lasted longer after treatment when only ketamine was added.

KLOTHO DEPLETION COULD CONTRIBUTE TO INCREASED INFLAMMATION SECONDARY TO INTESTINAL ISCHEMIA-REPERFUSION

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Introduction: Intestinal ischemia-reperfusion (IR) is associated with an intense local and systemic inflammatory response that can affect both local and distant organs. Klotho is an anti-aging protein that extends the lifespan and modulates cellular responses to oxidative stress. However, the potential role of klotho in modulating the inflammatory response to ischemia-reperfusion remains unclarified. The aim of this study was to investigate if an ischemia-reperfusion induced intestinal inflammatory response is accompanied by a change in klotho expression.

Materials & Methods: Twenty horses subjected to emergency abdominal surgery (SC group) of the small intestine (intestinal volvulus) and 4 horses destined for euthanasia (Control group) for reasons unrelated to the cardio-vascular system or gastrointestinal tract were used. All animals received the same anaesthetic protocol. Intestinal biopsies were taken and Klotho expression and inflammatory cytokines (TNF α , IL1 β), NF κ B, I κ B and MAPK p38 activation were measured.

Results: Intestinal Klotho protein expression was significantly decreased ($P < 0.001$) in the IR group, and this effect was accompanied by NF- κ B activation ($P < 0.05$) and subsequent production of inflammatory cytokines ($P < 0.001$), without affecting I κ B expression. IR also increased p38 MAPK phosphorylation (activation) ($P < 0.05$), as compared to control group.

Discussion/Conclusions: The results suggest an anti-inflammatory function for Klotho in the intestine and that an adequate tissue level of Klotho may provide protection against inflammation. Loss of klotho may be a common denominator linking increased oxidative stress, NF- κ B activation, and liver injury secondary to IRI

A PILOT STUDY TO EVALUATE THE IN VITRO PERFORMANCE OF THE DOUBLE FORWARDER KNOT, COMPARED TO SQUARE AND SURGEON'S KNOTS USING LARGE GAUGE SUTURE

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Introduction: The double forwarder (DF) knot is a self-locking knot that can be tightened to place an encircling ligature in a small space. The objective was to evaluate, in vitro, the strength and size of the DF knot in comparison to surgeon's (SU), and square (SQ) knots using large gauge suture.

Materials and Methods: Knots were tied using 2 and 3 USP polyglactin 910 and were tested on a universal testing machine under linear distraction. Mode of failure and

knot holding capacity (KHC) were recorded. Knot volume and weight were determined by digital micrometer and balance. Knot strength, size, and weight between knot type, number of throws, and suture type and size were compared using ANOVA testing.

Results: The DF knot, with all numbers of throws, had a higher KHC than SQ and SU knots with 4 or 5 throws ($P < 0.001$). When 6 to 8 throws were placed on a SQ and SU knots, the DF knot exhibited comparable KHC. All DF knots failed by suture breakage at the knot, whereas some square and surgeon's knots slipped when less than 6 throws were applied.

Discussion/Conclusions: Based on these results, the DF knot may provide some strength advantage compared to SQ and SU knots with less than 6 throws. Additional *ex vivo* and *in vivo* testing is needed.

CARBON-NANOTUBE-CHITOSAN-HYDROXYAPATITE COMPOSITE ENRICHED OR NOT WITH MESENCHYMAL STEM CELLS FOR POTENTIAL USE IN BONE DEFECTS - AN EXPERIMENTAL STUDY

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Introduction: Bone regeneration may face challenges in large gap defects. Natural constituents such as chitosan and hydroxyapatite have been proved to have a positive influence on bone healing. The purpose of this study was to assess the biocompatibility and osteoconductive properties of carbon-nanotube-chitosan-hydroxyapatite composite (CNCHC), enriched or not with BMMSC, in rat calvarial defects. Our hypothesis was that the biomaterial, aside from being enriched with BMMSC or not, is biocompatible with the target tissue and has osteoconductive abilities that make these two groups superior to a control group that did not receive any type of biomaterial.

Materials and Methods: All the procedures were approved by the Institution's Animal Ethics Committee (2326181016). Thirty 120-day-old male Wistar rats were underwent a calvarial osteotomy performed using a 5 mm trephine. The animals were randomly assigned into 6 groups.

Results: Histologic grading showed that rats from the control group had significantly lower inflammatory infiltrate at 20 days compared to other groups ($P = 0.005$). Rats from the control group also had lower granulation tissue scores and less novel bone was formed in both

post-operative assessments. Osteoclastic grading performed by histological assessment was less evident in the control group at both assessment periods (20 days after surgery; $P = 0.003$) and at 60 days after surgery ($P = 0.015$), when compared to the others. The predominance of a mononuclear inflammatory infiltrate was observed under light microscopy (LM).

Discussion/Conclusions: Our results suggest that CNCHC can be successfully applied in critical gap defects created in rat calvaria, showing proper biocompatibility and osteoconductive characteristics by creating a scaffold to the surgical fixing techniques.

CONSERVATIVE TREATMENT OF A COMMUNED FRACTURE OF THE FOURTH CARPAL BONE IN A YEARLING ARABIAN MARE

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Introduction: Horses with comminuted fractures of the carpal bones are underdiagnosed, usually because of difficulties in detection of these during standard radiographic examination. Current studies describing cases of comminuted fractures of the fourth carpal bone propose a pancarpal or partial carpal arthrodesis as the only successful method of therapy.

Materials and Methods: Case description. An 11-month-old Arabian filly with a 4 day duration of a 3/5 grade forelimb lameness was admitted to the clinic. Computed tomography (CT) scan showed a comminuted fracture of the fourth carpal bone with an accompanying slab fracture of the ulnar carpal bone and several chip fractures within surrounding bones. A heavy bandage starting below the elbow to the foot supported by a semicircular splint was applied for 6 weeks. A reinforced bandage was applied for the following 4 weeks. Stall rest for this period was recommended.

Results: 7 months later, a firm non-painful swelling of the carpus was noted. Flexion was not painful but was reduced. The mare was sound at walk on soft and hard ground as well as at trot on a straight line. Radiographs showed mild proliferative bone changes on the dorsolateral surface of the fourth carpal bone and osteoarthritis of the lateral aspect of carpometacarpal and middle carpal joints. No signs of instability or angular deformities were identified.

Discussion/Conclusions: Conservative treatment may be considered as an alternative method of treatment for comminuted fracture of the fourth carpal bone in cases without instability and severe injuries of the ligamentous apparatus. This type of management does not preclude surgical intervention in the future.

PATELLAR LIGAMENT DESMOPATHY IN SPORTS HORSE HIND-LIMB PUSH-OFF LAMENESS

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Introduction: Push-off type hind-limb lameness, identified using objective gait analysis as a lower total upward vertical pelvic excursion after push-off, warrants investigation of the stifle based on this region's functional importance in power production. The purpose of this study was to describe hind-limb push-off lameness in horses related to the patellar ligaments (PLs).

Materials and Methods: Medical records of horses undergoing optical or sensor-based gait analysis lameness investigations at the Swedish University of Agricultural Sciences 2017-2018 were reviewed, and cases with a hind-limb push-off lameness related to the PLs based on diagnostic anesthesia, and/or PL Doppler ultrasonography findings, were included.

Results: Nine sports horses with unilateral lameness related to PL pathology were included. Intra-articular (i.a.) stifle anesthesia was positive in 2/9 horses. PL infiltration anesthesia was positive in 5/7 horses non-responsive to i.a. anesthesia and 2 horses were negative to both. A total of 7/9 horses had PL pathology; of 10 desmitic PLs, the middle was most commonly affected (6/10). Neovascularization was detected in 5/10. Two horses positive to PL anesthesia lacked ultrasonographic changes. Following conservative (7/8) or surgical (1/8) treatment, 7/8 were improved/sound; in 1/8 lameness was unchanged at follow-up (1-9 months). One horse was euthanized for unrelated pathology. **Discussion/ Conclusions:** Horses with PL pathology responded variably to diagnostic anesthesia. PL neovascularization and the infiltration technique have not been described previously. In conclusion, hind-limb push-off lameness may be associated with PL desmopathy. Further investigation of the optimal blocking technique is needed to evaluate the clinical significance of ultrasonographic findings and treatment options.

EQUINE PRP: QUALITY ASSESSMENT AFTER STORAGE AND DIFFERENT METHODS OF ACTIVATION ON GROWTH FACTOR BIOAVAILABILITY

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Introduction: Platelet (PLT) concentrates are increasingly used in veterinary medicine. In most instances, multiple doses of autologous platelet rich plasmas (PRPs) need to be injected intra-articularly. This repeated treatment raises a

series of practical problems concerning preparation methods, optimal storage and activation of the final product.

Materials and Methods: Eighteen sport horses of different ages and sex were enrolled. Quality assessment of the PRP was performed by platelet count, pH measurement, bacterial analyses and swirling test (evaluation of the turbulence of the solution during bag trans-illumination) in fresh and frozen PRPs for 14 and 30 days. Six samples were randomly chosen and activated using 4 different methods: CaCl₂, freeze/thaw, sonication and combination of the last two methods. Thirteen growth factors (GFs) were measured using cytofluorometry and ELISA assays in these activated PRPs.

Results: All samples were sterile, with an adequate pH for clinical use, even in cryopreserved samples. The swirling test was positive only in PRPs with a significant concentration of intact platelets. Physical activation by 3 cycles of freeze/thaw or sonication allowed a significant increase of GFs in the preparation.

Discussion and Conclusions: Physical activation can be a cost effective method to release a great amount of GFs for treatment. Cryo-conservation of PRP does not alter the quality of the preparation for a ready-to-use treatment in clinical practice. Swirling test is a simple test to assess the concentration of intact platelets. Further studies are necessary to assess the in vivo effectiveness of frozen PRPs.

ANATOMICAL VARIATION OF THE OCCIPITAL CREST IN YOUNG DUTCH WARMBLOOD HORSES: A RADIOGRAPHIC STUDY

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Introduction: With the introduction of radiographic assessment of the equine spine during pre-purchase examination, the need to be familiar with the normal anatomic variation of cervical structures grows. Little is known about the normal anatomical variation and developmental changes during early life of the occipital crest in horses. The aim of the study was to identify morphological radiographic variation of the occipital crest in young Dutch Warmblood horses.

Materials and Methods: Radiographic examination of the cervical spine was performed in 29 Dutch Warmblood horses at one month, six months and 18 months of age. The shape together with presence, location and activity of mineralisation of the occipital crest was assessed.

Results: Shape variations and presence of mineralisation at the occipital crest was identified in all horses. However, the size, activity and shape of the occipital crest differed over time. Mineralisation formed earlier at the dorsal part than at the ventral part of the occipital crest.

Discussion/Conclusions: A large number of anatomical variations of the occipital crest can be detected radiographically in young, sound horses. This might be of interest when evaluating the occipital crest during pre-purchase or lameness examinations.

SUCCESSFUL REPAIR OF A DIAPHRAGMATIC HERNIA WITH SIMULTANEOUSLY PERFORMED THORACOTOMY AND MEDIAN LAPAROTOMY IN A HORSE

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Introduction: This case report describes an unusual surgical procedure carried out simultaneously from two approaches to repair a diaphragmatic hernia in a horse.

Materials and Methods: Case report of a horse referred with a history of colic. After admission dyspnea was the only evident clinical sign. The diagnosis of diaphragmatic rupture was made based on the radiographic and ultrasonographic findings. Delaying the repair was attempted first, since mature hernial borders are considered to be favorable for suturing. After 4 days, breathing became labored, a pleural effusion developed and a decision was made for immediate surgery to be performed. A ventral midline abdominal incision identified a 20-cm diameter diaphragmatic tear. Surprisingly the injury seemed to be chronic and a healed rib fracture with periosteal callus formation was also evident. Replacement of the herniated large colon was unsuccessful from this approach so another surgeon was asked to perform a simultaneous lateral thoracotomy. Manual separation of fibrinous adhesions between the colon and thoracic body wall was essential for repositioning the incarcerated bowel. The rent was successfully repaired.

Results: The patient did not show any signs of colic or respiratory distress during the postoperative period.

Discussion/Conclusions: The present case emphasizes the importance of appropriate pre-operative risk assessment in diaphragmatic herniation. Whilst diaphragmatic herniation is associated with a poor prognosis, well planned surgery with intra-operative creativity and flexibility increases the chance of a successful outcome.

COMPARISON OF THE LENGTH AND WIDTH OF THE LINEA ALBA IN THE STANDING AND DORSALLY RECUMBENT HORSE

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Introduction: Further research on the anatomy and biomechanical behaviour of the normal equine linea alba (LA) is

required to reduce the risk of incisional complications post-operatively. The aim of this study was to compare the length, width and thickness of the LA of the horse in a standing and dorsally recumbent position. The hypothesis was that the LA is smaller and shorter in the dorsally recumbent horse.

Materials and Methods: The LAs of 30 horses undergoing elective surgery were evaluated. The LA length was measured from xiphoid to umbilicus with the horse in dorsal recumbency and five reference points were determined. Transverse ultrasonographic images at the reference points were obtained using a linear probe and LA width and thickness were measured. Measurements were repeated once the horse was standing. The retrieved measurements from both positions were analysed for significant differences ($P < 0.05$).

Results: The length of the LA showed a significant difference between the 2 positions ($p = 0.0000029$) and increased by 19% when the horse was standing. The LA width was significantly wider with the horse standing compared to dorsal recumbency at 4 reference points (xiphoid; $P=0.032$, middle; $P = 0.025$, $\frac{3}{4}$ along LA; $P = 0.016$ and the umbilicus; $P = 0.01$). LA thickness showed no significant difference between positions.

Conclusion: The equine LA appears to be significantly wider and longer in the standing horse, compared to the horse positioned in dorsal recumbency. This could increase the tension on the sutures of the ventral midline after laparotomy and should be taken into account when closing the abdomen.

CREATION OF A STANDARD LESION IN THE ARTICULAR CARTILAGE OF THE RABBIT BY ARTHROSCOPIC APPROACH; INTRODUCTION OF AN OPERATING CRADLE TO STANDARDISE THE PROCEDURE

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Introduction: The rabbit is often used for research in cartilage repair via arthrotomy. In this study the aim was to determine if the creation and filling of an articular cartilage defect in the femoro-patellar joint with the aid of arthroscopy and CO₂ gas insufflation was viable in an in-vitro setup in order to be used ultimately in an in-vivo rabbit cartilage bio-engineered tissue research model.

Material and Methods: Four hind limbs were used from New Zealand White rabbits, fixed in a unique cradle device in such a position that defects created in the trochlear ridge of the femoro-patellar joint would be parallel to the ground floor surface.

Results: Dissection after surgery showed standard defects in size, form and shape but these were shallow. In 10 out of the 22 lesions created, damage to the edges of the defects was apparent. Also inadvertent iatrogenic damage was noted in all the joints.

Discussion/Conclusions: A minimally invasive surgical (arthroscopic) approach to the rabbit's stifle joint is possible with CO₂-gas insufflation. The specially designed cradle promoted stability and facilitated the creation of a standard defect. Making a standard defect in the articular cartilage however was difficult and time consuming. Therefore creation of a standard cartilage defect in the rabbit can probably be best performed using an "open" (arthrotomy) approach, with the rabbit secured in the cradle.

SMALL ANIMAL

RESIDENT'S FORUM - SMALL ANIMAL – ORTHOPAEDIC

INVESTIGATION OF THE TUMOR NECROSIS FACTOR SUPERFAMILY IN CANINE DEGENERATIVE SPINAL DISEASE

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Introduction: Degenerative spinal disease is a common ailment in dogs. Inflammation is known to be a key process that causes degenerating spinal structures become painful. The aim of this study was to investigate a wide array of inflammatory and pain-related agents and to identify key inflammatory pathways in dogs suffering from degenerative lumbosacral stenosis (DLSS) compared to healthy dogs.

Material & Methods: Ligamentum Flavum (LF) and intervertebral disc (IVD) tissue was collected from 13 dogs affected by DLSS and 16 dogs free of spinal disease. A qPCR gene array was used to investigate the expression of 84 inflammatory genes (n = 4 per group). Specific gene targets were further investigated in 4 additional samples per group using qPCR. Protein expression validation of nerve growth factor B (NGF) was performed using Western Blot analysis.

Results: Nuclear factor kappa B (NF-κB) and Tumor Necrosis Factor (TNF) Superfamily signaling were identified as major pathways activated in degenerative spinal disease, involving significant regulation (N-fold ± SD) of various inflammatory mediators, including NGF (-8.2 ± 10.2, P < 0.01) and TNFSF ligand 10 (9.4 ± 7.6, P < 0.01), and 11 (85 ± 73.5, P < 0.01). Protein expression of NGF was significantly upregulated in degenerated LF and IVD tissue.

Discussion/Conclusion: The present work shows that degenerative spinal disease involves the regulation of various

inflammatory and pain-related pathways, including TNFSF/NF-κB signaling. These findings may open new doorways to counteract the inflammatory and pain-related processes involved in canine degenerative spinal disease.

STABILISERS OF THE FELINE SHOULDER AND EX VIVO LIGAMENT RECONSTRUCTION

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Introduction: Shoulder (glenohumeral) luxation is an uncommon injury in cats with just two case reports previously described. Repair methods for shoulder luxation in cats are based on techniques described in dogs. The aim of this study was to describe the range of motion and clinical stability of the feline shoulder following experimental injury and repair using a prosthetic suture technique.

Materials and Methods: Eighteen feline cadaveric forelimbs were randomly allocated into three groups; medial injury, lateral injury or bilateral injury. Joint range of motion and clinical stability in all

directions was recorded before and after specific anatomic structures were sectioned and following surgical repair using a prosthetic suture technique. Results were compared between intact, injured and repaired limbs for each group.

Results: There was a significant difference in joint range of motion in specific directions between intact and injured joints, and between injured and repaired joints. There was no difference in joint range of motion between intact and repaired joints. Following injury but prior to repair, four of the six medially injured joints and five of the six laterally injured joints were still deemed clinically stable. All bilaterally injured joints were deemed clinically unstable following injury. Following repair, all joints were deemed clinically stable.

Discussion/Conclusion: The relative contributions of shoulder stabilisers to joint range of motion provides a reference for clinical cases with suspected shoulder instability. The prosthetic suture repair technique described was effective at returning the shoulder joint to a normal range of motion in this ex vivo model.

INFLUENCE OF EPITENDINOUS SUTURE PATTERN IN ADDITION TO A CORE LOCKING LOOP SUTURE IN A CANINE CADAVERIC FLEXOR TENDON MODEL

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Introduction: Tendon laceration frequently requires surgical tenorrhaphy for successful long-term outcome. Epitendinous

sutures (ES) can increase repair site strength by 10-50% and significantly reduce gap formation. The objective of this study was to determine the effect of ES pattern, in addition to a core locking-loop (LL) suture on forces at the repair site and development of gap formation in a canine cadaveric flexor tendon model.

Materials and Methods: Superficial digital flexor tendon (SDFT) specimens were randomly divided into 4 groups after transection ($n = 18$ in each): SDFT repaired with LL, LL+ simple continuous ES, LL+ Silfverskiöld cross-stitch ES or LL+ Interlocking horizontal mattress ES. Constructs were loaded to monotonic failure. Failure modes, gapping, yield, peak, and failure forces were analyzed. Significance was set at $p < 0.05$.

Results: Yield, peak, and failure force were significantly greater in ES groups when compared to core LL patterns alone ($p < 0.0001$). Addition of ES increased mean yield, peak, and failure force by 2.5x, 2.0x, and 2.0x respectively. Resistance to 1- and 3 mm gap formation was also significantly greater in ES groups compared to core constructs ($p < 0.0001$). No significant difference in yield, peak, failure force, and gapping were observed among ES patterns ($p > 0.827$).

Discussion: Addition of ES to core LL patterns significantly reduced occurrence of gapping and increased failure, peak, and yield forces of tenorrhaphies. Type of ES pattern did not significantly affect the biomechanical properties of the repair. The use of ES should be considered in a clinical setting to decrease surgical morbidity associated with repair failure; additional fixation methods can also be considered.

TRAUMATIC PELVIC FRACTURES IN 280 CATS: ASSOCIATED INJURIES AND RISK FACTORS FOR DEATH

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Introduction: Pelvic fractures are a common finding in cats after trauma. In people and dogs, mortality is not only related to the type of fracture, but also to the associated injuries. Information concerning fracture configurations and concurrent injuries in cats is lacking in the current literature. Therefore, the aim was to characterize and evaluate risk factors for associated injuries and death in cats with pelvic fractures.

Materials and Methods: Medical records were reviewed for cats diagnosed with pelvic fractures (2003 to 2016). Data included patient demographics, clinical and imaging

findings, diagnosis of concurrent injuries, treatment of fracture and survival. Pelvic fractures were classified based on location and severity. Descriptive statistics were performed, and logistic regression models constructed to examine associations between risk factors and outcome.

Results: Cases consisted of 280 cats with no (9%), unilateral (43%), and bilateral (48%) involvement of the weight-bearing axis, associated with a sacral fracture in 12%. Twenty percent of cats did not survive to discharge. Mortality and surgical treatment rates increased with the severity of the pelvic fractures. Mean number of body regions injured was 2.4, and was significantly associated with mortality ($P < 0.01$). Cats with neurological injuries were more likely to not survive ($P = 0.02$).

Discussion: Concurrent injuries to at least one body region, especially the abdomen and chest, can be expected in cats sustaining pelvic fractures. Mortality is associated with increased severity of the fractures, neurological injuries and the overall number of concurrent injuries.

EVALUATION OF COMPLICATION RATES IN CRUCIATE DEFICIENT CANINE STIFLES STABILISED WITH LOCKING TPLO PLATES; ANTI-ROTATIONAL K-WIRE IN-SITU, 55 CASES

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Introduction: We reviewed a population of dogs undergoing TPLO surgery, using locking implants, in three referral hospitals where patients retained an indwelling anti-rotational Kirschner wire (K-wire). We hypothesised that no significant difference in complication rate would be observed in this patient population relative to existing reports, and that complications related to plateau segment instability and/or tuberosity fracture may be reduced.

Materials and Methods: Medical records from three hospitals were reviewed to identify patients undergoing TPLO surgery. Following radiographic review, all cases that had an anti-rotational K-wire left in situ following locking TPLO were included, and medical records reviewed to identify and classify complications suffered in the peri-operative and short-term post-operative period.

Results: 95 patients were identified from the combined medical records of all institutions, 55 patients met the inclusion criteria for the retained anti-rotational K-wire group, with the remaining 40 acting as a control population. An overall complication rate of 7.5% was encountered across all 95 animals. Within the K-wire retention

group, a major complication rate of 5% was calculated, compared to 10.5% within the group that had the K-wire removed. No minor complications were encountered. Discussion: An indwelling anti-rotational K-wire is not associated with an increased peri-operative or short-term complication rate in canine stifles stabilised with locking TPLO implants. Further studies are warranted to evaluate potential benefits associated with this operative technique.

ARE POSTOPERATIVE ANTIMICROBIALS NECESSARY TO MAINTAIN AN ACCEPTABLE SSI RATE IN CANINE CLEAN ORTHOPEDIC AND NEUROSURGERIES?

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Introduction: The benefit of prophylactic antimicrobials in clean orthopedic procedures is controversial. Our aim was to describe the incidence and risk factors of surgical site infections (SSIs) in canine clean orthopedic and neurosurgeries at the Veterinary Teaching Hospital of University of Helsinki.

Materials and Methods: Data was collected from aforementioned surgeries in 2012-2016, excluding prosthetic surgeries. We used univariable logistic regression to examine risk factors for SSI and the Firth's bias adjustment method to take into account the rareness of events.

Results: 406 dogs met the inclusion criteria. Follow-up information was available for 363/406 (89%)

dogs. Of the 363 dogs, 329 (91%) received only perioperative antimicrobials, 26 (7%) did not receive peri- or postoperative antimicrobials, and 8 (2%) received perioperative as well as pre- and/or postoperative antimicrobials.

Altogether 23/363 (6.3%) dogs developed SSI of which ten were superficial. In orthopedic surgeries the SSI rate was 7.3%, with highest frequencies in arthrodesis (3/12, 25%) and arthroscopies (4/34, 12%). In neurosurgeries, the rate was 4.2%.

SSI occurred more likely in dogs being carriers of MRSP (OR 8.7, 95% CI 1.6-49.1) or undergoing arthrodesis (vs. fracture stabilization OR 4.4, 95% CI 1.0-19.9). Higher body temperature (OR 1.7; 95% CI 1.0-2.6; mean difference +0.4 °C) also increased the risk for SSI, while omitting antimicrobial prophylaxis did not (OR 1.7, 95% CI 0.4-5.0).

Discussion/Conclusion: The SSI rate was in accordance with previous reports. The results suggest that omitting perioperative antimicrobial administration was not associated with an increased risk of SSIs, but further studies are warranted.

LUMBOSACRAL FUSION USING INSTRUMENTED SYNCAGE® DISTRACTION-FIXATION IN A DOG WITH DEGENERATIVE LUMBOSACRAL STENOSIS

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Introduction: Degenerative lumbosacral stenosis (DLSS) is a common disorder in large breed dogs and has a multifactorial origin. Surgical treatment by dorsal laminectomy and discectomy results in decompression of neural structures, but when distraction-fixation is applied the ultimate goal is spinal fusion. The aim of this case report is to describe evidence of spinal fusion after distraction-fixation using a SynCage® device and pedicle screw rod fixation (PSRF).

Case description: A 4-year-old male neutered Leonberger presented with low back pain due to degenerative lumbosacral stenosis and chronic discospondylitis, confirmed on magnetic resonance imaging (MRI). The dog was treated by dorsal laminectomy, partial discectomy, curettage of the endplates, SynCage® distraction, and pedicle screw and rod fixation.

Results: Follow up included clinical examination, radiographs and computed tomography (CT). Low back pain improved despite concurrent bilateral cranial cruciate rupture and medial coronoid disease. The dog died 26 months postoperatively due to other causes, and with owner consent the lumbosacral segment was retrieved for CT, microCT and histological examination. CT demonstrated increase in bone through the SynCage® (all bone 85% to 91%, compact bone 55% to 76%, respectively, at 9 and 26 months postoperatively), as did microCT (all bone 92.8% and compact bone 80.8%). Histology showed continuous bone formation from the L7 vertebra through the SynCage® to the S1 vertebra.

Conclusion: Distraction-fixation using SynCage® and PSRF was well-accepted in this dog with severe DLSS despite comorbidities. CT, microCT and histological follow up showed clear evidence of spinal fusion through the cage.

INVESTIGATION OF THE EFFECTS OF FORAMINOTOMY AND INTERVERTEBRAL DISTRACTION ON THE VOLUME OF THE LUMBOSACRAL INTERVERTEBRAL FORAMEN: AN EX VIVO STUDY

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Introduction: Degenerative lumbosacral stenosis in dogs can involve L7 nerve root compression. Surgical techniques to decompress the L7 nerve root include foraminotomy and intervertebral distraction. The aim of this study was to compare the effect of foraminotomy and intervertebral distraction on the total, cranial, and caudal compartmental volumes of the L7-S1 intervertebral foramen (IVF).

Material and Methods: CT images were obtained from 7 canine lumbosacral (L5-CD1) specimens in the following sequential conditions: 1) native spine, 2) after dorsal laminectomy and partial discectomy of L7-S1, 3) after L7-S1 foraminotomy, 4) after distraction with an L7-S1 interbody cage, 5) after distraction with cage stabilized with pedicle screw-rod fixation (PSRF), and 6) after distraction with cage stabilized with PSRF fixed in flexion. Total, cranial, and caudal compartmental IVF volumes were calculated using the CT images and compared between conditions.

Results. Total IVF volume was significantly increased after foraminotomy (mean \pm SD: $149.0 \pm 27.9\%$, $P < 0.01$) and after intervertebral distraction ($120.0 \pm 25.0\%$; $P = 0.01$) with no difference between the distraction conditions. Foraminotomy induced a significantly larger increase in total IVF volume compared to intervertebral distraction ($P < 0.01$). Foraminotomy, but not distraction, induced a significant increase in the cranial compartmental IVF volume ($161.2 \pm 34.6\%$; $P < 0.01$).

Discussion/Conclusion. Foraminotomy and intervertebral distraction methods significantly expand the L7-S1 IVF. Foraminotomy is more effective in increasing the foraminal volume and especially the cranial IVF compartment, which is where the L7 nerve root transverses the IVF. Hence, foraminotomy may be more effective in decompressing the L7 nerve root.

EFFECT OF PLATE SPAN ON CONSTRUCT STIFFNESS AND STRAIN IN A SYNTHETIC FRACTURE GAP MODEL STABILISED WITH A LOCKING PLATE

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Introduction: To evaluate the effect of 3.5 mm locking compression plate span on construct stiffness, plate strain and bone-model strain in a synthetic fracture-gap model.

Materials and Methods: A short-oblique fracture gap model of a distal diaphyseal radial fracture was constructed using Delrin. Six replicates of 6-hole, 8-hole, 10-hole and 12-hole plate constructs were subjected to 4-point bending in displacement control with the plate on the compression surface. Maximum bending force and peak bending moment was 240 N and 6 Nm, respectively. Construct stiffness was determined, and Von Mises strain calculated using 3D digital image correlation.

Results: Stiffness was higher for 12-hole constructs than 6-hole ($P < 0.0001$), 8-hole ($P = 0.0037$) and 10-hole constructs ($P = 0.0022$). There were no incremental increases in stiffness between 6, 8 and 10-hole constructs. Strain was lower for 12-hole constructs on plate regions immediately distal to the fracture gap (region 2, $P = 0.004$; region 4, $P < 0.0002$), and on the Delrin proximal to the plate ($P < 0.0002$). There were no strain differences for the plate overlying the fracture gap ($P = 0.848$).

Discussion/Conclusion: An 80% plate span was needed for greater construct stiffness. A long plate span had less strain concentration on both the plate, and the Delrin proximal to the plate.

A THREE-DIMENSIONAL SURGICAL PLANNING WORKFLOW FOR DETERMINING ACETABULAR ORIENTATION IN DOGS

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Introduction: Failure to accurately implant the acetabular cup is a major risk factor for early failure after canine total hip replacement (cTHR). To establish a surgical navigation system for cTHR, basic knowledge about the normal acetabular orientation is needed. The purpose of this study was to determine the angle of lateral opening (ALO) and retroversion angle of the normal canine acetabulum in dogs using a three-dimensional (3D) computed tomography (CT)-derived model, and to test if the orientation differs between the left and the right acetabulum.

Materials and Methods: CT images of 14 client-owned dogs, without hip or pelvic related pathology were identified. Using a medical design software, patient-specific 3D surface models of the pelvis were generated. Anatomical pelvic landmarks were identified, reference planes were established and the ALO and retroversion angles were calculated.

Results: Fourteen dogs with weight and age ranging from 22-60kg and 12-133 months respectively were included. Comparing left and right acetabulum, no significant difference in ALO ($44.03 \pm 3.0^\circ$ and $43.4 \pm 4.0^\circ$; $p = 0.46$) and retroversion angles ($21.02 \pm 3.2^\circ$ and $21.69 \pm 2.5^\circ$; $p = 0.29$) was detected. Intra-observer variability was less or equal 5%.

Conclusion: The study shows that highly reproducible measurements were obtained of the ALO and acetabular retroversion using a 3D model based on CT data. No significant left-right difference for either measurement was detected. This will help with surgical navigation to improve acetabular bed reaming and cup implantation in especially in acetabular with dysplasia or degenerative changes.

RESIDENT'S FORUM - SMALL ANIMAL – SOFT TISSUE

SURGICAL CORRECTION OF COR TRIATRIATUM DEXTER IN FOUR DOGS WITH VENOUS INFLOW OCCLUSION

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Introduction: Cor triatriatum dexter is a rare congenital cardiac anomaly in which the right atrium is partitioned into two chambers connected by an opening of variable size. Several techniques are available for the treatment (surgical membrane resection with or without cardiopulmonary bypass, balloon dilation, cutting balloon catheterization). The objective was to describe the surgical correction and short-term outcomes of right atrial membrane resection in 4 dogs with cor triatriatum dexter with venous inflow occlusion.

Case description: Four dogs with cor triatriatum dexter were diagnosed by two-dimensional echocardiography or computed tomography angiography. All dogs showed signs of right-sided congestive heart failure preoperatively. They underwent surgical right atrial membrane resection with venous inflow occlusion under mild hypothermia.

Results: All dogs were discharged following surgery within 7 days. Three dogs underwent cardiac arrest for one minute or less during surgery but resuscitation (cardiac massage and adrenaline injection) was successful. One dog showed thrombus formation at the atrial suture site and transient tricuspid valve regurgitation, but recovered uneventfully after medical treatment. Another dog presented with a tension pneumothorax and hypoventilation directly after surgery and was treated efficiently by mechanical ventilation. Three dogs were free of clinical signs at follow-up. One dog presented with mild clinical signs recurrence (ascites and exercise intolerance) 2 months after surgery, ascites resolved with treatment.

Discussion/Conclusion: Cor triatriatum dexter can be treated successfully by surgical right atrial membrane resection with total venous inflow occlusion if cardiopulmonary bypass is not available.

COMPARISON OF THE DIFFERENT SUPPORTS USED IN VETERINARY MEDICINE FOR PRESSURE SORE PREVENTION AND THE IDENTIFICATION OF THE MOST AFFECTED ANATOMICAL ZONES

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Introduction: The aim of this original paper is to compare the pressure-relieving capacity of different supports used in veterinary medicine and to find the typical pressure sore locations in laterally recumbent dogs.

Methods: Three supports used in veterinary practices (A, the ground with blankets; B, a standard mattress; and C, a veterinary medicine memory foam mattress) were compared to a human medicine memory foam mattress (D). Three cadaver dogs with different body composition scores but similar sizes were positioned on the different supports in lateral recumbency. Pressures were measured in each dog/support contact point within 4 h with a TexiSense pressure mat.

Results: Regardless of the dogs' BCS and the support used, the scapulo-humeral articulation, the greater trochanter and the 13th rib were the recurrent risk zones. Pressure-relieving mats led to lower (85–105 mmHg) average maximal pressures than did the ground or standard mats (108–177 mmHg). The average maximal pressures depended on BCS, with maximal pressures observed in the skinny dogs and minimal pressures observed in the obese dogs.

Conclusion: It is important to use a pressure-relieving mat to reduce the risk of pressure sores. However, it is generally insufficient to maintain safe (<60mmHg) pressures in risk zones, particularly in skinny or obese patients.

EX-VIVO COMPARISON OF LEAKAGE PRESSURE AND LEAKAGE LOCATION USING A NOVEL TECHNIQUE FOR CREATION OF A FUNCTIONAL SIDE-TO-SIDE SMALL INTESTINAL ANASTOMOSIS OF CANINE TISSUES

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Introduction: A variety of techniques are used for creation of small intestinal anastomoses (SIA). Use of an electrothermal bipolar vessel sealing (EBVS) device for creation of SIA in a canine model has not been previously described. The purpose of this study was to develop an efficient, cost-effective alternative technique for creation of an SIA. The primary objectives were to evaluate initial leakage pressure (ILP), initial leakage location (ILL) and maximal intraluminal pressure (MIP) and compare results with stapled anastomoses.

Material and Methods: One-hundred and thirty jejunal segments were utilized (consisting of 2 segments/construct and 15 constructs/group). Four types of anastomoses were created: Total LigaSure(group A), LigaSure+Stapled (group B), Total Stapled (group C), and LigaSure+Sutured (group D). Five group A constructs were analyzed histologically.

Results: ILP was significantly different among groups with group D being significantly higher compared to groups A, B, and C ($P < 0.001$). There was a significant difference in LL among groups ($P = 0.003$). Leakage occurred at the longitudinal side-to-side intestinal anastomosis (SS-SIA) fusion line in 13/15(87%) constructs for groups A and B, and 9/15 (60%) constructs for group D. MIP was different among groups, with group C being significantly higher compared to groups A, B, and D ($P < 0.001$). Histology showed EBVS lead to collagenous fusion without cavitation defects.

Discussion: Results revealed that a functional SS-SIA was feasible with an EBVS device. Addition of 4 additional simple-interrupted sutures in group D significantly increased ILP and was considerably higher compared to small intestinal intraluminal peristaltic pressures in healthy dogs (15-25 mmHg). Further in-vivo studies are needed to determine the effectiveness of intestinal fusion in living intestinal tissues.

USE OF A TRANSABDOMINAL ORGAN RETRACTION DEVICE (T'LIFT®) FOR LAPAROSCOPIC OVARIECTOMY IN DOGS

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Objective: To compare surgical times and perioperative complication rates of canine laparoscopic ovariectomy (LapOVE) using either a transabdominal suspension suture (TSS) or the T'LIFT® transabdominal organ retraction device to suspend the ovaries.

Design: Randomized clinical trial.

Animals: Female dogs ($n = 30$).

Methods: Dogs were randomly assigned to two groups: S = TSS and T = T'LIFT®. LapOVE was performed by 1 surgeon and 1 assistant using a standard 2-port protocol. The signalment (age, weight, body condition score (BC), fat score of the ovarian ligament (FS)), operative time, ovarian resection time and perioperative complications were compared between groups.

Results: No significant difference was found between the groups regarding age, weight, BC and FS ($P > 0.05$). Surgical times were not statistically different between groups. Minor complications occurred in both groups, but were easily managed. In one case, the TSS needle broke when passed through the abdominal wall in a large breed dog.

Conclusions and clinical relevance: The T'LIFT® device can be used to suspend ovaries in 2-port LapOVE. It is easier to use than TSS, especially in large breed dogs. Further studies are needed to evaluate the possibility of its use in other types of video-assisted surgeries.

CLINICAL OUTCOMES FOLLOWING SURGERY FOR SPONTANEOUS PNEUMOTHORAX CAUSED BY PULMONARY BLEBS AND BULLAE - A MULTICENTRE RETROSPECTIVE STUDY

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Introduction: Spontaneous pneumothorax is a relatively rare condition in dogs and is most commonly caused by ruptured pulmonary blebs and bullae. Surgery remains the treatment of choice and is associated with lower recurrence and mortality rates than non-surgical management. Information on the outcome of dogs following recurrence is relatively scant. The purpose of this study is to evaluate the recurrence rate of spontaneous pneumothorax following surgery, identify potential risk factors for recurrence and evaluate outcomes of dogs with recurrence on a large cohort of patients.

Materials and Methods: Medical records from ten centres in the UK, USA and Australia were searched for dogs with spontaneous pneumothorax managed surgically between 2000 and 2016. Cases without a confirmed diagnosis of blebs or bullae or more than four weeks of follow up were excluded. Signalment, diagnostic imaging, surgery and outcomes were recorded.

Results: 120 cases were included (99 cases with long term follow up). A recurrence rate of 13.8% was found. An increased risk for recurrence in giant breed dogs was identified ($P = 0.012$). No other significant risk factors for recurrence were identified. Of those dogs with recurrence, 10/12 deaths were related to the pneumothorax. 4/12 underwent a second surgery, and resolution of spontaneous pneumothorax was achieved for three of these dogs.

Conclusion: The rate of spontaneous pneumothorax recurrence is low. There was an increased risk for recurrence in giant breed dogs. The majority of dogs with recurrence died or were euthanised, but the outcome for dogs undergoing a second surgery was favourable.

TRANSDIAPHRAGMATIC APPROACH FOR OPEN-CHEST CARDIOPULMONARY RESUSCITATION IN DOGS: A CADAVER FEASIBILITY STUDY

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Introduction: To describe and evaluate the feasibility of a transdiaphragmatic approach to perform open-chest cardiopulmonary resuscitation as an alternative to a traditional lateral thoracotomy in a canine cadaver model. The study design was an experimental, randomized cross-over pilot study in a university hospital setting using 14 canine cadavers, each weighing greater than 15kg.

Materials and Methods: Each cadaver had both a lateral thoracotomy and transdiaphragmatic approach to the heart. Prior to beginning the study, a single cadaver was randomly assigned to each operator and each operator was randomly instructed to perform either the lateral thoracotomy or transdiaphragmatic approach first. Data recorded included the time interval from incision to initiation of cardiac compressions, time interval from initiation of the first suture to re-establish a closed intra-pleural space, time interval from initiation of the first suture placement to the final skin suture, trauma to pulmonary, cardiac and soft tissues for both approaches, the distance to the caval foramen from the diaphragmatic incision, which rib space was entered during lateral thoracotomy and appropriate closure with anatomical tissue apposition in all layers.

Results: The mean time interval from incision to initiation of cardiac compressions for the trans-diaphragmatic approach was non-inferior to the lateral thoracotomy. The mean time to close the pleural space was faster for the trans-diaphragmatic approach.

Discussion/Conclusions: The transdiaphragmatic approach for open-chest cardiopulmonary resuscitation appears to be a viable alternative to lateral thoracotomy. In-vivo studies are required to determine the efficacy and safety of the transdiaphragmatic approach in live animals.

MACROGLOSSIA: AN ADDITIONAL ANATOMIC CHARACTERISTIC OF BRACHYCEPHALISM

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Objective: To measure and compare tongue volumes and cross-sectional areas of the upper airway in brachycephalic and mesaticephalic dogs. To document the relative extents the nasopharyngeal and oropharyngeal airways are occupied by tongue, and palatal tissues. To calculate the relative amounts of fat in these tissues.

Study Design: Prospective comparative study.

Animals: Eighteen brachycephalic dogs and 12 mesaticephalic dogs without upper airway disease.

Methods: Upper airway examinations and CT scans were performed of the head on all study participants. Two

cross-sectional areas of tongue, oropharynx, nasopharynx and palatal soft tissues were evaluated, one at the level of the most caudal aspect of the hard palate and at the level of the hamulae of the pterygoid. The fat content of the tongue and soft palate were assessed using Hounsfield units. Cross-sectional areas and fat content were compared between brachycephalic and mesaticephalic dogs.

Results: Brachycephalic tongue volume relative to body weight was significantly larger than mesaticephalics ($P < 0.05$). Tongue density was significantly lower for mesaticephalics compared to brachycephalics. Brachycephalic dogs have significantly lower total air (nasopharyngeal and oropharyngeal) to total soft tissue ratios and higher palatal tissue to air ratios.

Discussion/Conclusion: This is the first report to document relative macroglossia in brachycephalic dogs. Further studies to evaluate the tongue's contribution to airflow obstruction are indicated. This study confirms that brachycephalic patients have higher soft tissue to air ratios within the oropharyngeal and nasopharyngeal regions. Macroglossia should be added to list of anatomic anomalies characterizing BAS.

INVESTIGATION OF THE IN VITRO ANTIMICROBIAL ACTIVITY OF TRICLOSAN-COATED SUTURE MATERIAL ON BACTERIA COMMONLY ISOLATED FROM CANINE WOUNDS

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Introduction: Triclosan-coated suture materials are available for use in veterinary patients, although data are limited. Our aims were to determine the in vitro effect of coating suture material with triclosan on bacterial growth, the duration of action, and bacterial adherence.

Materials and Methods: Ten isolates of *Staphylococcus pseudintermedius* (MSSP), methicillin-resistant *S. pseudintermedius* (MRSP), *E. coli* and ESBL/AmpC-*E. coli* from clinical wound infections were incubated on Columbia blood agar with triclosan-coated and uncoated sutures, and positive and negative controls. Zones of inhibition (ZIs) were recorded after overnight incubation. Sustained efficacy assays were performed with fresh inoculums of isolates susceptible to the coated sutures. Bacterial adherence to the coated and uncoated sutures was evaluated using scanning electron microscopy following incubation in Muller-Hinton broth.

Results: Zones of inhibition were created by the triclosan-coated suture material. The exception to this was observed

with polyglactin-910 for two samples for each of *E. coli* and ESBL/AmpC-*E. coli* isolates. Triclosan-coated suture materials demonstrated sustained antibacterial efficacy (ranging from 2-29 days) against all pathogens compared to the uncoated equivalents. Poliglecaprone and polydioxanone produced much larger zones of inhibition, and longer duration of sustained efficacy was observed for all bacterial isolates. The greatest bacterial adherence was to uncoated polyglactin-910, followed by triclosan-coated polyglactin-910, and then uncoated monofilament suture materials.

Discussion/Conclusion: Triclosan-coated materials may reduce the prevalence of wound infections including those produced by multidrug resistant organisms. Triclosan-coated monofilament materials may be more protective against the development of surgical site infections than multifilament material.

HARD PALATE DEFECT REPAIR USING HAIRED ANGULARIS ORIS AXIAL PATTERN FLAP IN DOGS

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Introduction: To describe a novel application of haired angularis oris axial pattern flap (HAOF) in the oral cavity for reconstruction of large hard palate defects. The angularis oris axial pattern flap has been previously described for reconstruction of skin defects over the head and muzzle and a variation of the flap using the buccal mucosal surface has been described to reconstruct soft and hard palate defects in the oral cavity.

Material and Methods: Anatomical cadaver study and case series.

Results: Cadaver specimens were used for anatomical study and description of surgical technique. Cadaver dissections demonstrated repeatable flap elevation and the ability to reconstruct defects as far rostral as the maxillary canine tooth. Two clinical cases with large caudal hard palate defects that were reconstructed using the HAOF were reviewed. In one dog the flap was intact and healed at day 644 after surgery when the dog was euthanized for progressive metastatic disease. The second dog had two minor areas of dehiscence that were successfully repaired. This patient at the current time of publication 882 days post-HAOF reconstruction, has no evidence of further flap dehiscence.

Discussion/Conclusion: Large caudal or central hard palate defects can be successfully repaired using the HAOF. This flap may allow reconstruction of larger defects than the buccal mucosal or hard palate flaps that have been previously reported. Canine patients tolerate haired skin in the oral cavity well.

COMPARISON OF MUSCLE-SPARING AND NON MUSCLE-SPARING LATERAL THORACOTOMY ON POST-OPERATIVE PAIN AND LAMENESS - A RANDOMIZED CONTROLLED TRIAL

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Introduction: Muscle sparing thoracotomy in human surgery is reportedly less painful than standard thoracotomy. The purpose of this study was to compare muscle sparing lateral thoracotomy (MSLT) and standard lateral thoracotomy (SLT) in dogs, in a randomized blinded prospective clinical study.

Material and Methods: In the MSLT group, the latissimus dorsi muscle was retracted, whereas in the SLT group it was transected. The anaesthesia and analgesia protocol was standardised between groups. Variables included incision length/bodyweight, duration of surgical approach, amount of haemorrhage during the approach, duration of surgery, surgical site inflammation, and pre- and post-operative Glasgow Composite Pain Scale (GCPS) and Canine Brief Pain Inventory scores. Force-plate analysis was performed preoperatively, 3 days and 8-12 weeks post-operatively, and mean symmetry indices (MSI) for each dog were calculated.

Results: Nine dogs underwent SLT and 10 had MSLT. The values of post-operative GCPS, incision length and haemorrhage during the approach were significantly lower in the MSLT group. MSI was significantly lower 3 days post-operatively in both groups indicating lower peak vertical force of the ipsilateral forelimb. The mean reduction in MSI 3 days post-operatively was 13.2% (SLT) and 8.2% (MSLT); the difference between groups was not significant ($p = 0.16$). The MSIs at 8-12 weeks in both groups were not significantly different to pre-operative values.

Discussion: MSLT may be preferable over SLT due to reduced incisional haemorrhage and post-operative pain. Both techniques caused short-term post-operative ipsilateral thoracic limb lameness, but the degree of lameness was not significantly different between the 2 groups.

SCIENTIFIC SESSION - ORAL - SMALL ANIMAL ORTHOPAEDICS

COMPLICATIONS FOLLOWING TIBIAL PLATEAU LEVELLING OSTEOTOMY IN LARGE- AND GIANT-BREED DOGS STABILISED WITH MULTIPLE, LOCKING PLATES

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Introduction: The largest available locking implant for TPLO is the 3.5mm broad plate which may be biomechanically insufficient when used alone in the largest patients. Many surgeons use additional implants alongside the primary TPLO plate to increase the strength of the construct. This study aims to report the complication rate following TPLO in dogs where the osteotomy was secured with two or more plates, and identify variables associated with the incidence of post-operative complications.

Materials and Methods: Medical records and radiographs of client-owned dogs treated for cranial cruciate ligament disease with a TPLO stabilised with two or more plates between June 2010 and June 2018 were reviewed. Data were retrieved for 52 TPLO procedures that met the study inclusion criteria. Logistic regression analysis was used to evaluate association between variables and complication occurrence.

Results: Overall incidence of complications was 40%. The combined major (n = 16) and catastrophic (n = 1) complication rate was 32.7%, however reoperation rate was only 9.6%. Complete cruciate ligament rupture was associated with an increased risk of major or catastrophic complication (p < 0.025, OR 19.54 95% CI: 1.46-260.99). No factors were associated with overall complication risk.

Discussion/Conclusion: The complication rate in this study is comparable to previous studies in dogs >50kg where TPLO was performed. With many predisposed breeds classified as large/giant it seems prudent for surgeons and owners to understand the risk of complications with this procedure where multiple plates are deemed biomechanically necessary.

THE IMPACT OF EPITENDINOUS SUTURE-BITE PLACEMENT FROM THE TRANSECTION SITE ON THE BIOMECHANICAL STABILITY OF FLEXOR TENDON REPAIRS IN AN EX-VIVO CADAVERIC CANINE LACERATION MODEL

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Introduction: Blood supply and preventing gap formation <3mm are critical factors for successful tendon repair. Peripheral epitendinous sutures increase biomechanical stability of primary repairs by ~10-50% over core sutures alone. Our objective was to evaluate the effect of varying the suture-bite distance of an interlocking horizontal-mattress epitendinous (IHME) suture from the transection site in addition to a core locking-loop (LL) suture for tendon repair in an ex-vivo canine cadaveric model.

Materials and Methods: Cryopreserved tendons were randomly divided into 4 groups (n = 18), sharply transected and repaired with LL, LL+5E, LL+10E, LL+15E with epitendinous suture-bites (E) placed 5, 10 and 15mm from the transection site respectively. Constructs were tested to monotonic failure. Failure modes, gapping, yield, peak, and failure forces were analyzed. Significance set at p < 0.05.

Results: Mean ± SD yield force and failure force for LL alone was 61.3 ± 19.0N and 72.5 ± 6.8N respectively, which was significantly lower compared repairs where an IHME pattern was used (167.9 ± 24.1N, p < 0.0001). Gap formation to 1mm (p < 0.0001) and 3mm (p < 0.0001) occurred significantly less with addition of an epitendinous suture. Variation of IHME bite distance significantly increased construct strength (5mm-134.4 ± 26.1N; 10mm-151.0 ± 16.8N; 15mm-182.1 ± 23.6N) compared to LL alone (p < 0.0001). Failure mode was different between repairs when IHME was applied (p < 0.001).

Discussion/Conclusion: Addition of an epitendinous suture significantly reduced occurrence of gapping and increased failure, peak and yield forces of tenorrhaphies. Increasing epitendinous suture-bite distance from the transection site significantly increased construct strength. Limitations include ex-vivo nature, lack of cyclical-loading and effect of suture on tendon blood supply. Use of an epitendinous suture pattern should be considered to significantly increase repair-site strength and resist gap formation in canine tenorrhaphy.

ANALYSIS OF JOINT MOVEMENT IN CANINE STIFLE JOINT USING 4D-CT

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Introduction: In dogs, most studies on joint movement have been performed using fluoroscopy, but the technique is a 2D analytical method that cannot obtain 3D information. In the present study, we investigated the normal movement of the canine stifle joint using 4D-CT as a new technique.

Materials and Methods: Five hind limbs obtained from healthy beagles that were euthanized for an unrelated study were used. A 320-row area detector CT was used for 4D-CT imaging. We investigated the degree of medial and lateral displacement of the patella, the trajectory of the rotational motion of the patella and the position of the centre of it, the distance between the patella and the trochlear groove, the length of the patellar ligament, and the degree of medial and lateral rotation and cranial and caudal displacement of the tibia during movement of the stifle joint.

Results: 4D images of the stifle joint could be easily obtained using 320-row area detector CT. Four-dimensional CT could evaluate the movement of the stifle joint both three-dimensionally and dynamically. In normal dogs, it was reconfirmed that medial and lateral displacement of the patella, rotation of the

tibia, and cranial displacement of tibia do not occur during movement of the stifle joint. In addition, this study newly demonstrated the rotational motion and rotation centre of the patella.

Conclusion: The results of the present study demonstrate the utility of 4D-CT as a novel method for investigating joint movement in dogs.

ABDOMINAL SURGICAL APPROACH TO THE THORACOLUMBAR SPINE IN THE DOG - A DESCRIPTIVE CADAVERIC STUDY

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Introduction: Surgery of the thoracolumbar spine is indicated to treat different conditions resulting in a spinal cord compression. Approaches to the vertebral column are currently lateral or dorsal. Our objective was to document the feasibility of an abdominal (ventral) approach, and to determine how much of the ventral aspect of T13 to L7 could be accessed for herniated disc removal or for ventral implant placement.

Materials and Methods: Cadavers of six adult dogs, euthanased for reasons unrelated to the study, were used. A ventral median celiotomy was performed and the best approach to the spine was determined first. Then, the accessible spinal ventral area (SVA) was inked, and compare to the total SVA of the vertebral column with a photograph software (ImageJ software (US NIH, Bethesda, ND)). Four-mm cross-sections were performed from T13 to L7 on each cadaver.

Results: A ventral left-sided access to the SVA was feasible after mesocolon incision. The median of accessible SVA ranged between 69% and 93.9%, for T13 to L7. The placement of mono and bi cortical implants was demonstrated to be possible in all sections, with a safety angle measured from 30° to 50° in the majority of cases.

Discussion: The ventral approach of the thoracolumbar spine could be an alternative to current surgical approaches and may provide some advantages in minimizing spinal cord handling, or limiting the spinal cord exposure that could facilitate postoperative peridural fibrosis.

COMPUTER NAVIGATED JIG PIN PLACEMENT IN TIBIAL PLATEAU LEVELLING OSTEOTOMY

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Introduction: In human surgery, tibial osteotomy performed using computer navigation improves accuracy of limb

alignment. The specific aim of our study was to compare the accuracy of navigated TPLO jig pin placement with the conventional freehand technique. We hypothesized that computer navigation improves accuracy in comparison to freehand technique.

Material and Methods: CT scans of 5 dogs were used to create 3D printed hind limb models. Three surgeons were randomly assigned two limbs models for each of the five dogs. An Ellis pin was inserted into the tibia, to simulate freehand pin insertion. In the navigated group, a computer system was used to guide pin insertion by real time on screen guidance. Bones were CT scanned and varus-valgus and internal-external rotational alignment of the pin was determined. Errors, calculated as the absolute value of angle formed between pin and relevant plane, were determined. For statistical analysis, comparisons were made between alignment in each plane in freehand and navigated groups, using a paired t-test. Variances were compared using an F-test. Values of $p < 0.05$ were significant.

Results: For freehand insertion, there were no significant difference between varus-valgus alignment between the surgeons. For internal-external rotation, there was a difference between the surgeons when performing freehand alignment, but not when navigation was used. Difference between freehand and navigated surgery in alignment error was significant for only one surgeon ($p = 0.022$). Navigation significantly reduced construct variability.

Discussion/Conclusion: Navigation significantly improved the rotational alignment of the TPLO jig pin. The results provide a foundation for future work.

CLINICAL APPLICATION OF THE SMALL I-LOC NAIL IN 15 CATS

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Introduction: Complications in feline fracture healing are a therapeutic challenge. In attempts to reduce complications, interlocking nail (ILN) osteosynthesis has been utilized. Recently, a smaller version of an ILN (I-Loc) suitable for cats was designed, but has yet to be evaluated clinically. Therefore, our purpose was to describe the clinical outcome following use of the I-Loc-3 and 4mm nails.

Methods: Consecutive feline cases presenting with fractures of the femur, tibia or humerus were included. Descriptive statistics were reported. Medullary canal to nail diameter ratio (MC:ND), major complication rate, time to clinical union (CU), and limb function at CU were evaluated.

Results: 15 cats with 16 fractures were enrolled. Eleven I-Loc-3 nails (3 femora, 5 tibiae, 3 humeri), and 5 I-Loc-4 nails (3 femora, 2 tibiae) were placed. Mean MC:ND was

2.0 for the I-Loc-3 and 1.95 for the I-Loc-4. Mean time to CU was 8.2 weeks. At CU, lameness had resolved or was mild in all cats. No major complications were encountered. Discussion: Considering the low complication rate and excellent functional outcomes, our results suggest that the smaller I-Loc system is safe and effective. While the I-Loc-3 is likely to be the appropriate size for most feline humeri, either the I-Loc-3 or I-Loc-4 could be suitable for feline femoral and tibial fractures. The MC:ND of both I-Loc nails in this study was smaller than other studies. As endosteal blood supply is important to healing, particularly in feline tibiae, I-Loc use may be advantageous in terms of reducing rates of delayed and non-union.

SHORT TERM OUTCOME AND COMPLICATIONS FOLLOWING SURGICAL STABILIZATION OF CANINE TIBIAL FRACTURES WITH BIPLANAR PLATE FIXATION

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Introduction: Tibial fractures are the third most common type of fracture in dogs, constituting 20% of long-bone fractures and 10% of all bone fractures in canine patients. The aim of this study is to report the clinical and radiographic short-term outcome for dogs with tibial fractures managed with open reduction and internal fixation using two biplanar plates applied on the medial and cranial aspect of the tibia.

Material and Methods: Medical records of dogs with tibial fractures were reviewed for signalment, details of concurrent surgical procedures, type of fracture, implants used, administration of antibiotics, type of postoperative bandage/coaptation and complications.

Results: Twenty-seven dogs were enrolled in the study. The mean age at surgery was 5.79 years (range 8 months–14.2 years) and the mean weight was 23 kg (range 4.2–53.3kg). Breeds were mixed (7.4%; 2 dogs) and pure breed (92.6%; 25 dogs) with 17 different breeds represented. All of the complications were surgical site infections, occurring in 4 dogs (14.8%). Three of the complications were classified as major, requiring surgery for implant removal, the remaining dog had a perioperative infection classified as minor complication.

Discussion/Conclusion: In summary, the use of biplanar plating for management of tibial fractures in dogs results good to excellent short term outcome with low morbidity and a more favorable complication rate than previously reported. Short term outcome was excellent to satisfactory in 85.2% of cases, with complications in 4 dogs, resolving after implant removal and antibiotherapy.

SCIENTIFIC SESSION - ORAL - SMALL ANIMAL SOFT TISSUE

COMPLICATIONS AND OUTCOME FOLLOWING SURGERY FOR TREATMENT OF GASTRIC CARCINOMA IN 40 DOGS (2004-2018): A VETERINARY SOCIETY OF SURGICAL ONCOLOGY RETROSPECTIVE STUDY

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Introduction: Canine gastric carcinoma is a rare clinical entity, and information regarding clinical outcome following treatment with surgical excision is currently lacking. The aim of this study was to report the complications and outcome in dogs receiving surgery for treatment of gastric carcinoma.

Materials and Methods: Case accrual was solicited from Veterinary Society of Surgical Oncology members. Information gathered from retrospective medical record review included clinical presentation, tumor staging, tumor characteristics, type of surgical excision, histologic diagnosis, adjuvant therapy and oncologic outcome. The progression free interval (PFI), overall survival time (OST) and cause of death were recorded. Prognostic factors associated with outcome were evaluated using Cox proportional hazards regression analysis.

Results: The PFI and OST were 54 and 178 days (range, 1-1902), respectively. Major postoperative complications occurred in 8 cases (20.0%), including septic peritonitis secondary to dehiscence in 4 dogs (10.0%). Multivariate analysis results indicated that experiencing an intraoperative complication was considered poor prognostic indicator and that administration of adjuvant chemotherapy conferred a survival benefit.

Discussion/Conclusions: Dogs presenting with gastric carcinoma had a longer survival time following surgical resection than what has historically been reported, and major postoperative complication rates were comparative to established literature. Adjuvant chemotherapy was beneficial for survival in dogs following surgical treatment of canine gastric carcinoma but warrants further investigation as no standardized chemotherapy protocols have been established.

NOVEL SURGICAL STRATEGY FOR EN BLOC RESECTION OF RIGHT DIVISIONAL HEPATOCELLULAR CARCINOMA INVOLVING THE CAUDAL VENA CAVA IN DOGS

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Introduction: Surgical removal of right hepatic divisional hepatocellular carcinoma (HCC) involving the caudal vena cava (CVC) has the potential risk of heavy bleeding. The purpose of this study was to describe a novel surgical strategy for en bloc resection of an extensively enlarged HCC originated from the right division including the CVC in dogs.

Materials and Methods: Two dogs (#1 and #2) underwent 2-stage operation. The first operation was surgical implantation of a percutaneously controlled hydraulic occluder (HO) around the CVC between liver and adrenal gland. For 1 to 3 months, the CVC was gradually occluded by the HO. Computed tomography (CT) was performed followed by the second operation. The right branch of portal vein and right hepatic artery and duct were en bloc resected, and the CVC was individually cut at the level of HO implantation and between central and right hepatic division. En bloc resection of the mass including the CVC was then achieved.

Results: The CT revealed the complete occlusion of CVC and the collateral formation of venous return, and en bloc resection of the mass was feasible in both patients. The femoral and jugular venous pressures after the resection of CVC were 19 and 2 mmHg, respectively in case #1, and 11 and 0 mmHg, respectively in case #2. The postoperative prognosis of both patients was excellent.

Conclusion: Our study suggested that the surgical strategy with 2-stage operation would be useful for en bloc resection of a right divisional mass involving the intrahepatic CVC in dogs.

A COMPARISON OF NEAR-INFRARED FLUORESCENCE IMAGING, LYMPHOSCINTIGRAPHY AND METHYLENE BLUE DYE METHOD FOR INTRAOPERATIVE SENTINEL LYMPH NODE MAPPING IN CANINE MAST CELL TUMORS: A PROSPECTIVE CASE SERIES

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Introduction: The current most reliable technique for intraoperative sentinel lymph node (SLN) mapping in humans is lymphoscintigraphy combined with the peritumoral injection of methylene blue dye (MB). A novel technique called near-infrared fluorescence imaging (NIR) has been developed for SLN identification in humans and first prove-of-concept studies have been performed in healthy dogs. This prospective case study aims to determine the applicability and safety of NIR for intra-operative localization of SLNs in dogs with mast cell tumors (MCTs) and to compare the detection rate of NIR with lymphoscintigraphy and with MB application. **Materials and Methods:** Eight canine patients were subjected to preoperative lymphoscintigraphy using Technetium-99m. Intraoperatively MB and Indocyanine Green (ICG) were injected and SLNs were localized sequentially using a NIR camera, a gamma probe and visual assessment of blue staining. For each SLN it was noted and compared whether it could be localized transcutaneous or after skin incision using 1) NIR 2) lymphoscintigraphy and 3) MB. Thereafter, a lymphadenectomy was performed.

Results: Fourteen SLNs were identified in 8 patients. Prior to skin incision 13 were detectable by lymphoscintigraphy, 7 were fluorescing and none was visibly blue stained. After surgical excision ICG was visible within all SLNs, 8 removed SLNs were blue stained and 13 were Technetium-99m positive.

Discussion/Conclusion: These data show that NIR is a feasible and safe technique for SLN identification in dog with MCTs. Due to the lower number of detected SLNs compared to lymphoscintigraphy, we currently cannot recommend NIR for SLN mapping in all anatomical regions.

SINUSCOPIC DEBRIDEMENT AND TREATMENT OF SINONASAL ASPERGILLOSIS IN 10 PATIENTS

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Introduction: Sinonasal aspergillosis (SNA) is a cause of nasal discharge in dogs and cats. In 17% cases only the frontal sinus is affected. Topical treatments have success rates between 83-100%, and multiple treatments are often required. Antifungal treatment distribution and penetration of fungal plaques has been suggested as a reason for treatment failure. Open and rhinoscopic debridement has been described. Entry to the frontal sinus via rhinoscopy is not possible in all patients. This study reports the technique and outcome in 10 patients treated via sinusoscopic debridement.

Material and Methods: Between July 2017 and November 2018 10 patients with extensive frontal sinus filling or when debridement via the sinonasal ostium was not possible underwent sinusoscopic debridement and topical treatment with 1% clotrimazole cream

Results: 9 dogs and 1 cat were treated. All received a second percutaneous treatment with clotrimazole cream and 20% a third treatment. Rhinoscopic assessment was performed in 6/10 patients and they were found to be clear of fungal plaques. 8/10 patients were clear from clinical signs after the first treatment. One dog had recurrence of SNA at 6 months and a second debridement was performed. One cat had persistence of nasal discharge, but had concurrent calicivirus infection.

Conclusion: This technique represents a safe approach for effective frontal sinus debridement in cases of SNA and should be considered in patients where frontal sinus disease is extensive as a method to enhance topical treatments.

LIP-TO-NOSE FLAP FOR RECONSTRUCTION OF THE NASAL PLANUM AFTER WIDE EXCISION OF SQUAMOUS CELL CARCINOMA IN 7 CATS

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Introduction: This study aims at reporting surgical outcome of the lip-to-nose flap for nasal planum reconstruction following wide excision of squamous cell carcinoma (SCC) in a cohort of cats.

Material and Methods: Client-owned cats presenting with SCC of the nasal planum amenable to surgical excision were prospectively enrolled. After wide margins tumor excision, a composite lip-to-nose flap was harvested from the upper lip and transposed to reconstruct the nasal defect. Variables recorded included surgical time, surgical complications, healing complications, flap success rate, cosmetic and long-term functional outcome.

Results: Seven cats with SCC of the lateral (n = 6) or dorsal (n = 1) aspect of the nasal planum were included. Median surgical time was 67,5 minutes (range 49 – 80 minutes) and no intraoperative complications occurred. Perioperatively, 6 cats developed self-limiting edema of the muzzle and 1 cat had nasal discharge for 2 days. No major complications in the healing process occurred, and overall flap success rate was 100%. A small area of partial-thickness necrosis developed at the cranial edge of the flap in 3 cats and healed spontaneously in all cases within a few days. Based on owner satisfaction and periodical clinical assessment, cosmetic and long-term functional outcomes were considered excellent in all patients.

Discussion/Conclusion: The lip-to-nose flap is a successful option for single stage reconstruction of the nasal planum after wide margins surgical excision of SCC in cats, as it allows for good cosmetic and functional outcome and is associated with a high rate of flap success.

COMPUTED TOMOGRAPHIC COMPARISON OF OESOPHAGEAL HIATAL SIZE IN SMALL BRACHYCEPHALIC AND NON-BRACHYCEPHALIC BREED DOGS

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Introduction: Oesophageal abnormalities, such as gastro-oesophageal reflux (GOR) and sliding hiatal hernia (SHH), are common in dogs with brachycephalic obstructive airway syndrome (BOAS). In humans, concurrent GOR and SHH are significantly correlated with a larger oesophageal hiatus (OH). We evaluated and compared the OH in brachycephalics and non-brachycephalics using CT.

Material and Methods: Clinical records and images of dogs that underwent thoracic CT between June 2015 and September 2018 were reviewed. Patients were divided into 3 populations: brachycephalics referred for BOAS (Group 1), brachycephalics referred for non-BOAS-related reasons (Group 2) and non-brachycephalics (<15kg) without respiratory or gastrointestinal signs (Group 3). Images were evaluated in multiple planes and the OH cross-sectional area was measured in the 3 populations. The ratio of aortic (A) to OH cross-sectional area was calculated. Analysis of Variance (ANOVA) was performed to detect differences between groups.

Results: Twenty-five dogs in each group met the inclusion criteria. Mean OH:A values(standard deviation) for Groups 1, 2 and 3 were 8.1(2.3), 8.0(3.2) and 3.7(1.1) respectively. OH:A values were significantly higher for both Groups 1 and 2 than for Group 3 (p < 0.0001). There were no significant differences between Groups 1 and 2 (p = 0.995).

Discussion/Conclusion: OH cross-sectional area in brachycephalics is significantly larger than in non-brachycephalic breeds, supporting the existence of anatomical factors leading to a predisposition for GOR and SHH in these breeds.

SURGICAL TREATMENT OF ECTOPIC URETERS AND URETEROCELES IN DOGS: RETROSPECTIVE STUDY OF 35 CASES BETWEEN 2010 AND 2018

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Study design: Retrospective study.

Objectives: To provide short and long-term information about the complications, the continence score and potential predictive factors of ectopic ureter(EU) and ureterocele(UC) treatment.

Materials and Methods. Medical records of dogs diagnosed with EU/UC between 2010 and 2018 and treated with reimplantation, neoureterostomy, ureterocelelectomy or cystoscopic-guided laser ablation were reviewed. Continence was assessed using a 10-point continence score. Minor and major complications were recorded. The influence of several factors on continence rate was evaluated.

Results and discussion: Thirty-five dogs were included. 80% of dogs were continent immediately after surgery. Continence was achieved in 72%, 71% and 70% at 6-months, 1 year and 2 years postoperatively with surgery alone. Adjunction of medical treatment was needed in 10 dogs over the time. Among the factors evaluated, only spaying, whenever performed, was associated with a higher occurrence of urinary incontinence at long-term follow-up. Minor complications occurred in 63% of dogs and major complications in 11% of cases. Occurrence of lower urinary tract symptoms was significantly lower among dogs treated with laser ablation compared to neoureterostomy.

Conclusions: EU/UC surgery is associated with a good continence rate of 80% at long-term follow-up with medical treatment adjunction in some cases. Spaying was stressed out as a factor associated with incontinence relapse, though no multivariate analysis was possible. Minor and major complications were quite high in this study, even if laser ablation, used in one 1/4 of all cases, was significantly associated with a lower occurrence of lower urinary tract symptoms.

AGREEMENT BETWEEN ARTERIAL AND VENOUS LACTATE CONCENTRATIONS IN CRITICALLY ILL DOGS

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Introduction: Arterial lactate concentrations are the gold standard for assessing hyperlactatemia in critically ill human patients, whereas in veterinary medicine venous lactate concentrations are routinely used. Our first hypothesis was that venous lactate concentrations could reliably predict arterial lactate concentrations in dogs. The second hypothesis was that there would be a correlation between hyperlactatemia and hyperglycaemia.

Materials and methods: Critical ill patients with possible hyperlactatemia that underwent emergency surgery were included. Lactate and glucose concentrations in arterial and venous blood were determined.

Results: A total of 21 dogs were included. Both lactate and glucose concentrations in arterial and venous blood had a significant strong positive correlation ($R_s = 0.822$, $p < 0.001$ and

$R_s = 0.872$, $p < 0.001$, respectively), and lactate and glucose concentrations in arterial and venous blood did not significantly differ ($p = 0.627$ and $p = 0.149$, respectively). Selecting arterial lactate concentrations as the gold standard, sensitivity of venous lactate concentration was 87.50% and specificity 76.90%.

No linear relationship was observed between arterial lactate and glucose concentrations or between venous lactate and glucose concentrations ($R_s = -0.092$, $p < 0.693$ and $R_s = 0.116$, $p < 0.616$, respectively).

Discussion/conclusion: Preliminary results demonstrate a significant strong correlation between arterial and venous lactate concentrations in dogs, even though agreement was imperfect. Normal venous lactate concentrations were likely to indicate normal arterial lactate concentrations. However, increased venous lactate concentrations were also observed in cases with arterial lactate concentrations within normal limits. No correlation was present between hyperlactatemia and hyperglycaemia. In conclusion, venous lactate concentrations can reliably predict arterial lactate concentrations, especially if they are severely increased.

SENTINEL LYMPH NODE MAPPING BY NEAR-INFRARED FLUORESCENCE IMAGING AND CONTRAST-ENHANCED ULTRASOUND IN HEALTHY DOGS

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Introduction: So far, sentinel lymph node (SLN) mapping in veterinary oncology patients is lagging behind compared to human medicine. Nevertheless, it is critical in staging of cancers with lymphatic spread, also in the former. Two non-invasive techniques to identify the SLNs in superficial anatomical regions, namely near-infrared fluorescence (NIRF) imaging and contrast-enhanced ultrasound (CEUS), were assessed in a proof-of-concept trial in healthy dogs.

Material and Methods: Six healthy laboratory beagle dogs were injected subdermally in the inguinal, axillary, and popliteal region to map the regional SLNs. First, Indocyanine Green (ICG), a non-targeted NIR fluorescent dye, was administered and the region was screened with an NIRF camera. Next, microbubbles were injected on exactly the same spot and an ultrasound of the region was performed.

Results: Transcutaneous SLN visualisation of the regional LNs by NIRF imaging was successful in 17 out of a total of 18 regions. Contrast-enhanced ultrasound identified SLNs in all occasions (18/18). Both techniques were easy to perform and were well tolerated by all dogs.

Discussion/Conclusion: Visualisation of the afferent lymphatic tracts was excellent with NIRF imaging and good with CEUS. On the other hand, CEUS revealed differences in filling patterns of the individual SLNs, a feature potentially valuable in the discrimination between clean and metastatic SLN in patients with malignancies. Both NIR fluorescence imaging and CEUS have great potential during real-time transcutaneous SLN mapping in the staging of cancer.

SENTINEL LYMPH NODE BIOPSY GUIDED BY COMBINATION TECHNIQUE (LYMPHOSCINTIGRAPHY AND BLUE DYE) FOR MAST CELL TUMOUR IN DOGS: RESULTS IN 31 CONSECUTIVE CASES

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Introduction: Accurate nodal staging is cornerstone in the correct management of cancer patients. The present study aims at increasing knowledge on the feasibility and utility of radionuclide and blue dye injections to detect sentinel lymph node (SLN) and to guide their extirpation on mast cell tumour (MCT) in dogs.

Material and Methods: Client-owned dogs with MCT amenable to wide margin excision in absence of distant metastasis and with no-palpable/normal-sized regional lymph node (RLN) were prospectively admitted to peritumoral injection of 99m Tc-tecnezium and blue-dye. Extirpation of SLN was guided by gamma-probe. Technical and surgical complication, number of SLN and their location respect to the expected RLN, and histopathology results were recorded.

Results: Thirty-one MCT were included. In 3 cases in which a previous scar tissue was presented, the procedure failed in SLN identification. In only 32% of the cases SLN corresponded to the expected RLN. No complications were retrieved during SLN mapping procedures. In 55% of the cases an early or certain SLN metastasis was histologically diagnosed.

Discussion/conclusion: SLN mapping with radionuclide and blue-dye allowed to personalize the nodal staging approach in dogs with MCT. Biopsy of a clinically selected RLN could led to an incorrect and useless procedure. The presence of an old scar tissue could be a limitation for SLN mapping in dogs, as also happen in human patient. Considering the high percentage of occult nodal metastasis and discrepancy between SLN and RLN, SLN mapping should be included in the staging of canine MCT.

COMPARISON OF DIFFERENT SUTURE NEEDLE, TYPE AND PATTERN ON INITIAL INTESTINAL LEAKAGE PRESSURE AFTER ENTEROTOMY CLOSURE: AN EXPERIMENTAL STUDY IN PIGS

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Introduction: Monofilament on a swaged-on taper needle is recommended for gastro-intestinal surgeries, despite lack of scientific proof. The aim of the study was to compare different suture materials and patterns on leakage pressure after enterotomy closure.

Materials and Methods: Eighty-one jejunal enterotomies were performed among 8 pigs. A sections of 10cm-long jejunum was isolated using Doyen forceps; an enterotomy of 4cm-long was performed and randomly closed using conventional technique with: Group (Gp) 1a – monofilament (MO), taper point needle (TPN), continuous pattern (CP); Gp1b – MO, TPN, interrupted pattern (IP); Gp 2a – MO, reverse cutting needle (RCN), CP; Gp 2b – MO, RCN, IP; Gp 3a – Multifilament (MU), TPN, CP; Gp 3b – MU, TPN, IP; Gp 4a – MU, RCN, CP and Gp 4b – MU, RCN, IP. Stained solution was then infused into the intestinal lumen until leakage through the suture-hole was observed. The leakage pressure (LP) was recorded.

Results: Median LP were 45.0mmHg [30.0-55.0], 46.0mmHg [42.0-73.0], 44.0mmHg [38.5-60.8], 46.0mmHg [32.5-57.5], 42.5mmHg [30.8-60.0], 54.5mmHg [46.0-63.3], 39.0mmHg [31.3-45.8] and 57.5 mmHg [50.5-60.8] in Gp1a, Gp1b, Gp2a, Gp2b, Gp3a, Gp3b, Gp4a, and Gp4b respectively. LP did not differ significantly between groups whatever the suture thread and needle used. Higher LP were observed in Gp4b compared to Gp4a.

Discussion: Our study did not prove superiority of MO on a swaged-on TPN for intestinal closure compared to MU and RCN. All MLP were observed to be higher than the physiological intestinal pressure.

A RESORBABLE SELF-LOCKING LOOP TESTED IN A CASE SERIES OF CANINE LUNG LOBECTOMY

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Introduction: The objective of this study was to test the self-locking implant for sealing of lung tissue and airways in lung lobectomy in dogs diagnosed with pulmonary masses. We hypothesized the absorbable implant could be used for

mass ligation and sealing of canine lung tissue and provide tissue support throughout the healing of ligated tissue.

Material and Methods: Five patients (case #1-5) were included in this clinical case series. A pulmonary mass was involved in the cranial part of a left cranial lobe in case #1, the right caudal lobe in case #2, the left caudal lobe in case #3, the right cranial lobe in case #4 and #5. The resorbable self-locking implant was applied at the hilum of the affected lobe, and the affected lobe was removed by cutting close to the implant.

Results: The application of the self-locking loop was feasible for lung lobectomy in all cases. No air leakage or hemorrhage from the resected stump was observed in any of the cases.

Discussion/Conclusion: The results of this series of clinical cases suggested that the resorbable self-locking implant may be used for lung lobectomy. The use of the implant was subjectively easy and enabled en bloc ligation of the hilum of the affected lobe including the pulmonary arteries and veins and lobular bronchus. In conclusion, the resorbable self-locking implant was suggested to be useful for canine lung lobectomy. Further investigations regarding the clinical use of the implant are warranted in small animal surgery.

EVALUATION OF DIFFERENT METHODS OF SECURING CELLOPHANE BANDS FOR PORTOSYSTEMIC SHUNT ATTENUATION

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Introduction: The objective of this ex-vivo mechanical study is to compare mechanisms and pressures at failure of four methods of securing two types of cellophane bands.

Material and Methods: Cellophane bands composed of three or four layers were applied around a cadaveric external jugular vein (EJV) to create 25% or 50% attenuation. These bands were secured with Polymer Locking Ligation Clip (PLLC) medium/medium-large, or Titanium Ligation Clip (TLC) medium/medium-large. Sterile saline 0.9% was instilled into the lumen of the EJV until a pressure of 100mmHg was reached. Failure mechanism and luminal pressure at failure were compared between groups.

Results: Medium clips failed less often than medium-large clips ($P = <0.001$), and consistently sustained 100 mmHg without failing. Three-layer cellophane bands were 4.1 times more likely to fail than four-layer bands ($P = 0.003$, CI 1.6-10.2), and failed at lower pressures ($28.32\text{mmHg} \pm 3.59$ and $44.81\text{mmHg} \pm 6.51$ respectively, $P = 0.027$). Failure rates of the cellophane band constructs did not differ whether secured with PLLC or TLC, ($P = 0.635$) or with 25% vs 50% attenuation ($P = 0.780$).

Discussion: A single medium clip withstood physiological forces, and secured a cellophane band at up to 50% attenuation. A three-layered cellophane band was more likely to fail than a four-layered cellophane band.

Conclusion: These results provide evidence to support the application of a four-layer cellophane band secured with a single medium sized PLLC or TLC for portosystemic shunt attenuation. A single medium PLLC should be used to eliminate CT artifacts during postoperative evaluation of shunt closure.

PROGNOSTIC FACTORS FOR SHORT-TERM SURVIVAL OF DOGS THAT DEVELOP POST-ATTENUATION SEIZURES FOLLOWING SURGICAL CORRECTION OF SINGLE CONGENITAL EXTRAHEPATIC PORTOSYSTEMIC SHUNTS: 93 CASES (2005-2018)

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Introduction: Development of post-attenuation seizures (PAS) is a devastating and frequently fatal postoperative complication in dogs following surgical correction of congenital portosystemic shunts, with survival rates ranging from 0-53.8%. Study objectives were to report short-term survival rate of dogs that underwent surgical attenuation of a single congenital extrahepatic portosystemic shunt (cEHPSS) and experienced PAS within seven days postoperatively, and to investigate prognostic factors for short-term survival.

Materials and Methods: Medical records at 14 institutions were retrospectively reviewed to identify dogs that underwent surgical attenuation of a single cEHPSS from January 2005 through February 2018 and developed PAS within seven days postoperatively. Logistic regression

analysis was performed to identify factors associated with 30-day survival.

Results: Ninety-three dogs were included. Thirty (32.3%) dogs survived to 30 days. Seventy-six (81.7%) dogs experienced generalized PAS. Prognostic factors positively associated with survival included a history of preoperative seizures (odds ratio [OR]=7.6, 95% confidence interval [CI]:1.9-30.3, $p = 0.004$) and development of focal PAS only (OR = 14.4, 95% CI:3.4-60.2, $p = 0.0003$).

Discussion/Conclusion: The overall short-term survival rate was low. Affected dogs that had a history of preoperative seizures or experienced focal PAS only had significantly improved short-term survival. In affected dogs with a history of preoperative seizures, PAS may have a different etiopathogenesis or reflect continuation of seizures experienced preoperatively. Generalized PAS may be more challenging to abolish, more distressing for the client to observe, associated with greater treatment cost and perception of a poorer prognosis for recovery, all of which may provoke a decision

PROSPECTIVE EVALUATION OF CORRELATIONS BETWEEN CERTAIN CLINICAL FINDINGS OF PERINEAL HERNIA IN 47 DOGS

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Perineal hernias are characterised by chronic dyschesia and/or perineal swelling accompanied by rectal deviation. Nevertheless, the possible role of colonic deviation has not been determined. Inclusion criterion for this prospective study was a complete diagnostic workup of a chronic perineal hernia followed by castration, standard herniorrhaphy by the transposition of the internal obturator muscle and, if necessary, rectorrhaphy. The side, the type and the severity of perineal muscle defect were initially assessed during a rectal examination and then more comprehensively during surgery. The O'Brien and the Lee and Leowijuk formulae were used to assess the possible presence of megacolon radiographically. Patients were admitted for follow-up evaluations at 2 weeks, 2 months and 6 months after surgery. Of the 47 patients permitted to the study, the disease was typically presented in older (median age of 9 years), non-castrated, small breed (32% Bichon) male (95.7%) dogs. Right sided hernias were more frequent; however, 26 out of 47 patients exhibited bilateral manifestations. A significant positive correlation was not revealed between the duration of clinical signs and either the severity of the rectal (or colonic) deviation or the post-operative outcome. The pre-operative rectal palpation was not able to

precisely diagnose either the type or the severity of rectal deviation confirmed intra-operatively. The Lee and Leowijuk method appeared more sensitive than the O'Brien formula. There was no statistically significant positive correlation between the presence or absence of a radiologically diagnosed megacolon and either the duration of clinical signs or the severity of rectal deviation.

POSTERS: SMALL ANIMAL ORTHOPAEDIC & NEURO

FEMORAL AND TIBIAL ALIGNMENT IN CHIHUAHUAS WITH MEDIAL PATELLAR LUXATION: ANGULAR VALUES AND INTRA- AND INTER-OBSERVER AGREEMENT OF MEASUREMENTS

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Introduction: Measurement of limb alignment in veterinary orthopedics and establishment of reference ranges for these alignments would allow veterinarians to grade angular deformity quantitatively and plan more suitable treatments. The aims of this study were to report the values for femoral and tibial angles in Chihuahuas with medial patellar luxation (MPL) and to evaluate the intra- and inter-observer variabilities.

Materials and Methods: Radiographs of 21 client-owned Chihuahuas with a diagnosis of MPL were evaluated retrospectively. The measurements were performed on the frontal, lateral and axial view radiographs of the femur and tibia. Radiographs of each dog were investigated by three observers, who repeated the protocol twice, enabling inter- and intra-observer variability to be measured.

Results: Inter-observer, intra-class correlation coefficients (ICC) consisted of 92.85% high and 7.15% good correlation. Intra-observer ICCs for the first observer had 28.57% high and 50% good correlation. For the second observer, 100% high correlation was recorded, and for the third observer, 71.42% high and 14.28% good correlation was recorded.

Discussion/Conclusion: The radiographic methods have good, or in most cases high, intra- and inter-observer correlations, showing that the measurements are reliable. Femoral alignment measurements were better correlated than tibial alignments in this study. This may be due to the different

anatomic shape of the bones, and observer experience and positioning of the dogs for imaging may also be contributing factors.

VERTEBRAL ANGIOMATOSIS RECURRENCE IN A 14 MONTH OLD MAINE COON CAT

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Introduction: Vertebral angiomas in cats is a rare, locally aggressive, benign, tumor-like lesion that has been reported to have a good prognosis if surgically treated. It is characterized by abnormal proliferation of well-differentiated vascular capillaries, but its local proliferation can be aggressive and lead to medullary compression. In the veterinary literature, vertebral angiomas recurrence has not been described, however only 2 of 9 cases had a follow up exceeding 4 months. This report is the first that describes vertebral angiomas recurrence after surgical excision.

Case description: A 14 month-old Maine Coon cat had a successful surgery for vertebral angiomas at the age of 7 months, but represented with hind limb ambulatory paraparesis 7 months later. A CT scan confirmed the recurrence of vertebral angiomas, showing more aggressive characteristics than the initial lesion. An aggressive thoraco-lumbar laminectomy was performed, with concurrent vertebral stabilization to avoid fractures during the recovery. During surgery, a durectomy had to be performed to remove the macroscopically visible proliferative bone.

Results: Histological analysis confirmed recurrence of the vertebral angiomas, with similar characteristics to the first episode, except for greater inflammation. Seven months after the second surgery, the cat was euthanized due to persistence of the non-ambulatory state.

Discussion/Conclusion: This case highlights the potential for vertebral angiomas to recur with more aggressive local invasion, and opens the discussion concerning the long-term prognosis for this tumor-like lesion, as only 2 of 10 cases were known to be free of recurrence 1-year post surgery.

TITANIUM MESH SYSTEM FOR THE TREATMENT OF MAXILLO-FACIAL FRACTURES IN 3 DOGS

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To describe the technique and outcome in three cases of titanium mesh reconstruction of traumatic craniofacial fractures. **Case Descriptions**

Case 1: Open severely comminuted frontal bone fracture in a Hungarian Vizsla following a horse kick

Case 2: Displaced comminuted fracture of the right zygomatic arch causing impingement of the ocular globe in a Border Collie.

Case 3: Severely comminuted mid-face fracture with complete collapse of the nasal cavity and mid-face in a German Shepherd. Repaired with combined intra-oral wiring, splinting and titanium mesh.

Results: Titanium mesh provided an appropriate substrate for cranioplasty in these dogs. It was used to provide protection to prevent further damage and to reconstruct the buttresses of the skull. Healing was uneventful in all cases. Excellent function and cosmesis was achieved with no short or long term complications.

Conclusion: Titanium mesh can be successfully used as a substrate for cranioplasty following facial fractures when primary reconstruction is not possible. The physical properties of the titanium mesh made anatomical reconstruction possible and provided sufficient rigidity to lead to uncomplicated healing with no postoperative complications.

MODIFIED AXIS LAMINOTOMY FOR CERVICAL MENINGIOMA TREATMENT IN AN 8-YEAR-OLD IRISH TERRIER

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Introduction: Meningioma is the most common tumor of the nervous system in dogs; the usual surgical approach for spinal meningioma removal is laminectomy/hemilaminectomy. The unique anatomy of the axis confounds the choice of approach in this location because the dorsal atlantoaxial and nuchal ligament have to be preserved to avoid cervical instability. This case reports the use of a dorsal axis laminotomy for C2 meningioma which preserves the spinous process of C2, the atlanto-axial and nuchal ligament.

Case Description: An 8 year old Irish terrier was presented for progressively worsening ataxia ongoing for one month. MRI revealed an 8mm dorsolateral intradural/extramedullary lesion on C2, consistent with meningioma. Modified axis laminotomy was performed using a pneumatic drill. Three cuts were performed: a longitudinal one on each side of the vertebral arch and a transverse one at the caudal fourth of the spinous process. The laminar flap was rotated and the mass debulked. The axis lamina was repositioned and secured using polypropylene sutures positioned through holes drilled in the spinous process.

Results; Three weeks post-operatively, a significant improvement of the left side paresis was observed. Seven months post-operatively, on the latest follow up, the owners considered that surgery had resulted in an improvement in their dogs quality of life.

Discussion/Conclusion: In this case, C2 laminotomy enabled satisfactory visualization of the vertebral canal, with preservation of the dorsal compartment and stabilizing ligaments, thus maintaining vertebral stability. Safe debulking was possible through this approach.

Repositioning of the dorsal arch of C2 maintained protection of the spinal cord and theoretically reduced the risk of laminectomy membrane formation.

TYPE IV DERMOID SINUS AND INTRAMEDULLARY DERMOID CYST ASSOCIATED WITH SPINA BIFIDA IN A CANE CORSO: A CASE REPORT

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Introduction: Dermoid sinus is a congenital malformation characterized by incomplete separation of the skin from the neural tube during embryogenic development. Six types and three subtypes of dermoid sinuses are described. Dermoid sinuses type IV are rarely reported, and extension of this malformation into the spinal cord as a dermoid cyst has not previously been described in veterinary medicine.

Case description: A 1-year-old male Cane Corso was presented for investigation of progressive paraparesis, hindlimb ataxia and hypermetria, associated with proprioceptive deficits of both hindlimbs.

The owner previously reported back pain and mental confusion. Physical examination and diagnostic imaging findings were suggestive of a dermoid sinus with spina bifida.

Results: After initial medical treatment with antibiotics and corticosteroids, surgical excision of the suspected dermoid sinus was carried out. During surgery, extension of the lesion into the spinal cord was evidenced, requiring partial durotomy and myelotomy for complete removal of the cyst. Histopathological examination of the excised tissue confirmed the diagnosis of a dermoid sinus associated with an intramedullary dermoid cyst. Following surgery, the dog showed progressive clinical improvement after an initial phase of temporary neurologic deterioration.

Discussion and Conclusion: Association of a type IV dermoid sinus with an intramedullary dermoid cyst and spina bifida is a unique finding in a small animal patient. Preoperative imaging is crucial for surgical planning, but may be misleading for determining the extent of the dermoid sinus. Dissection under operative microscope assistance is therefore recommended. Histopathological examination is necessary for definitive diagnosis.

OUTCOME OF NONVIABLE NONUNION FRACTURES IN DOGS AND CATS TREATED WITH AUTOLOGOUS CORTICOCANCELLOUS BONE GRAFT AND CIRCULAR EXTERNAL SKELETAL FIXATION

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Introduction: Nonunion is a serious complication in small animal orthopedics that will not resolve without further surgery. The aim of this study was to determine the midterm outcome of patients affected by nonviable nonunions of the tibia/fibula and radius/ulna treated with autologous corticocancellous bone graft and circular external skeletal fixation (CESF).

Materials and Methods: The outcome of 3 dogs and 3 cats affected by crural and antebrachial atrophic nonunion fractures treated with autologous corticocancellous bone grafts and CESF was retrospectively evaluated. Intraoperative and postoperative complications were recorded. Preoperative and postoperative radiographs were reviewed, and postoperative bone length was compared with the contralateral limb, measured from the radiographs taken at 24 weeks. The final clinical evaluation was undertaken 32 weeks after the surgical procedure.

Results: Eight weeks after surgery a bridging callus was radiographically evident on at least 3 out of 4 cortices in every patient. The limbs maintained an average of bone length (mean \pm SD) of $86.8 \pm 8\%$ (range 75.2%-98.5%) compared with the contralateral. Crural and antebrachial alignment was considered acceptable and no major complications were seen. The midterm outcome was judged excellent in 4 cases and good in 2 cases.

Discussion/Conclusion: All patients achieved bone union within 8 weeks after surgery. Our results encourage the use of CESF associated with autologous corticocancellous bone graft for the treatment of crural and antebrachial atrophic nonunions fractures in dogs and cats.

THE EFFECT OF INTERLOCKING HORIZONTAL-MATTRESS EPITENDINOUS SUTURE PLACEMENT ON THE BIOMECHANICAL PROPERTIES OF TENDON REPAIRS IN AN EX-VIVO CANINE CADAVERIC CALCANEAL TENDON LACERATION MODEL

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Introduction: Tendon laceration frequently requires surgical tenorrhaphy after partial or complete transection to enable re-establishment of collagen fibril alignment. Epitendinous sutures have several advantages including improved biomechanical strength of the repair over core sutures alone and minimizing tendon gapping. Our aim was to evaluate the effect of an interlocking horizontal-mattress epitendinous (IHME) suture in addition to three-loop pulley (3LP) sutures for tendon repair in an ex-vivo cadaveric model.

Materials and Methods: Twenty-eight cryopreserved gastrocnemius tendons were sharply transected after randomization and repaired with either a 3LP or 3LP+IHME. Tensile loads required to create a 1mm gap, 3mm gap, and construct yield and failure modes were analyzed. Significance was set at $p < 0.05$.

Results: Mean \pm SD yield force and force at failure for 3LP+IHME was $178.0 \pm 45.3\text{N}$ and $242.1 \pm 47.8\text{N}$ respectively, which was significantly greater compared to 3LP alone, $97.9 \pm 36.2\text{N}$ and $119.3 \pm 35.6\text{N}$ ($p < 0.0001$). Occurrence of gap formation to 1mm ($p < 0.001$) and 3mm ($p < 0.013$) was significantly less in the epitendinous suture group. Mode of failure was significantly different between groups ($p < 0.001$) with 3LP+IMHE patterns failing by suture breakage (13/14; 93%) compared to suture pull-through in the 3LP (11/14; 79%).

Discussion/Conclusions: Addition of an epitendinous suture significantly reduced gap formation between tendon ends and significantly increased yield (1.8x), peak (2.0x) and failure (2.0x) force of repairs. Limitations include its ex-vivo nature and no evaluation of cyclical loading. Use of an epitendinous suture pattern should be considered to significantly increase biomechanical strength of repairs however further testing in-vivo is necessary to evaluate the effect of suture use on tendinous blood supply.

AN ARTICULAR TYPE II MONTEGGIA FRACTURE WITH CONCURRENT HUMEROULNAR LUXATION IN A BENGAL CAT

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A 7 month-old Bengal cat presented with a fracture of the ulna trochlear notch with concurrent caudal luxation of the radial head and humero-ulnar luxation. Open reduction and internal fixation was performed using a lateral 2.0 mm locking compression plate to repair the ulna fracture and circumferential sutures passed through bone tunnels to treat the humero-ulna instability. Uncomplicated healing occurred and the cat regained normal elbow range of motion without any recurrence of lameness.

A CASE OF HUMERAL INTRACONDYLAR FISSURE PROGRESSING TO LATERAL CONDYLAR FRACTURE IN A CAT

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Introduction: HIF (Humeral Intracondylar Fissure) is a relatively common condition in the dog with spaniels being predisposed¹. It has also been reported in the Vietnamese potbellied pig², but to the authors knowledge this is the first report of HIF in a cat.

Case Description: An 8-year-old, male, neutered, Maine Coon cross presented with a right lateral humeral condylar fracture, after jumping from a low height. CT scan confirmed the presence of a partial humeral condylar fissure in the contralateral limb. Intra operative assessment of the condylar fracture surface found it to be sclerotic and discoloured, consistent with the appearance seen in dogs diagnosed with HIF¹. The fracture was anatomically reduced and stabilised with a transcondylar lag screw and caudolaterally applied locking plate. Assessment at 36 days post-surgery confirmed excellent function and radiographic evidence of fracture healing. The cat represented 279 days after the original surgery with a left lateral humeral condylar fracture, which was treated as previously described.

Results: The cat went on to make an excellent recovery from both surgeries.

Discussion/Conclusion: This report describes the first case of HIF in the cat which has significant implications for assessment and treatment of cats presenting with humeral condylar fractures.

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SPINAL FRACTURES AND LUXATIONS IN DOGS: A RETROSPECTIVE STUDY (2010-2015)

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Introduction: Aim of the study was to review canine cases with spinal fractures and luxations (SFL) and describe injury type and location, impact of damage on spinal cord, treatment, complications and outcome.

Materials and Methods: The records of 183 dogs diagnosed with SFL were reviewed and telephone follow-up was conducted to collect data regarding outcome (poor, functional, excellent). The severity of neurological signs was graded on a 5-grade scale.

Results: Road traffic accident was the most common cause of trauma (44.3%) and the combination of fracture-luxation was most commonly recorded (44.8%). Over two-thirds of the population (69.4%) were paraplegic, with nociceptive deficits. The lumbar spine was the most commonly affected region. Twenty-five dogs manifested Schiff-Sherrington posture. Concurrent injuries and multiple spinal injuries were also identified. Thirty-seven dogs were euthanised on the day of presentation. Eighty-one dogs were managed conservatively and sixty underwent surgical treatment. Complications were evident in both groups. Outcome was poor in 49.2%, functional in 10.9%, excellent in 6.6% and unknown in 33.3% of the dogs. Dogs with intact nociception had a favourable outcome irrespective of method of treatment. Finally, 9/54 severe cases with absent nociception regained motor function, seven of which were also reported to have regained nociception.

Discussion: Most of our findings are consistent with and support the relevant literature. Despite the limited follow-up in our study, of the dogs with recorded outcome, both the surgically and conservatively treated cases showed clinical improvement. Interestingly, nine dogs with severe spinal cord injury survived and recovered motor function with/without nociception irrespective of treatment method.

BIOENGINEERING A NOVEL GROWTH FACTOR SYSTEM FOR FRACTURE NON-UNION: FIRST SUCCESSFUL TREATMENT OF A DOG

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Strategies for promoting bone healing are required in veterinary patients in specific situations where healing is problematic, such as in fracture non-union. Bone morphogenetic protein-2 (BMP-2), is a powerful signalling molecule that has the potential to drive bone regeneration. Human BMP-2 can be manufactured as a recombinant protein (rhBMP-2), and has been used successfully in dogs to augment treatment of fracture non-union. When used to drive bone healing in humans, rhBMP-2 is delivered in supra-physiological doses that are expensive, and can cause side effects. A bioengineering group have established a poly (ethyl acrylate) (PEA) and fibronectin (FN) coating technique that enables rhBMP-2 to

be bound effectively to a material surface and presented to cells in a biomimetic manner with potent effect. The bound rhBMP-2 will control the differentiation of osteoblast-forming cells (e.g. mesenchymal stem cells) and the production of bone by the resulting osteoblasts. The system has the potential to drastically reduce the required rhBMP-2 dose and deliver it directly to the site of regenerative demand. The rhBMP-2 remains bound and localized to the material, and therefore undesirable off-target effects should be minimised. Furthermore, rhBMP-2 is expensive and reducing the dose should reduce the cost of treatment. Here we report the first translation of this methodology from laboratory to clinic. We treated a two-year-old Münsterländer dog with an atrophic non-union of the humerus. Radiographic union was achieved just seven weeks post-operatively, and nineteen months after surgery the dog is reported by her owner to have a good quality of life.

USE OF A CUSTOM ADDITIVE MANUFACTURED TITANIUM PLATE FOR CRANIOPLASTY IN A DOG WITH MULTILOBULAR OSTEOCHONDROSARCOMA

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The emergence of additive manufacturing technology has enabled the development of patient-specific implants for surgical reconstruction. The use of this technology has the potential to improve surgical accuracy and clinical outcomes. An 9-year-old spayed female daschund presented for a 7.2 × 5.2 × 6.7 cm cranial mass involving approximately 70% of the dorsal calvarium and invading into the frontal sinus. Histopathology was consistent with a multilobular osteochondrosarcoma (MLO). Based on evaluation of the CT scan, surgery was deemed feasible.

The CT scan was exported as DICOM files, which were reconstructed using Materialise Mimics and the stereolithography (.stl) file was exported for printing. A life-sized 3D model of the patient and tumour was printed. Concurrently, a cutting guide was designed and printed in plastic and confirmed to fit on the printed skull. The DICOM file was exported to OSIRIX and the tumor margin was identified with regions of interest (ROIs) in all directions. A defect with 5mm margins beyond the tumor was created. The plate was designed using ADEPT cranial plate software with the anticipated defect. A custom additive manufactured titanium implant was printed.

Surgery was performed successfully and the patient was discharged from hospital 48 hours postoperatively with no neurologic signs. Histopathology confirmed an MLO with complete surgical margins. The reported case is the first known clinical use of additive manufacturing for the successful creation and

application of a patient-specific titanium plate for reconstruction following canine cranioplasty.

SURGICAL REDUCTION OF SACRO-CAUDAL LUXATION IN DOG WITH LOSS OF TAIL MOBILITY AND DEEP PAIN NOCICEPTION: A CASE REPORT

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Introduction: Sacro-caudal luxation can be associated with injury to the sacral and/or caudal nerves roots, which can result in loss of tail nociception, tail paralysis and urinary incontinence. In cats, this pathology is well-known and depending on neurological assessment, several treatment options are available. When sacro-caudal luxation is associated with loss of tail nociception and tail paralysis, but preserved urinary continence, surgical stabilization is advisable. However, little information is available concerning sacro-caudal luxation surgery and prognosis in dogs.

Case Description: A 25 kg large crossbreed dog presented with sacrocaudal luxation associated with a loss of tail nociception and mobility. Surgical approach to the sacro-caudal region was performed. A 0.8 pin was inserted in both the sacro-caudal articular processes in a dorso-medio to ventro-lateral direction, and a tension band wire placed between the ventral and dorsal part of each pin.

Results: Dog tail mobility recovery was observed after 14 days and good vertebral alignment was still maintained after 2 months follow up.

Conclusion: In the author's opinion, this new surgical stabilisation technique could be an effective substitute for high tail amputation in dogs, promoting recovery of tail mobility. Furthermore, it avoids the challenges raised by the more developed, and caudally oriented, transverse processes in dogs, which make the application of the technique used in cats more challenging in dogs.

FEATURES OF THE CANINE C2-C3 SPINAL CORD VASCULAR ENVIRONMENT

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Introduction: Haemorrhage is the main peri-operative complication encountered when surgically approaching the cervical spine. Anatomical structures such as the interarcuate branches are poorly described in the veterinary literature. The purpose of this study is to describe the exact anatomic location and size of the interarcuate branches at the level of the C2-C3 intervertebral space in dogs.

Material and Methods: The cervical spines of 5 mid-sized dogs were harvested. The ventral venous plexuses were injected with latex, 2 of them with a barium sulfate mixture to undergo a CT-scan. The 5 injected samples underwent thorough dissection of the C2-C3 intervertebral space through a dorsal laminectomy. The C2-C3 region of 5 small breed dogs was also harvested and prepared for histological examination.

Results: Interarcuate branches arose from the ventral venous plexus at the level of the intervertebral vein, caudally and cranially to the intervertebral foramen, and merged dorsally. No communication was observed on CT or dissection. The dissection showed the cervical fibrous sheath against the inner cortex. It could be easily separated from the lamina. The interarcuate vein plunged in this membrane at the level of the intervertebral foramen and latex could be found between the bone and the membrane dorsally. On histological examination, a dorsal communication of the interarcuate branches were found in a split of the fibrous sheath, that was adherent to the ligamentum flavum, when it was present.

Discussion/Conclusion: The interarcuate branches may be encountered when performing a lateral or dorsal approach of the C2-C3 intervertebral space.

INDUCED-MEMBRANE TECHNIQUE FOR THE TREATMENT OF CHRONIC POST-TRAUMATIC OSTEOMYELITIS REQUIRING MASSIVE SEGMENTAL BONE RESECTION IN TWO DOGS

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Introduction. Regeneration of large bone defects resulting from chronic post-traumatic osteomyelitis (CPTO) represents a challenge both in human and veterinary medicine. The present study reports the use of the Induced-membrane technique (IMT) for the treatment of CPTO in 2 dogs.

Case descriptions: A 7 year-old Golden Retriever (case 1) with an open humeral fracture treated with plating, and a 9 year-old crossbreed dog (case 2) with a closed radio-ulnar fracture treated with plating followed by external fixation, were referred with CPTO. Treatment consisted of two-stage IMT with antibiotherapy given after both procedures based on culture and sensitivity results.

Results and Discussion: Radical excision of infected /necrotic bone resulted in critical size bone defects of 5 cm and 4 cm in length, equivalent to 2 and 3 times the bone diameter respectively. Good functional outcome, with full bone regeneration and resolution of infection, was observed within 6 months of grafting in both cases. Implant revision with additional plating was necessary in case 1.

Conclusions: This is the first report focusing on the use of the IMT for the treatment of CPTO in 2 dogs in which the technique efficiently treated bone infection and regenerated critical size long bone defects. Further clinical cases are however needed to recommend routine use of the technique for the treatment of CPTO with extensive bone loss in dogs.

POSTERS: SMALL ANIMAL SOFT TISSUE

SEGMENTAL MANDIBULECTOMY AS A NOVEL ADJUNCT MANAGEMENT STRATEGY FOR THE TREATMENT OF AN ADVANCED CHOLESTEATOMA IN A DOG

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Introduction: Surgical treatment can be curative for cholesteatomas. However, a high recurrence rate and poor survival times have been demonstrated in patients with advanced lesions causing neurologic signs and/or trismus. The aim of this manuscript was to report the long-term outcome of a segmental mandibulectomy used as a novel, adjunct management strategy to treat an advanced cholesteatoma.

Case Description: A 6-year-old female spayed Labrador retriever was presented for a 10-month history of head and neck sensitivity progressing to pain on opening her mouth, trismus and peripheral vestibular syndrome. Computed tomography demonstrated a proliferative mass arising from the tympanic bulla consistent with a cholesteatoma. A total ear canal ablation, bulla osteotomy and adjunct segmental mandibulectomy was performed.

Results: Within 36-hours after surgery, the patient was comfortably eating. At re-evaluation 2 weeks after surgery, no neurologic abnormalities were noted and the patient continued to do well with normal jaw opening and no pain. At 33-months post-operatively, the patient was evaluated for reluctance to prehend food and halitosis. A follow-up CT scan showed changes concerning for recurrence of the cholesteatoma. However, repeat surgical intervention for the cholesteatoma was not pursued as the owner appreciated the dog's comfort level to be satisfactory following treatment of the mandibular drift. The patient has continued to do well for the 42-month follow-up period since surgery.

Discussion/Conclusion: Segmental mandibulectomy could be utilized as an adjunct therapy in the treatment of advanced cholesteatoma resulting in reduced mouth opening and pain to facilitate early and long-term resolution of clinical signs.

THE EFFECT OF A CRICOID STENT ON THE RIMA GLOTTIDIS AND INTRALUMINAL LARYNGEAL PRESSURE IN DOGS

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Introduction: Brachycephalic dogs with severe laryngeal collapse are difficult to manage with limited surgical options available. Failure of techniques and poor client acceptance of permanent tracheostomy results in euthanasia in many cases. To overcome these limitations we have developed a novel extraluminal subcartilaginous cricoid stent for the treatment of laryngeal collapse. The aim of this study was to evaluate the effect of the stent on the area of the rima glottidis and intraluminal laryngeal pressure.

Materials and methods: Cricoid stents designed to conform to the shape of the cricoid cartilage of normocephalic dogs were tested in 8 cadaveric larynxes. The stent was placed in the space created by separating the cricoid cartilage from its mucosa. Inspiratory airflow through the larynx was generated by a custom made machine, and the resultant intraluminal pressure was measured using an inclined manometer. The rima glottidis was photographed during testing using an identical technique for all specimens, and the photos were used to determine the area of the rima glottidis. Intraluminal pressure and area of the rima glottidis was determined both prior and subsequent to placement of the cricoid stent.

Results: Placing the stent resulted in a significant increase ($P < 0.05$) in the area of the rima glottidis, and significant decrease ($P < 0.05$) in negative intraluminal laryngeal pressure.

Conclusion: The stent caused an increase in the area of the rima glottidis and less negative intraluminal laryngeal pressure. A stent placed in this location may provide an alternative strategy for dogs with severe laryngeal collapse.

TOPICAL ADMINISTRATION OF LIDOCAINE ON MESOVARIUM DURING OVARIOHYSTERECTOMY IN CATS

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Introduction: The objective of this study was to assess the intraoperative analgesic effect of lidocaine administered topically on the ovarian pedicles in cats subjected to OHE during dissociative anaesthesia.

Material and Methods: In this prospective, randomized and blinded study, cats were pre-medicated with medetomidine, methadone, and meloxicam. Ketamine was injected intramuscularly

for induction of anaesthesia. Cats were assigned to one of two groups where group L received lidocaine as topical application on the ovarian pedicles and group NaCl received an equal volume of sodium chloride at the same sites. Systolic and diastolic blood pressure and heart rate were measured every second minute. Mean values for those parameters were compared between the two groups at seven time points: T1 = after ketamine induction; T2 = start of surgery; T3 = administration of local anaesthesia; T4 = ligation and extirpation of the first ovary; T5 = ligation and extirpation of the second ovary; T6 = cervix; T7 = suturing of linea alba.

Results: 25 female cats were included. Bodyweight was 3.1 ± 0.8 kg (mean \pm SD) and age was 28 ± 27 months. There were no significant difference between groups concerning systolic or diastolic blood pressure, or heart rate. In both groups, blood pressure increased at removal of ovaries compared to start of surgery.

Discussion/Conclusion: There were no differences of the intraoperative surgical stress response between the groups. Based on surgical stress, the study offered no supportive evidence for use of local anaesthesia at the ovarian pedicles in feline OHE.

LAPAROSCOPIC TREATMENT OF A PARAPROSTATIC CYST IN A DOG

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Introduction: Prostatic cysts are accumulations of glandular secretions from the prostatic parenchyma and are uncommon in dogs. Cyst resection, drainage and omentalization is the treatment of choice. The aim of this case report is to describe the laparoscopic treatment of a paraprostatic cyst (PPC) in a dog for the first time.

Case Description: Laparoscopic partial resection, drainage and omentalisation of a PPC was performed through four abdominal 5mm ports situated one on midline caudal to the umbilicus, one on the medium-left abdominal region and two on the right caudal abdomen. Abdominal ultrasonography showed a right cranial PPC and an inguinal herniated PPC cyst after the patient was presented for inguinal enlargement.

Results: The intra-abdominal PPC was treated laparoscopically and the patient recovered uneventfully and without clinical or ultrasonographic complications during 15 months follow up.

Discussion: PPC is uncommon, and affected dogs present with fluid-filled structures arising from the prostate gland for which the treatment of choice is partial or complete resection, drainage and omentalization. To avoid morbidity and disadvantages related to a parapreputial laparotomy approach, this case was treated laparoscopically. In this case, laparoscopic treatment of a PPC was a feasible technique with low morbidity, fast recovery and good outcome.

POSTOPERATIVE VARIATION IN ACUTE PHASE PROTEINS IN CATS

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The acute phase response is a process that reflects all changes that occur in the organism of an animal after suffering a tissue injury which aims to re-establish homeostasis. During this response there are variations in the levels of acute phase proteins (APPs) and these variations can be used to evaluate the systemic response to infection, inflammation or tissue trauma. The objective of this study was to assess the variation of certain acute phase proteins in cats undergoing ovariectomy to determine their usefulness in monitoring postoperative inflammation.

48 female cats were included. Ovariectomy was performed by celiotomy (approach through linea alba) and by laparoscopy. For each patient, serum was extracted for evaluation of the following APPs: albumin (ALB), paraoxonase-1 (PON-1), serum amyloid A (SAA) and haptoglobin (HP). The evaluation times were: presurgical, and 6,12 and 24 hours after surgery.

The results showed that from 6 hours post-surgery, there was a significant increase in SAA, with the highest values at 24 hours post-operatively, decreasing subsequently at 48 hours post-operatively. For the rest of the APPs evaluated (HP,ALB and PON-1),there were no significant changes in any of the values at any times.

SAA is the most sensitive APP in the feline species for the assessment of postoperative inflammation in this model. More studies are needed in order to evaluate the rest of the APPs assessed here as potential indicators of inflammatory and infectious processes in cats.

CONGENITAL LOBAR EMPHYSEMA, HIATAL HERNIA AND SECONDARY NUTRITIONAL HYPERPARATHYROIDISM IN A 2 MONTH-OLD KITTEN

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Introduction: Congenital lobar emphysema (CLE) is a rare cause of dyspnea due to over inflation of a lung lobe.

Case Presentation: A 2 month-old domestic Shorthair kitten was presented with respiratory distress and a history of walking difficulties and raw diet feeding. At presentation, the cat had dyspnea with muffled heart and lung sounds, and difficulties in standing. Radiographs showed right mediastinal shift, hyperinflation of the left lung field,

possible stomach herniation, and diffuse decreased bone opacity. Hypocalcemia and respiratory acidosis were present on blood gas analysis. The clinical and radiological findings led to a diagnosis of suspected CLE, stomach herniation and secondary nutritional hyperparathyroidism. After sternotomy and laparotomy, the left apical lung lobe appeared emphysematous and a hiatal hernia was present. The latter was reduced and lung lobectomy was performed. After surgery, the cat experienced symptomatic hypocalcemia with recumbency and urinary retention, which was managed with calcium supplementation and a urinary catheter for 48 h. The cat was discharged after 4 days with a balanced diet and temporary oral calcium supplementation. Histology confirmed diffuse lobar emphysema associated with bronchial cartilage dysplasia.

At 1-month check-up, the cat had a normal gait, ionized calcium and breathing pattern.

Discussion: This is the second case of CLE reported in kittens and the first one associated with hiatal hernia and secondary nutritional hyperparathyroidism. These latter conditions negatively affected the cat's initial clinical condition and the post-surgical period. CLE should be considered a differential diagnosis of respiratory distress in kittens, and carries a favourable prognosis if promptly diagnosed and treated.

TWO-PORT LAPAROSCOPIC PROPHYLACTIC GASTROPEXY VIA EXTRACORPOREAL FULL-THICKNESS BODY WALL SUTURE COMBINED WITH OVARIECTOMY IN TWO DOGS

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Introduction: This report describes the operative technique and long-term outcome of two-port laparoscopic prophylactic gastropexy (PG) via extracorporeal full-thickness body wall suture combined with ovariectomy.

Case Description: Two large breed dogs were referred for laparoscopic PG and ovariectomy. Laparoscopic ovariectomy two-port technique was performed. Placing the patients in reverse Trendelenburg position a skin incision was made caudal to the last right rib following the line chosen for peritoneal gastropexy site incision. The stomach was apposed to the abdominal wall with laparoscopic 5 mm Babcock grasping forceps and suspended two trans-abdominal stay sutures. A longitudinal incision was made into the peritoneal gastropexy site and into the seromuscular layer of the pyloric antrum using 5 mm laparoscopic scissors. The seromuscular layer of the stomach at the peritoneal incision site were sutured with a simple continuous suture tied extracorporally.

The portal and gastropexy sites were closed with simple interrupted suture. Follow-up was pursued through phone interview to the owners at 4, 12, 26 and 60 weeks.

Results: Median duration of surgery was 47 minutes. No minor or major complications were seen intraoperatively nor postoperatively and the owners have been satisfied with the procedure. No clinical signs of gastric dilatation-volvulus were reported at 60 weeks follow-up.

Discussion/Conclusion: To the author's knowledge this is the first report of two-port laparoscopic PG via extracorporeal full-thickness body wall suture combined with ovariectomy in dogs. According to our experience this seems a safe, uncomplicated and effective technique to combine PG and OVE.

COMPARISON OF CLINICAL OUTCOMES AND PROGNOSTIC FACTORS FOLLOWING NORMOGRADE OR RETROGRADE CATHETERIZATION OF THE COMMON BILE DUCT DURING CHOLECYSTECTOMY IN DOGS WITH CONFIRMED GALL BLADDER MUOCOCELE

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Gall bladder mucoceles (GBM) are defined as discrete accumulations of mucus leading to GB distension, secretory dysfunction and varying degrees of common bile duct (CBD) obstruction. Cholecystectomy is generally indicated for GBM causing extrahepatic biliary obstruction. Intraoperatively, cholecystectomy is often preceded by cannulation with either retrograde or normograde flushing of the CBD to ensure luminal patency.

Medical records of dogs with GBM treated surgically from two veterinary-teaching hospitals were reviewed. Signalment, history, clinical signs, results of selected clinicopathologic analyses, abdominal imaging, surgical interventions performed including method of CBD catheterization and flushing, histologic biopsy results, and survival were recorded. Follow-up information was obtained via telephone communication.

Diagnosis of GBM was confirmed in 121 dogs with concurrent rupture at surgery in 33 dogs (26.4%) and bile peritonitis in 45 dogs (36.5%) that was not associated with development of complications (P = 0.73) or non-survival (P = 0.76). Patency and surgical technique for catheterization of the CBD was performed at the discretion of the primary surgeon with retrograde flushing in 53 dogs (42.4%), normograde flushing in 69 dogs (55.2%), and both methods in 3 dogs (2.4%). Multivariate analysis showed catheterization method was not significantly associated with complications (retrograde flushing: OR 0.30; P = 0.23) or survival to discharge (retrograde flushing: OR

1.99; $P=0.4$). In addition, each 1-kg (2.2-lb) increase in body weight, and 0.1 increase in post-operative bilirubin value were associated with an 8% and 34% increase in the odds of non-survival to discharge respectively. No associations between method of surgical CBD catheterization were found. Elevation in post-operative serum bilirubin concentrations in dogs undergoing cholecystectomy for GBM is associated with poor clinical outcome.

THE USE OF METHYLENE BLUE FOR PAROTIDECTOMY DUE TO BENIGN DISEASE IN 3 DOGS

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Introduction: Parotidectomy is a technically challenging surgery, mostly due to the close association of the gland with the surrounding structures, including the facial nerve. The literature about complete parotidectomy in dogs is scarce, but the morbidity is high. Methylene blue has been used to overcome the most common complication of facial nerve injury in people. The purpose of this study was to characterize its usefulness and feasibility in dogs.

Cases Description: Prospective case series included 3 dogs with a fluctuant, fluid-filled swelling over the lateral aspect of the face. Cross-sectional imaging was used to confirm the localization of the parotid gland. Injection of methylene blue was achieved via cannulation of the Stenson's duct intraoperatively. **Results:** No spillage of methylene blue was observed and the gland stained dark blue within seconds. Complete parotidectomy was achieved successfully after injection of methylene blue. The staining was useful to identify innervation outside the coloured gland and facilitated dissection. No postoperative complications were recorded nor recurrence of the clinical signs within a mean follow-up period of 15 months.

Discussion/Conclusion: Methylene blue staining for complete parotidectomy in dogs is feasible, easy, affordable and not time consuming. It can be used as an indirect facial nerve identification technique, and could therefore facilitate dissection and reduce the incidence of post-operative facial nerve paralysis.

PULMONARY VALVE REPLACEMENT UNDER CARDIOPULMONARY BYPASS WITH BEATING HEART IN A PORCINE MODEL

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Introduction: Pulmonary regurgitation (PR) is an undesired condition after patch grafting surgery in dogs with severe

pulmonary stenosis (PS). We applied a tridimensional modelling to design a trileaflet pulmonary valve made of autologous pericardium. The leaflets were surgically implanted under CPB, on a beating heart. The aim of this study is to test the feasibility of this technique in an acute porcine model.

Material and Methods: Prospective research ($n = 5$), weight (18 ± 5.2 kg), pulmonary annulus (18.7 ± 3.2 mm), pulmonary valve gradient (PVG) (3.1 ± 1.2 mmHg). Through a left thoracotomy, the pericardium was removed, fixed in 0.6% glutaraldehyde for 10 minutes and washed in 0.9% saline solution. Then, using a designed template, 3 pulmonary leaflets were drawn and cut. A beating heart CPB (80 ml/kg/min) with mild hypothermia was conducted. The main pulmonary artery was transversely opened, the native leaflets were resected, and the new leaflets were sutured with 5-0 polypropylene and secured with ePTFE pledget. Afterwards, the arteriotomy was reconstructed and the CPB was weaned at 37°C for transthoracic echocardiography. Then, the animals were euthanized.

Results: The duration of valve replacement was 84 ± 21 minutes, CPB time was 149 ± 52 minutes, and PVG was 5.1 ± 1.7 mmHg.

Discussion/ Conclusion: It is possible to perform and implant a autologous pericardium trileaflet valve, without evidence of PR or PS after CPB surgery. This model could be applied in combination with open patch grafting.

LONG-TERM COMPARISON OF THIN FILM BANDING WITH AMEROID RING CONSTRICTOR FOR THE TREATMENT OF EXTRAHEPATIC CONGENITAL PORTOSYSTEMIC SHUNTS IN DOGS

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Introduction: Surgery is the current accepted method for congenital portosystemic shunts (CPSS) in dogs. Acute shunt ligation may not be tolerated in as many as 84% of animals. Commonly used gradual attenuation methods are the ameroid constrictor (AC) and the thin film band (TFB). Evidence comparing these techniques is currently limited.

Methods: Data were retrospectively collected for dogs that underwent surgery for extrahepatic CPSS by TFB or AC relating to signalment, pre-, intra- and post-operative management and short-term outcomes. Data on revision surgeries were reviewed. Long-term outcomes were obtained by use of an online owner-directed health related quality of life questionnaire. Data were reported with summary statistics.

Results: Seventy-six client owned dogs were included ($n = 53$ TFB; $n = 23$ AC). Postoperative complications (and mortality) occurred in 26% (9%) and 30% (4%) of dogs in the

TFB and AC group respectively. Persistent shunting was identified in 31% of surviving dogs in the TFB group and in 0% in the AC group. Revision surgery was performed in 14 dogs treated initially with TFB and no dogs treated initially with AC. Out of those, 67% achieved favorable outcomes.

Conclusion: The success of surgical treatment with AC was greater than with TFB while TFB produced a relatively high rate of failures requiring revision surgery. AC provided a more reliable way of achieving complete shunt attenuation, than TFB. Overall long-term outcomes were similar between the two groups, although the overall proportion of dogs with ongoing clinical signs was greater than previously reported.

LIVER LOBE TORSION IN A CAT PRESENTED WITH HEMOABDOMEN

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An 11-month-old, spayed female domestic shorthair cat was presented for evaluation of acute onset severe lethargy. On physical examination, the cat was laterally recumbent, hypothermic, bradycardic, with pale pink mucous membranes, bounding pulses and a distended abdomen. A point of care ultrasound showed significant abdominal effusion and abdominocentesis showed hemoabdomen. The bloodwork revealed regenerative anemia, neutrophilia, hypoproteinemia, hypoalbuminemia, increased alanine aminotransferase, hyperlactataemia and hypokalemia.

The cat was warmed up and received a first transfusion of cat erythrocytes and a second transfusion with DEA 1.1 negative dog erythrocytes. After stabilization, abdominal ultrasonography examination revealed a large volume of free echogenic fluid in the abdominal cavity probably associated with torsion of the right medial liver lobe and gallbladder.

Exploratory laparotomy was performed, revealing torsion of right medial and quadrate hepatic lobes together with the gallbladder. Lobectomy of the affected lobes and cholecystectomy were performed using a surgical stapler. The cat was discharged after 4 days with no sign of hemolysis. Histopathologic examination of the right medial liver lobe showed a pseudocyst with torsion of a hepatic lobe and hemorrhagic infarction associated with a mucocele. One month postoperatively, the cat had completely recovered. Hematology was normal and alanine aminotransferase and aspartate aminotransferase were slightly increased.

Hepatic lobe torsion is very uncommon in cats with variable clinical signs. This is the first report of the successful treatment of a right medial and quadrate hepatic lobe torsion with concurrent hemoabdomen.

UNEXPECTED MORPHOLOGIES HAMPER SURGICAL DISSECTION AND LIGATION OF PERSISTENT DUCTUS ARTERIOSUS IN DOGS

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Introduction: Although minimally invasive occlusion of persistent ductus arteriosus (PDA) has become the mainstream approach, circumferential ductal ligatures remain the preferred treatment option in very small patients and with extremely large PDAs. However, it appears that not all PDA morphologies are amenable to surgical ligation.

Materials and Methods: Intra-operative images and/or necropsy findings of dogs with a PDA with unusual morphologies were retrospectively reviewed.

Results: In 2 dogs, the PDA was nothing more than a waist between the aorta and the main pulmonary artery whereas 3 cases of intramural PDA were observed. In the latter, a crease between the ductal-aortic segment and the main pulmonary artery was visible caudally. However, cranially, a plane of dissection could not be established between aorta, cranial border of the PDA and main pulmonary artery because the ductus ran completely within the wall of the aorta.

Discussion/Conclusion: Ductal morphology can have serious implications during surgical dissection and/or ligation of a PDA. In some dogs, the DA hardly separates from the pulmonary artery in its central zone before it joins the aorta whereas in others there is no region at all in which the DA is separated from the adjacent vessels and the entire ductus (and not only a segment) courses within the wall of the aorta. Certain PDA morphologies preclude surgical dissection and/or subsequent double ligation of the PDA. Surgeons should realize that such unusual cases do exist and interrupt the surgery whenever the suspicion is high.

SURGICAL TREATMENT OF A TYPE IB CHOLEDOCHAL CYST USING CHOLEDOCHOJEJUNOSTOMY IN A DOMESTIC SHORTHAIRED CAT

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Introduction: This case described the use of CT in the diagnosis and classification of a choledochal cyst in a cat, and surgical management of a type Ib cyst using choledochojunostomy.

Case Description and Results: A cat was presented for dysorexia, chronic weight loss and apathy. Serum biochemistry showed a moderately increased bilirubin concentration. On ultrasonography, a large, fusiform cystic lesion with lithiasis, adjacent to the duodenum, was observed. On CT scan, the gallbladder appeared mildly enlarged and filled

with mineralizations. The cystic duct was tortuous and enlarged and the common bile duct appeared collapsed by a large choledochal cyst. A type Ib choledochal cyst was diagnosed. At surgery, a cystic lesion of the common bile duct was confirmed and a choledochojejunostomy was performed. Histopathology revealed a moderate cholecystitis, fibrous choledochal cyst and chronic cholangitis. A complete blood count and serum biochemistry was within references limits at 2 and 6 weeks after surgery. On ultrasonography, a persistent slight dilatation of the choledochal cyst was still present. The cat was presented 5 months after surgery with severe regenerative anemia. The owners declined further therapeutic measures and elected for euthanasia.

Discussion and Conclusions: In humans, MR cholangiopancreatography is the gold standard for evaluation and diagnosis of choledochal cysts. CT scan allowed evaluation, description and classification of the choledochal cyst in this cat. No gold standard treatment has been proposed for management of choledochal cyst, but choledochojejunostomy/duodenostomy may be considered as a surgical option.

SURGICAL TREATMENT OF FELINE INTRACRANIAL MENINGIOMAS: A RETROSPECTIVE STUDY OF 26 CASES

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Introduction: Surgical excision is the treatment of choice for feline intracranial meningioma. The objective of this study was to report clinical findings, complications and outcomes following surgery.

Material and Methods: Medical records (01/2000-01/2017) of cats that underwent surgical excision of an intracranial meningioma in our institution were reviewed. Patient data included signalment, clinical signs, surgical technique, complications, histopathologic diagnosis, survival time and owner's answers to a satisfaction questionnaire. The Kaplan-Meier method was used to evaluate the survival characteristics and logrank test to compare Kaplan-Meier curves.

Results: Of 26 cats identified, 24 fulfilled inclusion criteria, 20 were included in the survival analysis. The exact cause of death was known in 17 cases. Overall median survival time (MST) was 881 days (95% confidence interval 518; 1248). Cause of death was not related to meningioma in 9/17 cases. Age of cat did not influence survival ($P = 0.94$) or occurrence of complications ($P = 0.051$). Complications occurred in 13/24 cats with 4/24 considered dramatic. Complications

appeared mostly in the first 24 hours post-operatively (12/13). Males had more postoperative complications ($P = 0.042$), in particular more convulsions ($P = 0.016$). Cats with cranioplasty had fewer complications ($P = 0.021$). Clinical recurrence was confirmed in 3 out of 17 cats. Recurrence-free survival time was 826 days. Most of the owners were satisfied with the outcome (12/14).

Discussion/Conclusion: Surgical treatment of intracranial meningioma in cats allows long MST with no effect of age at the time of surgery, and a high percentage of minor and major complications that could be reduced by cranioplasty.

SURGICAL FINDINGS AND TREATMENT OF SPONTANEOUS PNEUMOTHORAX SECONDARY TO CONFIRMED OR SUSPECTED MIGRATING VEGETAL FOREIGN BODY IN 27 DOGS AND 1 CAT

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Introduction: Spontaneous pneumothorax (SP) is rarely reported in the veterinary literature and migrating vegetal foreign bodies (MVFB) account for 5% of reported SP. The aim of this study was to describe the surgical findings and treatment of SP secondary to MVFB confirmed or suspected by computed tomography (CT).

Material and Methods: Cases undergoing CT consistent with SP secondary to MVFB and thoracic surgery were retrospectively reviewed and divided into 2 groups according to whether CT positively identified (group 1) or only suspected (group 2) a MVFB.

Results: Sixteen dogs and 1 cat were included in group 1 and 11 dogs in group 2. Surgeries were performed via thoracotomy ($n = 16$), thoracoscopy ($n = 2$) or thoracoscopic assisted surgery with mini thoracotomy ($n = 11$). An agreement between lobes affected on CT and the surgical findings was observed in 27/30 (90%) of cases. A MVFB was identified during surgery in 13/17 of cases of group 1 and in 6/11 of group 2. In 8/27 of cases, a lung perforation was identified with no MVFB found. Twenty-nine lobectomies (17 partial and 12 total lobe) and one perforation suture were performed. No recurrence of pneumothorax was observed in any case. A second surgery (MVFB removal) was performed in 4 dogs with recurrent draining tracts.

Discussion/conclusion: CT identified the perforated lobes in 90% of animals in this study and surgery resulted in a resolution of SP in all cases. When perforated lung lobes secondary to MVFB are treated without removal of foreign materials, clinical signs of draining tract can develop.

THE EFFECT OF PERINEAL URETHROSTOMY ON THE URETHRA OF THE CAT. A CADAVERIC STUDY

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Objective: The aim of this study was to characterize the changes that occur in the pelvic urethra after performing a perineal urethrostomy (PU).

Study Design: Cadaveric study.

Study group: 10 castrated adult male cats

Methods: Four radio-opaque markers were placed on the pelvic urethra, at predefined locations, via a ventral approach to the peritoneal and pelvic cavities. Two orthogonal radiographic views of the caudal abdomen and pelvis were acquired immediately after placing the markers. A perineal urethrostomy was performed, using a standard technique, with the cadavers placed in ventral recumbency. Immediately after performing PU radiographs were repeated using the identical technique. The distance of each marker from a predefined origin, and the relative positions of the markers relative to one another were measured on all the radiographs.

Results: Perineal urethrostomy resulted in significant caudal translation of the markers. The mean distance between each marker and the origin was significantly increased, on both lateral and ventrodorsal radiographic views, after PU. However, PU did not result in a change in the relative mean distances between the markers on either of the radiographic views.

Conclusions: This study demonstrates that caudal translation of the urethra is the major component of urethral mobilization when performing a perineal urethrostomy.

Clinical Significance: Understanding the effect of PU on the pelvic urethra is important when considering the use of this technique for treating urethral disease cranial to the bulbourethral glands.

COMBINED EXTRA- AND INTRAORAL APPROACH MAXILLECTOMY WITH VENTRAL ORBITECTOMY FOR EXCISION OF ORAL TUMOURS IN CATS

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Introduction: Oral tumours in cats are highly infiltrative. Caudally located tumours are especially difficult to remove with a tumour-free margin with standard intraoral approach maxillectomy. Combined extra- and intra-oral approach maxillectomy combined with partial orbitectomy preserving the globe was described in the dog to improve outcome. The objective of this study was to describe the technique and feasibility of a similar approach in cats.

Material and Methods: Medical records of cats undergoing combined extra- and intra-oral approach maxillectomy with ventral orbitectomy in a single referral institution were reviewed. The key points of the surgical technique are: good level of analgesia, performing the extraoral approach first, gaining access to the oral cavity by creating a bipedicle flap which will later facilitate closure, continuing the dissection through the intraoral approach, performing the ventral orbitectomy last to avoid prolonged bleeding from the maxillary artery, and using an osteotome to protect the globe.

Results: Five cats were treated for squamous cell carcinoma, soft tissue sarcoma and osteosarcoma. Intraoperative complications included hypotension, bleeding leading to hypotension and hypothermia. Postoperative complications included dehiscence in 2 cases, excessive sneezing of haemorrhagic mucus in 1 case and anorexia in 1 case.

Discussion/Conclusion: This technique appears to represent a viable and safe option for excision of maxillary tumours in cats. Further studies are required to assess the effect of this technique on survival of the cats with maxillary tumours.