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# Scientific Presentation Abstracts: 2018 European College Veterinary Surgeons Annual Scientific Meeting, July 4-6, 2018 - Athens, Greece

## LARGE ANIMAL

### RESIDENT'S FORUM - LARGE ANIMAL

#### IN VITRO EVALUATION OF THE MECHANICAL AND PHYSICAL PROPERTIES OF THE FORWARDER KNOT EXPOSED TO FLUID MEDIA USING LARGE GAUGE SUTURE

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**Introduction:** Knot configuration affects the strength of ventral midline celiotomy closure in horses. Self-locking knots have demonstrated higher knot holding capacity (KHC), higher relative knot security (RKS), lower knot weight and volume compared to surgeons' knots. The forwarder knot has only been tested under dry conditions. The objective of this study was to evaluate the effect of exposure to media (equine fat and balanced electrolyte solution) on the KHC, RKS, weight and volume of the forwarder knot compared to the surgeon's knot.

**Materials and Methods:** Forwarder knots completed with 3 USP polyglactin 910 were tested on a universal testing machine following short term exposure to fat or saline; control suture remained dry. Forwarder knots were completed with 2, 3 and 4 throws. The KHC, RKS, weight and volume were compared to data previously reported for a surgeon's knots. Parametric testing was performed using separate analyses of variance.

**Results:** The forwarder knot exposed to media had significantly higher KHC and RKS and significantly lower volume compared to the surgeons' knot ( $P<0.0001$ ). Exposure of the forwarder knot to fat increased the KHC and RKS

significantly when completed with 4 throws ( $P=0.003$ ). Exposure of the forwarder knot to fat increased the weight significantly but not the volume (weight  $P=0.0012$ , volume  $P=1.00$ ).

**Discussion/Conclusions:** Exposure to media significantly altered the mechanical and physical properties of the forwarder knot. Based on our results the forwarder knot is a superior knot to start a continuous suture line compared to a surgeon's knot using 3 USP polyglactin 910 suture.

#### MANAGEMENT OF RIB FRACTURES IN EQUINE NEONATES: SURGICAL VS CONSERVATIVE THERAPY ASSOCIATED WITH SHORT & LONG-TERM OUTCOME

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**Introduction:** This study compares the short-term outcome of foals admitted to a neonatal intensive care unit with fractured ribs treated conservatively versus surgically treated and the racing performance of foals following surgical repair.

**Materials and Methods:** A total of 97 foals with rib fractures were included. Information included sex, the side and number of ribs fractured, complications relating to the rib fractures, and conservative versus surgical treatment. Conservative management was elected in 24 foals in 2015, and surgical repair was performed in 73 foals using four different surgical techniques. Short-term outcome was defined as survival to discharge. Racing performance was compared to maternal siblings of their 2,3, and 4-year old years.

**Results:** 79% of foals with fractured ribs survived to discharge. Conservative management had an 83% survival rate, surgical management was 78%. The mortality rate was higher with left-sided rib fractures in the conservative group, but was higher with right-sided rib fractures in the surgically treated group. Foals treated surgically had comparable performances to maternal siblings. However, they were less

likely to start a race and earned less money compared to their maternal siblings.

**Discussion/Conclusion:** Foals with fractured ribs have a good prognosis for survival following discharge. Comorbidities directly related to rib fractures such as pneumothorax, hemothorax, hemopericardium, and diaphragmatic hernia increase mortality. Foals with surgically repaired fractured ribs have comparable performances to their maternal siblings. Careful case selection is important when recommending surgical repair of fractured ribs in neonates, as not all cases of fractured ribs will benefit from surgery.

## COMPARISON OF MORPHOLOGICAL CHANGES AND TACTILE SENSITIVITY OF THE PHARYNX AND LARYNX BETWEEN FOUR STANDING SEDATIVE AND ANALGESIC PROTOCOLS IN 8 ADULT HEALTHY HORSES.

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**Introduction:** Little information is available concerning sedative protocols for standing upper airway surgery. The objectives of the study were to compare the level of sedation, topographic changes and tactile sensitivity of the pharynx and larynx between four protocols of sedation-analgesia commonly used in horses.

**Material and methods:** Four protocols were evaluated on 8 healthy adult horses: xylazine or detomidine, and butorphanol intravenously; xylazine or detomidine intravenously and topical application of lidocaine. These conditions were compared to a control group. Head drop after sedation and number of sudden head movements were recorded. On endoscopy, soft tissue collapse and tactile sensitivity on different pharyngeal and laryngeal regions were evaluated. Parameters were assessed by linear or generalized mixed effects models.

**Results:** Head drop was significantly increased in protocols using xylazine. In protocols with butorphanol, a significant increase in head movements was recorded. Nasopharyngeal collapse was significantly more frequent in protocols using lidocaine or xylazine. No dorsal displacement of the soft palate (DDSP) was noticed for all horses in the control and protocol groups. In the larynx regions, all protocol groups showed a greater desensitization compared to control but no difference was observed on the pharynx.

**Discussion/Conclusions:** All protocols were not equal in the depth of sedation, desensitization of target areas or side effects. Lidocaine and butorphanol produced good desensitization of the larynx but lidocaine can induce soft tissue collapse and butorphanol might cause sudden head movements

during surgery. Xylazine can be useful when a rapid onset of sedation needs to be implemented during the procedure.

## COMPARISON OF 201 THOROUGHBRED RACEHORSES' PERFORMANCES BEFORE AND AFTER DESMOTOMY OF THE INTERSPINOUS LIGAMENT WITH THAT OF MATCHED COHORTS.

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**Introduction:** Back pain, commonly caused by impingement of the thoracolumbar spinous processes, is a common cause of poor performance of racehorses. To the authors' knowledge, no study has evaluated performances of horses after desmotomy of the interspinous ligament performed as a treatment for back pain. We hypothesised that the performance of horses undergoing desmotomy of the interspinous ligament as a treatment for back pain would improve.

**Materials and Methods:** Medical records of all horses presenting to an equine referral hospital for desmotomy of the interspinous ligament between February 2015 and September 2016 were reviewed. The study was confined to Thoroughbred racehorses with sufficient information in the patient record and enough racetrack data to allow their racing performances be compared to that of matched controls. Horses used as matched controls had no clinical signs of back pain, were the same age, sex, and racing type and were trained at the same time by the same trainer as those undergoing desmotomy.

**Results:** Two-hundred-one horses met the inclusion criteria. Horses undergoing desmotomy had greater improvement in racing performance than their matched controls. Fourteen horses required further medical treatment and 4 horses required a second desmotomy because of persistent back pain.

**Discussion/Conclusion:** This study demonstrates that desmotomy of the interspinous ligament of horses with back pain caused by dorsal spinous process impingement was effective in improving their performance.

## AXIAL SKELETON/PELVIC OSTEOMYELITIS IN FOALS: DIAGNOSTIC UTILITY OF CT, TREATMENT AND OUTCOME: 6 CASES

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**Introduction:** Diagnosis of septic physitis/osteomyelitis of the axial skeleton/pelvis in foals is precluded by limitations of conventional imaging modalities. Early diagnosis and aggressive treatment is essential for outcome. CT enables accurate diagnosis of axial skeleton/pelvic osteomyelitis; however, no study with consecutive CT examinations exists. The aim of this study was to demonstrate the utility of CT in foals with osteomyelitis of the axial skeleton/pelvis for diagnosis, disease progression, pre-surgical planning, follow-up and outcome.

**Materials and Methods:** CT examinations of foals aged <6 months at Evidensia Equine Hospital Helsingborg between 2013-2016 were reviewed, and cases with axial skeleton/pelvic infection were included.

**Results:** Six Warmblood foals, aged 10-90 days, weighing 68-180 kg, were included. Foals presented with pyrexia (6/6), pain localized to the axial skeleton (5/6), lameness without palpable abnormalities (5/6), systemic inflammation (6/6). Radiography/ultrasonography was inconclusive in 3/3 foals. CT diagnosed osteomyelitis of the sacroiliac (SI) joint (3/6); pelvic symphysis (1); ribs, cervical and thoracic vertebrae (1), occipital condyle with atlanto-occipital joint infection (1). Three/6 had concurrent appendicular skeleton osteomyelitis.

Two foals were euthanized. Four/4 treated foals were discharged. Infection resolved with: medical treatment (intraarticular and long-term systemic antimicrobials) of SI-joint sepsis (2/2); combined surgical debridement and long-term antimicrobial treatment of pelvic symphysis infection (1) and occipital condyle osteomyelitis (1). Repeat CT confirmed healing of lesions in 3/3 foals.

**Discussion/Conclusion:** CT provided early, precise and definitive diagnosis and follow-up of axial skeleton/pelvic infection in foals. Long-term antimicrobial +/– surgical treatment was successful in all treated foals. Future athletic outcome was not determined.

## THORACOTOMY WITH RIB RESECTION FOR EXPERIMENTAL ACCESS TO THE HEART IN HORSES

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**Introduction:** Thoracotomy is an uncommon procedure in horses, but remains essential in a variety of cases of pleuro-pneumonia, pericarditis, thoracic trauma, and diaphragmatic herniation. This study aimed to develop an experimental surgical procedure allowing extensive access to the heart, and to describe the effect of thoracotomy on PaO<sub>2</sub> and PaCO<sub>2</sub> in

horses anesthetised using conventional endotracheal intubation and intermittent positive pressure ventilation (IPPV) with isoflurane.

**Material and methods:** Twelve female horses were anesthetized with zolazepam and tiletamin and anesthesia was maintained with isoflurane in oxygen using IPPV. Fifth rib resection and pericardiotomy was performed for complete surgical exposure of the heart. Arterial blood samples were collected prior to (T0) and at 5 (T5), and 30 (T30) minutes after puncture of the pleura parietalis. After thoracotomy, horses remained anesthetised for up to six hours to perform cardiac investigations.

**Results:** In 11 horses, resection of the fifth rib was adequate for the exposure of the heart. In one horse, removal of the sixth rib was necessary. The procedure (skin incision to completion of pericardiotomy) lasted <45 minutes. PaO<sub>2</sub> decreased significantly ( $p<0.05$ ) from  $291.8 \pm 82.8$  mm Hg to  $165.2 \pm 73.5$  mm Hg in horses post thoracotomy, whereas PaCO<sub>2</sub> remained stable.

**Discussion/Conclusion:** The surgical procedure was fast and provided excellent access to the heart, and it is thus useful in experimental studies. Conventional anaesthetic protocols available in most equine surgical facilities may be used to keep horses anesthetized for several hours after thoracotomy.

## SURGICAL ENLARGEMENT OF THE NASOMAXILLARY APERTURE AND TRANSNASAL CONCHOTOMY OF THE VENTRAL CONCHAL SINUS: COMBINING TWO SURGICAL TECHNIQUES TO IMPROVE SINUS DRAINAGE IN 6 EQUINE CADAVER SPECIMENS

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**Introduction:** This cadaver study was undertaken to describe the combination of two surgical techniques for establishing paranasal sinus drainage with minimal blood loss in horses with obstruction of the sinusal canals.

**Material and Methods:** CT was performed in 6 cadaver heads of adult horses before and after surgery. Endoscopic-guided transnasal conchotomy of the ventral conchal sinus (TCVCS) and surgical enlargement of the ventral conchal sinus (SENMAP) respectively, were performed unilaterally in 3 heads. A combination of both procedures was performed bilaterally in heads 4-6. Transnasal endoscopy of the sinus

compartments and direct and CT measurements of the incision dimensions were performed.

**Results:** All procedures could be performed successfully. Centering the trephination site 2 cm further rostral in heads 4-6 as initially described significantly improved surgical access. Maximal rostro-caudal incision distance varied between 45 and 50 mm (mean:  $46.7 \pm 2.9$  mm) in TCVCS procedures and between 28 and 48 mm (mean:  $41.7 \pm 6.2$  mm) in SENMAP procedures. The distance from the ventral aspect of the incision to the bottom of the VCS varied from 8 and 23 mm (mean:  $15.3 \pm 7.5$  mm) for TCVCS procedures and from 0 and 5.7 mm (mean:  $2.3 \pm 2.7$  mm) for SENMAP procedures. Trans-nasal endoscopy revealed excellent visualization of the rostral and caudal sinus compartments in specimens with combined procedures.

**Discussion/Conclusions:** The described combined technique might represent a feasible surgical technique for improving sinus ventilation and drainage in sinusitis-affected horses presenting with obstruction of the nasomaxillary aperture.

## EVALUATION OF AN ALTERNATIVE TECHNIQUE FOR RESECTION OF THE MANICA FLEXORIA IN AN EQUINE CADAVER MODEL

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**Introduction:** Manica Flexoria (MF) tears are a frequent cause of tenosynovitis of the DFTS. Total resection of the MF is indicated when one of the MF-margins is disrupted. The aim of this study was to describe and evaluate an alternative technique for tenoscopic resection of the MF.

**Material and methods:** Three surgeons with different levels of experience performed the surgical technique in 12 cadaver limbs per surgeon. The surgery was divided into 6 steps, including resection of the lateral/medial MF-borders using a hook knife, and resection of the proximal border using a micro-scalpel. Evaluation criteria included: completeness of resection, appearance of resection borders; collateral damage to associated structures and time required for resection. Parameters were compared between surgeons.

**Results:** The MF was successfully resected in all limbs. MFs were categorized as symmetric (19/36); showed a mild asymmetry (11/36) and showed uneven and/or curved borders (6/36). No significant difference was detected between surgeons. A total of 27 lesions were identified; 5 of them were severe and potentially clinical relevant. Three of 5 severe lesions were caused by the arthroscope (scutum 1; DDFT 2) and two lesions were caused by the micro-scalpel

to the DDFT. The median resection-time was 14:54 minutes (range 06:42-43:33).

**Discussion/Conclusion:** The described technique allowed a successful and symmetric resection of the MF, with minimal collateral damage to adjacent structures and is suitable for surgeons with varying levels of experience.

## METABOLITE PROFILING OF SYNOVIAL FLUID AS AN EARLY PREDICTOR FOR PALMAR OSTEOCHONDRAL DISEASE IN THE THOROUGHBRED RACEHORSE

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**Introduction:** Palmar osteochondral disease (POD) in Thoroughbred racehorses is well-recognised to have implications for serious injuries. Standard diagnostic imaging techniques are poorly sensitive to early disease and magnetic resonance (MR) imaging is required for diagnosis prior to manifestation of irreversible damage. The study aims to identify consistent alterations in biomarkers within synovial fluid (SF) of joints with POD to facilitate prompt recognition of the disease.

**Material and Methods:** SF was collected from MC/TPJ of 15 Thoroughbred racehorses (28 joints). This included 2 controls (n=5) and 13 clinical cases (n=23), the latter with lameness localised to the MC/TPJ and MR changes consistent with dorsal impact injury (n=3) and POD (n=20). Spectra were produced using <sup>1</sup>H-NMR spectroscopy (700MHz) and analysed.

**Results:** Twenty-five metabolites were recognised associated with various biosynthetic and degradation pathways. Cluster analysis demonstrated 7 metabolites with differences in peak signal intensity between cases and controls that were of statistical significance ( $P < 0.05$ ).

**Discussion/conclusions:** This study identified and quantified metabolites present in SF of MC/TPJ of cases with POD. <sup>1</sup>H-NMR spectral analysis demonstrated small differences between metabolomic profiles of healthy and diseased joints, consistent with the known metabolic changes occurring in POD, although their full significance is yet to be determined. Limitations included low numbers of controls which may have impacted results, with an increased number of differences in signal strength expected with a larger cohort. Identification of significant changes in levels of biomarkers within SF will potentially provide means of early disease recognition and facilitate timely intervention prior to irreparable damage.

## RADIOGRAPHIC AND ARTHROSCOPIC FEATURES OF THIRD CARPAL BONE SLAB FRACTURES AND THE IMPACT ON RACING PERFORMANCE FOLLOWING ARTHROSCOPIC REPAIR IN A POPULATION OF RACING THOROUGHBREDS IN THE UK.

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**Introduction:** Slab fractures of the third carpal bone (C3) are a common injury of Thoroughbred (TB) racehorses. Signalment, fracture configurations, radiological observations, arthroscopic features and the impact of C3 slab fractures on racing performance in UK TB racehorses have not previously been reported.

**Materials and Methods:** Case records of TB racehorses undergoing arthroscopically guided C3 slab fracture repair at Newmarket Equine Hospital between 2006 and 2015 were retrieved. Radiographs and arthroscopic studies of 75 fractures in 72 horses were reviewed and features recorded.

**Results:** The left carpus was more commonly affected than the right (45/69 65.2%). C3 slab fractures occurred most commonly through the radial facet in a frontal plane (48/75 64%). A high proportion of fractures were displaced (38/75 50.7%); horizontal displacement was most common. Seventy-three (97.3%) C3 bones had increased radiographic opacity. Comminution was identified in 44/75 (58.7%) fractures and all comminuted fragments were detected arthroscopically but only 21/44 (47.7%) were identified radiographically. Comminution was most frequently identified as a palmer wedge (29/60 48.3%) and additional cartilage lesions were evident in 44/69 (63.8%) fractures. Forty-one horses (63.1%) returned to racing.

**Discussion/Conclusion:** Frequent radiographic features included displacement and increased radiopacity and frequent arthroscopic findings included comminution and cartilage lesions. However, despite these negative prognostic indicators, the majority of horses returned to racing.

## SCIENTIFIC SESSION - ORAL - LARGE ANIMAL GENERAL

### MANAGEMENT OF EQUINE ATAXIA CAUSED BY CERVICAL VERTEBRAL STENOTIC MYELOPATHY - A EUROPEAN PERSPECTIVE

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**Introduction:** Diagnosis and therapy of cervical vertebral stenotic myelopathy (CVSM) are challenging and have been described in race-horses. We aimed to analyze CVSM-cases presented for diagnostic work-up and treatment in non-racing horses. We hypothesized that our diagnostic work-up protocol including clinical/orthopedic/neurological/radiographic/myelographic examinations may provide practical reference points for in vivo diagnosis/prognosis and adequate CVSM-management.

**Materials and Methods:** Medical records were reviewed retrospectively. Patients were included if our standardised work-up protocol was followed, no infectious diseases caused neurological signs, and cervical radiographs/myelograms confirmed CVSM. Age/breed/sex/type of performance/degree of neurologic deficits and number/sites/quality/therapy of stenosis were recorded.

**Results:** Sixty-two horses met the inclusion criteria. The majority of horses were between 5-10yrs (44%) or >10years (35%); nine horses (15%) were between 1-4years and four <1year (6%) old. Forty-six horses were Warmbloods (73%), 10 ponies (16%) and 6 of other breeds (11%). Males were more affected (69%) than females (31%). Sixty-one percent were pleasure-horses, 26% sport-horses and no information was available for 13%. Most patients presented with mild-to-moderate neurological signs (grade 2/5=18%, grade 2-3/5=31%). On myelograms, 23 horses (37%) had single-level, 22 (35%) double-level, and 8 (13%) triple-level stenosis, while 9 patients (15%) had no stenosis. Fifty horses (55%) showed dynamic and 41 (45%) static stenosis. Dynamic stenosis was more common (46%) than static (29%) and/or combined stenosis (25%). Stenoses were more frequently observed in the mid-to-caudal vertebrae. Static stenoses were more caudally. Based on our protocol, 15% of horses were euthanased without therapy, 62% were treated conservatively and 23% underwent cervical ventral interbody fusion.

**Discussion/Conclusion:** Our diagnostic work-up protocol provided practical reference points for in vivo diagnosis/prognosis and thus, adequate management of CVSM in a non-racing horse population.

## MAPK ACTIVATION CAN MODULATE THE GLYCOCALYX INJURY SECONDARY TO INTESTINAL ISCHEMIA/REPERFUSION

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**Introduction:** Recent evidence has shown that ischemia/reperfusion (I/R) injury damages the endothelial cell

glycocalyx and that this might contribute to the pathophysiological changes secondary to I/R. Glycocalyx is a regulated structure that is sensitive to modulation by cytokines, free radicals, and several physiological enzymes. Cytokines have been shown to activate several endothelial cell signaling cascades, AKT, c-Jun NH<sub>2</sub> terminal kinase, and phosphatidylinositol 3 kinase and possibly ERC. Many of these signals may be involved in active regulation of the glycocalyx by the endothelial cell. The aims of this study were to investigate a potential involvement of MAPK on intestinal glycocalyx injury secondary to I/R, in horses with colic submitted to surgery.

**Materials and Methods:** Sixty horses subjected to emergency abdominal surgery of the small intestine (intestinal volvulus) and 4 horses destined for euthanasia for reasons unrelated to the cardio-vascular system or gastrointestinal tract were used. Intestinal tissue samples were taken in order to analyse intestinal Tumor Necrosis factor TNF, IL-1, MAPK (AKT, p38-MAPK, and ERK) expression and glycocalyx components.

**Results:** Intestinal I/R significantly increased TNF, IL1, AKT and p38-MAPK expression, while no changes in ERK expression was observed. IRI also increased ERK, p38 MAPK and AKT phosphorylation. MAPK activation was accompanied by a significant reduction of syndecan-1 and heparan sulphate levels in the intestinal samples, while increased levels of heparanase were observed.

**Discussion/Conclusion:** These results indicate that glycocalyx damage secondary to IRI could be mediated, at least in part, by MAPK activation, suggesting that modulation of MAPK signaling may be beneficial in reducing intestinal IRI.

## CLINICAL DIAGNOSIS OF EQUINE SARCOIDS: ACCURACY ASSESSMENT AGAINST HISTOPATHOLOGY AND THE DEVELOPMENT OF A DIAGNOSTIC PROTOCOL

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**Introduction:** Histopathological examination is the gold standard for equine sarcoid diagnosis. Nevertheless, a biopsy is often not performed because of risk of lesion exacerbation or interference with outcome in experimental studies. In

these cases, diagnosis is often based on clinical assessment, but the accuracy of this clinical diagnosis has never been determined.

**Material and methods:** An online examination was compiled containing 40 histologically confirmed cases of equine skin lesions. The cases were selected carefully to represent the prevalence of sarcoids and other skin lesions in the population. Respondents with different levels of expertise were asked to indicate whether the cases were sarcoids or not, and how confident they were of their diagnosis. Part of the inexperienced respondents were given a diagnostic protocol (DP) to help them with case assessment.

**Results:** The online examination was completed by 234 respondents. Overall sensitivity and specificity without the use of the DP were 83.3% and 79.6%, respectively. Equine sarcoid experts were significantly better at distinguishing sarcoids from other lesions and were more certain of their diagnosis compared to certified specialists, equine practitioners and novices. Respondents using the DP were significantly more likely to correctly diagnose a lesion compared to their peers not using the DP (OR=1.25; P=0.002) and this was mainly because novice respondents obtained better results when using the DP.

**Discussion:** The results indicate that clinical diagnosis of equine sarcoids by experienced veterinarians or inexperienced veterinarians using a DP is an acceptable alternative whenever histopathological examination is unavailable or wanted.

## RETROSPECTIVE ANALYSIS OF 145 EPIPOIC FORAMEN ENTRAPMENT COLIC SURGERIES IN A REFERRAL HOSPITAL ON THE EUROPEAN CONTINENT (2008-2016).

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**Introduction:** Recent data from a larger continental European horse population regarding survival from Epiploic Foramen Entrapment (EFE) surgery, recurrence and potentially influencing factors are lacking.

**Materials and Methods:** Pre-, per- and postoperative data of EFE surgeries were obtained during the 8.75 year study period. Post-discharge information was gathered by telephone. Influences on re-laparotomy, hospital discharge, colic after hospital discharge and on survival after discharge were assessed. Influence of anastomosis type on postoperative ileus (POI) was explored.

**Results:** The 145 surgeries were performed on 142 horses (recurrence 3%). Warmblood horses represented 85%. Wind-sucking/crib-biting was confirmed in 60%. Intestines were always entrapped from left to right. Ileum was involved in 74%. Incontrollable intraoperative hemorrhage was encountered in 6%. One hundred and seven horses (74%) recovered from surgery. Survival to discharge of horses undergoing surgery was 48%. Survival to discharge of horses recovering from surgery was 65%, resulting in 35% mortality prior to discharge. Median survival time of the 70 discharged horses was 1529 days. Preoperative increased heartrate had a negative effect on survival to discharge and preoperative increased peritoneal fluid lactate concentration on survival after discharge. The occurrence of POI after surgery influenced survival to discharge negatively and jejunileostomy was significantly associated with POI.

**Discussion/Conclusion:** Epiploic foramen entrapment surgery was associated with high morbidity and mortality. Both preoperative heartrate and peritoneal fluid lactate concentration significantly influenced outcome. Occurrence of POI had a negative impact effect on hospital discharge. Recurrence occurred in 3% of cases despite previous reported spontaneous epiploic foramen closure (in about 50%) after EFE.

## A COMPARISON OF TWO SKIN CLOSURE TECHNIQUES ON THE PREVALENCE OF INCISIONAL COMPLICATIONS FOLLOWING EMERGENCY ABDOMINAL SURGERY IN HORSES

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**Introduction:** Incisional complications are common following colic surgery in horses. Different techniques have been suggested to decrease the incidence of surgical site infection (SSI) but have shown conflicting results. The objectives of the study were to conduct a prospective randomised study to assess the difference in incisional complications between skin closure with staples or sutures following abdominal surgery and to determine risk factors for incisional complications.

**Methods:** 115 horses that underwent abdominal surgery between the years 2012 and 2014 were assigned randomly to a suture or a staples group for incisional skin closure. Horses were included for analysis if they survived >14 days after surgery. Data regarding pre-, intra- and post-operative variables were recorded. Incisional complications included: SSI,

marked oedema, superficial or complete dehiscence and incisional hernia. Information regarding the incision was collected during hospitalisation and until 6 months post-operatively.

**Results:** There was no significant difference regarding incisional complications between the suture and staple groups. The incidence of incisional complications was: SSI - 40%, marked oedema- 61%, superficial dehiscence- 2.6%, complete dehiscence- 0.9% and incisional hernia- 6%. The sex of the horse (particularly, the reproductive state) and the surgeon were found to have a significant influence on SSI rate.

**Discussion/Conclusions:** As no difference was found between skin suture and staples, regarding SSI following abdominal surgery, the surgeon must rely on their preference and other variables such as speed of application. Special attention should be given to pregnant mares since they carry high risk for SSI.

## SURGICAL MANAGEMENT OF FOREIGN BODY OBSTRUCTION OF THE SMALL AND LARGE COLONS IN 29 EQUIDS (2004-2016)

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**Introduction:** Foreign body (FB) ingestion can cause colonic impaction and usually surgical intervention is indicated for its resolution. Previous publications have described only few cases, making data interpretation challenging. The objective of the study was to describe the clinical presentation, surgical findings, complications and outcome of a case series of small and large colon FB obstruction in 29 equids.

**Materials and Methods:** Medical records of cases diagnosed with FB obstruction of the large or small colons between the years 2004 and 2016 that underwent surgery were reviewed. Data regarding signalment, clinical signs, surgical findings and post-operative variables were recorded. Short (survival to hospital discharge) and long (1 year after surgery) term survival rates were documented.

**Results:** Females and Arabian horses were overrepresented with a mean age of 4.2 years. Abdominal distension was the most common observation on arrival and the FB could be felt in 20% of cases during rectal examination. Significantly more FBs were found in the small colon during surgery ( $P<0.0001$ ) and most were removed by small colon enterotomy. Complications post-operatively were seen in 41%, with fever and diarrhoea being the most common. Twenty three cases were released from the hospital and all

cases that were available for long term follow up were alive and returned to their previous activity.

Conclusions: Colonic FB are found most commonly in the small colon of female Arabian horses. Few techniques are available to improve the safety of FB removal, and the preferred method depends on the FB location, shape and mobility.

## RANDOMIZED CONTROL TRIAL COMPARING FLUNIXIN MEGLUMINE AND FIROCOXIB IN EQUINE SMALL INTESTINAL STRANGULATING OBSTRUCTION

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Introduction: Endotoxemia following small intestinal strangulating obstruction (SISO) is associated with an increased risk of death. Non-steroidal anti-inflammatory drugs (NSAIDs) treat endotoxemia by blocking prostanoid production by cyclooxygenases (COX) –1 and –2, which can be selectively inhibited. COX-1 is expressed constitutively and is known to promote gut barrier function, whereas COX-2 is induced in inflammation and contributes to signs of endotoxemia. In preclinical SISO models, barrier recovery occurred faster with COX-2 inhibitors as compared to non-selective NSAIDs. We hypothesized that treatment of post-surgical SISO horses with either firocoxib (COX-2-selective) or flunixin (nonselective) would result in effective pain control while endotoxemia would be reduced in the firocoxib group.

Materials and Methods: Post-operative SISO patients were administered either flunixin (1.1mg/kg IV q12h) or firocoxib (0.3mg/kg IV loading dose; 0.1mg/kg IV q24h) in a blinded randomized control trial.

Results: In 56 cases, we observed no significant difference in pain control between the two groups ( $P=0.4$ ). COX selectivity was confirmed by significant suppression of plasma thromboxane B<sub>2</sub> in the flunixin group but not the firocoxib group (COX-1 inhibition,  $P=0.01$ ), whereas both drugs equally suppressed PGE<sub>2</sub> production (COX-2 inhibition). The flunixin group had a significantly higher percentage of horses with elevated plasma sCD14, a marker of endotoxemia, as compared to the firocoxib group ( $P=0.04$ ). There was a trend toward increased survival in the firocoxib group.

Discussion/Conclusions: In SISO patients, flunixin or firocoxib effectively controls postoperative pain, but firocoxib had a significantly greater effect on reducing a biomarker of endotoxemia (sCD14) as compared to flunixin.

## RACING PERFORMANCE FOLLOWING LARYNGEAL TIE-FORWARD AND SOFT PALATE THERMOCAUTERY IN NATIONAL HUNT THOROUGHBRED RACEHORSES

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Introduction: Limited information exists on the success of a laryngeal tie-forward procedure (LTFP) combined with thermocautery of the soft palate (TSP) in National Hunt (NH) racehorses. LTFP is widely performed on NH racehorses, despite a lack of evidence to justify its use.

Materials and Methods: Racing performance of 111 NH racehorses was determined using *Racing Post* rating (RPR), race earnings (RE) and performance index (PIIndex). Correlations between all 3 measures of performance were analysed.

Results: A trend towards decreased performance of operated horses was detected except when the last race preoperatively was compared to each race and for the median of 3 and 5 races postoperatively. When performance measurements were evaluated for the median of 3 and 5 races pre- and postoperatively, postoperative improvement was 46%, 24% and 8-14% for operated and 50-51%, 41-42% and 24% for control horses using RPR, RE and PIIndex, respectively. The correlation between RPR and RE was higher ( $r = 0.626-0.782$ ) than the correlation between PIIndex and other measures ( $r = 0.366-0.706$ ).

Discussion/Conclusion: In the present study, LTFP and TSP did not improve racing performance in NH racehorses with palatal dysfunction. *Racing Post* rating and RE may be superior measures of performance.

## HISTOLOGICAL EXAMINATION OF THE INTERSPINOUS LIGAMENT IN HORSES WITH OVERRIDING DORSAL SPINOUS PROCESSES

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Introduction: Previous work defined the normal structure and innervation of the interspinous ligament (ISL) in horses; however, the alterations to the ISL in horses with over-riding dorsal spinous processes (ORDSPs) have not been investigated. The aim of this study was to assess the structural

anatomy and innervation of the ISL in horses with clinically significant ORDSPs.

**Material and methods:** Samples of the ISL were obtained from 10 horses that underwent subtotal osteotomy for the treatment of ORDSPs. Control samples were obtained from horses without spinal pathology. Histological staining of ISL sections was performed to assess the ligaments' morphology (haematoxylin & eosin) and to determine the proteoglycan and glycosaminoglycan content in the ISL (Alcian-PAS). Immunohistochemistry was performed for quantitative evaluation of ISL neurons.

**Results:** The ISL in horses with ORDSPs showed altered collagen fibre alignment and arrangement of the ligamentous layers when compared to healthy controls. A significant increase of fibrocartilaginous tissue with evidence of fibrocartilaginous metaplasia was detected ( $p=0.001$ ). The number of sensory nerves in the ISL was significantly higher in horses with ORDSPs compared to controls ( $p=0.017$ ).

**Discussion/Conclusion:** Structural alterations of the ISL including loss of fibre alignment and fibrocartilaginous metaplasia are associated with ORDSPs in the equine thoracolumbar spine. The increase in the sensory innervation of the ISL in horses with ORDSPs, may contribute to the back pain experienced by some horses with ORDSPs.

## DESCRIPTIVE STUDY OF THE USE OF TELETHERAPY IN NON-CUTANEOUS TUMOURS

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**Introduction:** The availability of teletherapy for the treatment of equine tumors is increasing. Despite this, large retrospective studies with long-term follow-up are infrequent. Our objective was to report the long-term outcomes for different non-cutaneous tumour types, as well as the short- and long-term effects of therapy.

**Materials and Methods:** Computerised medical records of 36 horses receiving teletherapy for non-cutaneous tumours at two university teaching hospitals were evaluated (1999-2015). Descriptive statistics were used to compare variables.

**Results:** The follow-up period ranged from 2 to 144 months. Remission times ranged from 2 to 144 months (mean: 27.0 months), with 14 cases remaining in remission at the time of follow-up. Tumour type influenced outcome with ossifying fibromas, lymphomas, osteosarcomas and

carcinomas other than squamous cell carcinoma, having improved outcomes compared to other tumour types. Fibrosarcomas had consistently poor outcomes with remission achieved for 14 months or less. The occurrence of complications, resulting from the tumour or the therapy itself, were common, occurring in 20 (55.5%) out of 36 horses. The occurrence of complications due to repeat anesthetic episodes were infrequent, with pneumonia occurring in only 1 patient. This study also highlighted complications of teletherapy previously unreported in equine patients, including pharyngitis and trismus.

**Discussion/Conclusion:** Teletherapy can be used to treat a variety of non-cutaneous tumours, however, the efficacy of treatment is related to tumour type. Complications related to teletherapy or the tumour itself are common occurrences, however, those related directly to multiple anesthetic episodes are less frequent.

## HIGH MULTI-DRUG RESISTANCE IN THIRD GENERATION CEPHALOSPORIN RESISTANT *E. COLI* ISOLATED FROM HORSES AT FIVE EQUINE HOSPITALS IN THE UK

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**Introduction:** Antimicrobial resistance (AMR) threatens the efficacy of antimicrobials. Extended-spectrum  $\beta$ -lactamases (ESBL) confer resistance to third generation cephalosporins (3GC) and are often associated with multi-drug resistance (MDR, resistance to  $\geq 3$  classes of antimicrobial) in *Escherichia coli*. This study aimed to determine the prevalence, patterns and risk factors of AMR in ESBL-producing faecal *E.coli* carried by horses at five UK equine hospitals.

**Materials and Methods:** Each hospital was sampled for three weeks: faecal samples and data were collected daily from inpatients. Samples were inoculated onto Harlequin agar+cefotaxime (3GC), incubated overnight at 37° C and were confirmed by double-disc diffusion test, with susceptibility performed against clinically relevant antimicrobials. *E. coli* isolates were screened by PCR assay for relevant ESBL genes.

**Results:** 753 faecal samples were collected from 217 horses. ESBL-producing *E.coli* was detected in 46.1% samples (n=347) (range 22.6-88.2% between hospitals). AMR was detected to ceftiofur (93.7.1% n=325), gentamicin (91.4%, n=317), trimethoprim/sulfamethoxazole (85.9%, n=298), doxycycline (85.0%, n=295) and enrofloxacin (27.1%, n=94), with MDR detected in the majority (94.2%)

of samples with ESBL-producing *E. coli*. A gene responsible for ESBL-phenotype (*blaCTX-M*) was detected in 91.4% of samples and ongoing analysis aims to identify other genes responsible for the resistance phenotypes.

**Discussion/Conclusion:** This study demonstrated a high prevalence of carriage of ESBL-producing *E. coli* from faeces of hospitalised horses with a high proportion of MDR isolates; however there was wide variation between hospitals. Strategies aimed at identifying and limiting risk factors associated with carriage are important to reduce AMR in hospitalised patients.

## DESCRIPTION OF THE ANATOMICAL APPEARANCES OF INFUNDIBULA IN MAXILLARY CHEEK TEETH USING COMPUTED TOMOGRAPHY COMPARED WITH ORAL EXAMINATION IN DIFFERENT AGE GROUPS OF HORSES.

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**Introduction:** Correct identification of infundibular caries is mandatory before reconstruction can be performed. The aim of this study was to investigate age-related changes in the infundibula using computed tomography (CT) and to compare these findings to those on oral examination.

**Material and Methods:** A cross-sectional prospective study was conducted on 40 cadaver heads. The horses were of equal sex distribution and were divided into the following age groups; immature (2-5 years); adults (6-14 years), and geriatric ( $\geq 15$  years). CT scans of the heads and examination of the bisected oral cavity were performed. Infundibular abnormalities on CT were recorded using a validated grading system and infundibulae were measured. Infundibulae from unerupted teeth, where deciduous caps were present, and decapped or fractured were excluded.

**Results:** The preliminary results consist of the CT classifications of infundibulae from 18 heads. CT examination identified infundibular lesions in 59/86 immature infundibulae, 68/140 adult infundibulae, and 55/120 geriatric infundibulae. Only geriatric horses showed infundibular lesions on oral examination (26/120). The prevalence of cemental hypoplasia was 65% (immature), 47% (adult) and 30% (geriatric).

**Discussion/conclusion:** CT revealed a high percentage of infundibular lesions in all age groups. CT findings and oral examination findings do not correlate well.

## CHOANAL ATRESIA TREATED WITH MEMBRANOUS ABLATION AND SEPTAL REMOVAL IN 9 HORSES

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**Introduction:** Nine horses with unilateral (8) or bilateral (1) choanal atresia underwent removal of the buccopharyngeal septum and resection of the nasal septum.

**Material/Methods:** The buccopharyngeal septum of 8 horses was ablated with a laser, with the horses sedated, and that of one was excised with a laparoscopic scissors, with the horse anaesthetised. The nasal septum was resected from 6 horses while the horses were sedated and from 3 while the horses were anaesthetised. All horses underwent a temporary tracheostomy before surgery. Ventral, dorsal, and caudal septal incisions were made with obstetrical wire positioned with aid of a rhinotomy (9) and laryngotomy (6) or videoendoscopy (3). The cranial incision was made with a scalpel. When resecting the septum with the horse sedated, the sites of laryngotomy and rhinotomy were desensitized with local anaesthetic solution instilled subcutaneously, and the nasal septum was desensitised by anaesthetising the maxillary (6) and ethmoidal nerves (2) and by spraying the nasal cavity with local anaesthetic solution (6).

**Results:** One horse developed hemolytic anemia 4 days postoperatively and was treated successfully with a blood transfusion. One horse developed severe ataxia immediately after surgery and was euthanised the next day. One horse treated for bilateral choanal atresia was euthanized 6 months postoperatively, because its airway became obstructed by a circumferential cicatrix. Seven of the 8 horses discharged (88%) returned to full exercise.

**Discussion:** Resecting the nasal septum, in addition to ablating the buccopharyngeal septum, of horses with unilateral choanal atresia avoids formation of an obstructing cicatrix.

## FUNCTIONAL ASSESSMENT OF COMBINED LARYNGEAL REINNERVATION AND PACING FOR UNILATERAL VOCAL FOLD PARALYSIS IN NATURALLY AFFECTED HORSES - A LONG TERM STUDY

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**Introduction:** The use of functional electrical stimulation (FES) of the larynx allows for limitation of the muscular loss when denervation occurs. Previous studies have shown that muscle size improvement does reverse once stimulation is stopped. The present experimental study compares long term results of reinnervation of the cricoarytenoidus dorsalis muscle (CAD), with or without additional pacing of the CAD or ventriculo-corpectomy.

**Material and methods:** Horses with natural Recurrent Laryngeal Neuropathy (RLN), divided in 2 groups (stimulation S vs control C), underwent reinnervation of the left CAD using neurotization with the 1st cervical nerve (C1). In S-group, 2 electrodes were placed into the CAD for FES. In C-group, a bilateral ventriculocorpectomy was performed. A 1 year follow-up included evaluation of laryngeal function at rest and exercise, and CAD thickness. Statistical analysis was performed using a mixed effect model with time as both fixed and random effects (intercept and slope) and horse identity as the subject effect.

**Results:** Eleven horses were included (S-group, n= 6; C-group, n=5). Reinnervation was confirmed in 4 horses within each group through direct stimulation of C1. In the S-group, electrode breakage occurred in 4 horses. Mean arytenoid abduction angle increased during native function at exercise and was significant in both groups, but not between groups ( $p=0.18$ ). CAD volume was significantly greater after 12 months in the S-group ( $p<0.01$ ).

**Discussion/Conclusion:** In RLN horses, reinnervation through CAD neurotization improved laryngeal function, and laryngeal pacing significantly increased this effect, although some electrode breakage issues occurred in some horses.

## DOES FASTING REDUCE THE RISK OF POST-ANAESTHETIC COLIC IN HORSES?

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**Introduction:** Fasting prior to general anaesthesia is common practice to reduce intra- and post-operative complications, especially to decrease the risk of post-anaesthetic colic (PAC). Recent studies led to the conclusion that traditional reasons for fasting do not withstand scrutiny and fasting might contribute to PAC.

**Material and Methods:** Patients hospitalized for a minimum of 72 hours, that were older than 12 months and undergoing general anaesthesia for reasons other than gastrointestinal disorders were included in the study. Information obtained included age, reason and month of anaesthesia, administration of dobutamine and use of opioids. Horses were divided into groups: 1) elective, fasted; 2) non-fasted

emergencies, and 3) elective, fasted non-surgical (MRI/CT). PAC was defined as any sign of gastrointestinal discomfort, such as inappetence, reduced demeanor, grinding teeth, pawing and rolling.

**Results:** Of 441 equine anaesthetics included in the study 392 cases were elective and 49 emergencies. Following elective anaesthesia, 14.8% (58/392) horses showed signs of PAC, whereas the incidence of PAC following emergency surgery was 6.1% (3/49). The difference showed a trend towards but was not statistically significant ( $p=0.07$ ). Neither anaesthesia duration nor season nor age nor use of dobutamine or opioids had any significant influence on the incidence of PAC.

**Discussion:** The results of this study indicate that food deprivation does not reduce the incidence of PAC. Age, duration of anaesthesia, use of dobutamine or opioids did not have a significant influence on the development of PAC.

**Conclusion:** Withholding food from horses for several hours prior to surgery might be a questionable tradition.

## SCIENTIFIC SESSION - ORAL - LARGE ANIMAL ORTHOPAEDICS

### ARTHROCENTESIS AND ARTHROSCOPIC EXPLORATION OF THE DORSAL ASPECT OF THE RADIOCARPAL AND INTERCARPAL JOINTS IN THE DROMEDARY CAMEL

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**Introduction:** Joint disease appears a common cause of lameness in racing dromedaries, with the carpus most frequently affected. This study aimed to develop arthrocentesis and arthroscopic techniques for treatment of carpal articular diseases.

**Material and methods:** The most reliable and safest arthrocentesis techniques of the radiocarpal and intercarpal joints were investigated in 6 isolated limbs. Arthrography was performed in 7 sedated dromedaries in kneeling position, and 4 in standing position (with and without ultrasound guidance), to determine the best patient positioning and compliance, to describe the extent of the joint capsule and to confirm communications. Arthroscopic approaches of the radiocarpal and intercarpal joints were then developed on isolated limbs. In 3 sedated camels, dorsal arthroscopic exploration of the carpal joints was performed under local and intra-articular anesthesia, before applying the technique for interventional arthroscopy in 2 clinical cases.

**Results:** In flexion, the dorsomedial approach to the radiocarpal joint was easier due to anatomical particularities.

Dorsomedial and dorsolateral approaches to the intercarpal joint were found to be reliable (100% success at first attempt). Concurrent centesis of the common dorsal extensor tendon sheath occurred in 1/9 radiocarpal joint centesis (dorsolateral approach), while the palmaro-lateral approach had a 100% success rate. Arthroscopic evaluation of the dorsal articular surfaces, middle intercarpal and radiocarpal ligaments was feasible with positioning of the portals limited to the most medial and lateral aspects.

**Discussion/conclusion:** Despite species related limitations, dorsal carpal arthroscopy allows evaluation of clinically relevant structures and bone fragment removal at the joint periphery. The presence of the carpal pad complicates the location of instrument portals, instrument manipulations and access.

### THE PROBLEM OF PIN BREAKAGE IN EQUINE TRANSFIXATION PIN CASTING: BIOMECHANICAL EX VIVO TESTING OF FOUR DIFFERENT PINS

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**Introduction:** This study aimed to compare the fatigue behavior of different pins used for equine transfixation pin casting.

**Materials and Methods:** A simplified test model mimicking the biomechanical environment of a transfixation pin cast was developed and was compared to a real fiberglass transfixation pin cast using equine cadaveric third metacarpal bones (MC3) in a pilot study. For the main study, 24 pairs of equine cadaveric MC3 that had one transfixation pin placed horizontally in the distal metaphysis were tested using the simplified model. A 6.3/8.0 mm Imex Duraface pin with thread-run out design (ITROP) was compared to a 6.1 mm smooth Steinman pin (SSP), a Securos 6.2 mm positive-profile pin (SPPP) and an Imex 6.3 mm positive-profile pin (IPPP) under cyclic loading until failure in axial compression of MC3.

**Results:** All pins broke at clinically relevant load levels and number of cycles. The SSP endured significantly ( $p=0.0025$ ) more cycles before failure (mean: 48685) than the ITROP (mean 25889). No significant differences in cycles to failure were observed comparing the SPPP versus ITROP, and the IPPP versus ITROP, respectively.

**Discussion/conclusion:** The SSP demonstrated the best resistance against cyclic failure in the defined test configuration, even though it was associated with more lateral displacement and cortical wear-out. This shows that besides well-established disadvantages such as reduced resistance to axial

extraction and higher potential to pin loosening, the SSP has the advantage of increased resistance to cyclic bending stress.

### EVALUATION OF DYNAMIC SERUM AMYLOID A CHANGES IN EQUINE SEPTIC SYNOVITIS

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**Introduction:** The diagnosis and monitoring of septic synovitis remain challenging, in part because the clinical picture may be influenced by comorbidities (i.e. cellulitis, severe trauma). Serum amyloid A (SAA) is a major acute-phase protein (APP) in equids that reaches peak concentrations in serum approximately 48 hours after onset of inflammation. In human medicine, APPs are widely used for monitoring critical patients. Based on the similarity between APPs in humans and SAA in horses, the aim of this study was to evaluate if SAA clearance would be a valuable tool for monitoring septic synovitis in horses.

**Materials and Methods:** Medical records of horses admitted to the University Equine Clinic between 1.1.2015-1.7.2017 for potential septic synovitis were reviewed. SAA Clearance was calculated and statistical analyses via ANOVA and paired t-test were used to assess for significance between groups.

**Results:** Eighty-one horses met the inclusion criteria. Septic synovitis was diagnosed in 31 patients; in 60% of these horses one arthroscopic lavage resolved disease. Survival to discharge was 93.8% of patients. SAA within 48hr of hospital admission was significantly higher ( $P = 0.038$ ) in horses with septic synovitis than in horses without septic synovitis. Initial SAA clearance did not reach statistical significance. However, we noticed a trend for clinical resolution at or above 0.49.

**Discussion/conclusion:** This represents an advantage in cases undergoing multiple lavages in which difficulty obtaining serial synovial samples can occur. The lack of significance in SAA clearance is likely due to few horses in each group and should be further investigated.

### NEURECTOMY OF THE DEEP BRANCH OF THE LATERAL PALMAR NERVE AS A TREATMENT FOR CHRONIC EQUINE FORELIMB PROXIMAL SUSPENSORY DESMITIS: 23 CASES

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**Introduction:** A small proportion of forelimb proximal suspensory desmitis (PSD) cases have persistent lameness despite appropriate management. The hypothesis was that there may be persistent pain and lameness despite adequate healing of the ligament, in a similar fashion to hindlimb PSD, and that focal neurectomy would be effective in returning these cases to soundness without recurrent injury of the ligament.

**Materials and Methods:** Inclusion criteria for clinical cases to undergo surgery were a positive response to blocking the deep branch of the lateral palmar nerve (DBLPN), and an ultrasonographic appearance consistent with chronic desmitis without loss of structural integrity. Under general anaesthesia, a 3-4cm skin and fascial incision was made distal to the accessory-metacarpal ligament. Three cm of the DBLPN was removed using a guillotine technique. The fascia and skin were closed routinely and the horses were rested for a minimum of 4 weeks before return to exercise.

**Results:** The median duration of lameness prior to surgery was 10 months. Nineteen cases had long-term follow-up. Seven failed due to other reasons, so on censored analysis 11/14 (79%) were in full work at 12 months post surgery; and 8/12 (67%) were still in full work at two years. None suffered severe suspensory breakdown post-operatively, or evidence of neuroma formation.

**Discussion/conclusion:** This appears to be an effective treatment for chronic forelimb proximal suspensory desmitis, in cases deemed to have minimal loss of structural integrity.

## LEUCOCYTE-RICH AND LEUCOCYTE-POOR PLATELET CONCENTRATES FOR THE TREATMENT OF EQUINE INTRA-SYNOVIAL PATHOLOGY - A CLINICAL FOLLOW-UP OF 70 CASES

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**Introduction:** The use of therapeutic haemo-derivatives is becoming increasingly common in equine clinical practice. The study aim was to compare the safety of leucocyte-poor and leucocyte-rich preparations for the treatment of intra-synovial disorders.

**Materials and Methods:** A prospective database was constructed for all clinical cases receiving PRP between 2010 and 2017. Patients received a full orthopaedic work up and additional treatments as required. PRP was harvested using either a commercial filter (V-PET) or centrifuge system (ACP). Horses were injected with the PRP intra-synovially, using standard aseptic techniques with no concurrent medications. Horses underwent rehabilitation programs appropriate for their injuries. Follow-up was by clinical examination and

telephone conversations. Results were analysed using a Fisher Exact test and a power calculation.

**Results:** 70 horses were treated with intra-synovial PRP, with long-term follow-up on 60. Forty-two horses (60%) were treated in addition to arthroscopy, tenoscopy or burscopy; 28 (40%) did not have concurrent surgery. The majority of the lesions treated were stifle soft tissue pathology followed by osteoarthritis of the coffin and fetlock joints, and navicular bursal pathology. No synovial flares or reactions were elicited with either leucocyte-poor or leucocyte-rich preparations. Follow-up analysis suggested that 60% of patients returned to their previous level of athletic function after treatment. Those treated with ACP® had a 58% return to athletic function compared to 69% with V-PET.

**Discussion/Conclusion:** The lack of adverse reactions is encouraging. These results suggest that either preparation is safe in clinical practice.

## DEVELOPMENT OF A LINEAR DIODE ARRAY AND X-RAY FAN BEAM TO ACQUIRE STANDING IMAGES OF THE EQUINE PELVIC REGION WITH VOLUMETRIC IMAGING POTENTIAL.

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**Introduction:** Large animal veterinary imaging of the non-appendicular anatomy is extremely challenging due to the large patient size and consequent scattering of x-ray photons. Obtaining what would be considered useful diagnostic quality images of the spine, abdomen or pelvis in the horse is not practically possible in most cases without using very high x-ray exposures. An alternative to traditional plane radiographs is to use a slit-collimator on the x-ray tube (creating a thin fan beam) and a linear-scan detector, and moving either the object or the imaging equipment across the examined area. The objectives and hypothesis of this study were to develop a system which would be capable of obtaining radiographic quality images of the thoracolumbar spine and pelvis of a horse.

**Materials and Methods:** A pilot feasibility study was conducted on an equine cadaver specimen as a proof of concept and feasibility study. After completion of the pilot study, two industrial six axis robots were acquired with a CT generator tube and XSCAN linear diode array for in vivo image acquisition.

**Results:** The results of the study demonstrate that similar images of the spine can be acquired compared to current cone beam imaging technologies. However, in vivo, the LDA scan is able to obtain superior images in the deeper structures due to a minimization of scatter. Furthermore radiation doses using the LDA are 10 fold less than the traditional cone beam imaging.

Discussion/conclusion: Based on these data, it is possible to acquire 3D volumetric CT scans of the equine pelvis in standing horses.

## HUMERAL FRACTURE INTRAMEDULLARY, INTERLOCKING NAIL AND PLATE FIXATION IN 15 HORSES LESS THAN 1 YEAR OF AGE (1999-2013)

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Introduction: Treatment options for equine humeral fractures are limited. Previous reports of internal fixation establish a poor prognosis for survival and athletic function. Internal fixation with an intramedullary interlocking nail (IIN) alone has improved success in patients with diaphyseal fracture configurations allowing ideal fixation. The objective of this study is to report outcomes of an IIN and plate fixation for humeral fractures in horses less than 1 year of age. We hypothesise that fractures which are not acceptable candidates for IIN fixation alone would have improved survival and achieve athletic performance following IIN and plate fixation.

Materials and Methods: Medical records of horses 1 year of age or less, with humeral fractures repaired using an IIN and cranial plate from 1999-2013 were reviewed. Long-term follow up was obtained through clinical examination or telephone communication.

Results: Twelve male and 3 female horses of Quarter Horse (9), Paint (2), Thoroughbred (1), and mixed breeds (3) were included. Ages ranged from 2 to 11 months (mean, 6 months) and weights from 113.6 to 377.3 kg (mean, 241.5 kg). Twelve of 15 (80%) survived to discharge. Eleven of 12 survived long-term and were used as intended, with a mean duration of follow up of 5.6 years. Complications included partial failure of fixation, carpal contracture, laminitis, and non-union.

Conclusions: These findings confirm that internal fixation with an IIN and plate is a viable treatment option for young horses with humeral fractures not amenable to IIN fixation alone, providing a favorable prognosis for survival and athletic function.

## CYTOKINE AND GROWTH FACTOR RELEASE FROM NORMAL EQUINE SUSPENSORY LIGAMENT EXPLANTS CULTURED WITH PLATELET-RICH GEL SUPERNATANTS

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Introduction: Suspensory ligament desmitis (SLD) is a cause of lameness in horses. Currently, the use of regenerative therapies, such a platelet-rich plasma (PRP), has gained acceptance by equine specialists.

Materials and Methods: The effects at 48 h of two concentrations (25 and 50%) of two PRP hemoderivatives, one rich in WBCs -leukocyte concentrate- (Lc-PRGS) and other poor in WBCs -leukocyte reduced- (Lr-PRGS) on normal suspensory ligament explants (SLEs) were compared. We evaluated the production and degradation of growth factors, pro-inflammatory and anti-inflammatory cytokines via ELISA. Allogeneic venous blood from 6 clinically healthy horses was used. Platelet concentrates were obtained through a manual double centrifugation tube method (activated with calcium gluconate 50 uL/mL).

Results: SLE 50% Lc-PRGS had a significantly lower ( $p < 0.01$ ) transforming growth factor- $\beta$ 1 concentration. Concentrations for platelet-derived growth factor BB were significantly ( $p < 0.05$ ) highest in Lc-PRGS. Interleukin-1 concentrations were significantly lower in SLEs Lr-PRGS when compared with Lc-PRGS. Tumor necrosis factor- $\alpha$  concentrations were significantly ( $p < 0.05$ ) lower in 50% Lr-PRGS. Interleukin-4 concentrations were significantly higher in the SLEs control group and 25% Lc-PRGS. SLEs Lc-PRGS showed the significantly highest interleukin-1receptor antagonist concentrations.

Discussion/conclusion: The results from this study suggest that Lr-PRGS could be indicated for the treatment of horses with SLD, because it significantly diminished the release of pro-inflammatory cytokines. However, Lc-PRGS induced a robust release of IL-1ra and higher IL-4 release. Thus, Lc-PRGS could also be indicated for the treatment of SLD. Further studies should be performed to determine the anabolic effect of both PRP treatments.

## USE OF A NON-RESORBABLE BI-LAYERED IMPLANT FOR JOINT RESURFACING IN THE TREATMENT OF DEEP OSTEOCHONDRAL DEFECTS

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Introduction: Articular cartilage repair remains a major challenge and (osteo-)chondral defects generally result in incongruity of the cartilage surface and development of osteoarthritis. This study aimed to evaluate a novel concept of a non-resorbable bi-layered polyurethane elastomer implant for joint resurfacing and induction of formation of

neo-cartilage over the elastomer that was loaded with collagen-mimetic peptides.

**Materials and methods:** Two osteochondral defects were created bilaterally (proximal and distal) on the medial femoral ridge in 6 Shetland ponies. In one limb, the defects were repaired using the implant, and the defects in the contralateral joint served as controls. Re-look arthroscopy was performed after 3 weeks in 1 pony. At the end point (after 12 weeks), macroscopic observations, histology and immunohistochemistry were performed.

**Results:** After 3 weeks, the distal implant was completely covered with repair tissue and the proximal implant partially (30%). At 12 weeks, the distal implant was completely covered in 5 ponies and partially in 1 pony (50%). The proximal implant was completely covered in 2 ponies and partially in 4 ponies (50%). Repair using the implant showed good resurfacing whereas the controls showed indentation and incongruity of the cartilage surface. The repair tissue did not contain glycosaminoglycans and collagen type 2. No degeneration of the surrounding cartilage was observed.

**Discussion/conclusion:** Good resurfacing of the cartilage layer could be achieved using the implant despite the fact that the repair tissue was fibrous in nature. Long-term studies and response to training are needed to further evaluate the possible advantages of this implant.

## STANDING MRI FOR SURGICAL PLANNING OF EQUINE FRACTURE REPAIR

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**Introduction:** Surgical fixation of fractures in horses must be stable and performed with precise anatomic reduction to be successful. The aim of this study was to confirm that standing MRI (sMRI) provides useful information about fracture configuration and anatomical landmarks to ensure optimal limb (carpus/tarsus and distally) fracture reduction and facilitate surgical planning.

**Material and Methods:** Medical records of horses with fractures, that had undergone an sMRI procedure prior to surgical fixation were reviewed. A fiberglass cast was applied in some cases to improve horse comfort during the examination. Data obtained from pre-operative radiographic and sMRI procedures were compared and their relative interest determined. Other findings (bone oedema, concurrent soft tissue lesions), post-operative assessment of fracture reduction and outcome were also recorded.

**Results:** Thirty-one horses with fractures of the proximal phalanx (n=10), distal metacarpus/metatarsus (n=12),

carpus (n=5) and tarsus (n=4) were included in the study. sMRI were completed in all horses and provided good quality images. Use of a cast during 15/31 sMRI procedures reduced limb movement without any detrimental effect on MRI image quality. MRI provided a 3D assessment of the fractures, ensuring an optimal approach and positioning of the implants. In 13 cases it also revealed fracture features that were not visible or were only suspected on radiographs.

**Conclusions:** Pre-operative use of sMRI to document fracture configuration is feasible and facilitates surgical planning, thus improving surgical outcome and prognosis, particularly for complex fractures. A fiberglass cast is suitable for this procedure as it decreases movement without any loss of imaging quality.

## ARTHROSCOPIC APPROACH AND INTRA-ARTICULAR ANATOMY OF THE EQUINE ATLANTOOCCIPITAL JOINT

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**Introduction:** The equine atlantooccipital (AO) joint may be affected by a range of pathologies including OCD, degenerative joint disease and septic arthritis. Surgical treatment, including debridement and joint lavage, is more likely than medical therapy to be successful for AO joint sepsis. The aim of this study was to describe an arthroscopic approach to, and intraarticular anatomy of the AO joint.

**Materials and Methods:** Nine horse cadaver necks and 1 live foal with septic arthritis of the AO joint were included in the study. CT studies and arthrograms of the AO joint were performed, with concurrent myelography in 1 specimen, to identify arthroscopic approaches. Arthroscopy was performed in 10 cadaver joints. All accessible articular cartilage was debrided in 3 joints. Joint anatomy, accessibility, and iatrogenic injury were assessed by review of arthroscopic images, post-surgery necropsy and CT.

**Results:** Dorsal and ventral arthroscopic portals enabled adequate triangulation and accessibility of 50% of the articular surfaces of the dorsocranial occipital condyle and 15% of the dorsocranial atlas. Iatrogenic needle perforation into the spinal canal occurred in 2 cases. Joint distention caused displacement of the dura. Haematogenous AO joint septic arthritis and osteomyelitis of the occipital condyle in one 2-week-old foal were successfully debrided arthroscopically without complications. The foal had made a full recovery at 1.5 years follow-up.

**Discussion/Conclusion:** The dorsal AO joint is arthroscopically accessible and surgery was successful in 1 clinical case; however, ultrasound-guided needle placement and

distension is recommended due to potential risks of penetrating the spinal canal.

## SEPTIC ARTHRITIS/OSTEOMYELITIS IN FOALS MAY LEAD TO OSTEOCHONDRAL LESIONS

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**Introduction:** Failure of the cartilage canal blood supply leads to ischemic chondronecrosis which causes osteochondrosis, and osteochondral lesions. Osteochondrosis is a disease with a heritable component and usually occurs under aseptic conditions. In pigs and chickens, bacteria can bind to growth cartilage and can disrupt the blood supply. The aim of this study was to examine whether bacteria are present in canals in growth cartilage of foals with septic arthritis/osteomyelitis, as previously documented in pigs and chickens, and whether this is associated with osteochondrosis.

**Materials and Methods:** The study consisted of 7 foals aged 9-117 days that had been euthanased because of septic arthritis/osteomyelitis. The cases had 16 lesions in growth cartilage that were evaluated histologically.

**Results:** Bacteria were present in cartilage canals in foals with septic arthritis/osteomyelitis. Infected canals were most often necrotic. Portions of necrotic canals adjacent to bacteria frequently contained neutrophilic granulocytes, termed septic canals. Septic canals were associated with ischemic chondronecrosis in the AECC of 5 cases and the physis of 2 cases, and ossification was focally delayed in 5 of those cases. Septic cartilage lesions often occurred with adjacent osteomyelitis. Pathologic fracture was present in 3 locations in 2 cases.

**Discussion/Conclusion:** Bacteria were present in cartilage canals and were associated with focal chondronecrosis in both the AECC and physis. This establishes sepsis as a plausible cause of some osteochondral lesions in horses. Horses with sepsis-related osteochondral lesions may be used for breeding without increasing the prevalence of OCD-predisposing genes in the population.

## DETECTION OF SYNOVIAL SEPSIS IN HORSES WITH A NOVEL HAND-HELD FAST ENZYME ASSAY

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**Introduction:** Current methods to diagnose synovial sepsis such as bacterial culture, synovial cytology or PCR are either

time consuming or require laboratory conditions and special equipment. Recently, a novel hand-held fast enzyme assay (EAA) measuring increased enzyme activities of myeloperoxidase (MPO), lysozyme (LYS) and elastase (HNE) to diagnose sepsis in wound beds of human patients has been developed. The aim of this study was to investigate the suitability of this hand-held test to detect synovial infection of horses.

**Material and Methods:** Synovial fluid of horses without synovial disease (control group), with joint/tendon sheath disease (aseptic synovitis group) and with septic synovitis (septic synovitis group) was analyzed with routine cytology and total protein measurement, synovial culture, 16S PCR as gold standard for detection of bacterial DNA and the EAA, to determine the sensitivity and specificity of the latter in the diagnosis of synovial sepsis.

**Results:** All samples from the control group (n=9) as well as all samples from the septic synovitis group (n=12) were correctly detected by the EAA as non infected vs. infected. In the aseptic synovitis group 10 out of 11 samples tested negative. One cytologically aseptic sample from a previously septic joint tested positive on EAA, but also tested positive for bacterial DNA by PCR.

**Discussion/Conclusion:** The hand-held enzymatic activity assay tested in this study showed great promise as a quick and easy stall-side tool to diagnose septic synovitis in horses.

## POSTERS LARGE ANIMAL

### SUCCESSFUL CULTURE OF EQUINE INTESTINAL STEM CELLS FOLLOWING DELAYED SAMPLE STORAGE

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**Introduction:** Equine intestinal stem cells serve as potential therapeutic targets to treat horses with severe intestinal injury. Intestinal stem cells reside within the mucosal crypts and are critical for repair, but their therapeutic potential has not been utilized. The ability to collect, expand, and store stem cells creates opportunities to utilize their regenerative potential therapeutically, including for transplantation. The aims of this study were to describe the isolation and culture of intestinal stem cells into three-dimensional (3D) enteroids in clinically normal horses following delayed tissue storage.

**Materials and Methods:** Full thickness biopsies of small intestine were collected by sharp dissection post euthanasia. Intestinal crypt dissociation was either immediately performed (control) or tissue was stored at 4°C in phosphate buffered saline (PBS) for 24, 48 or 72 hours (hr) prior to

crypt dissociation. Intestinal crypts were plated and grown in a 3D matrix. Size, phenotype and plating efficiency were compared to controls. One or two-way ANOVAs were performed.

**Results:** Intestinal crypts were successfully collected from all storage time points. At 72hr storage, the intestinal mucosa was friable and crypts appeared damaged. Crypts from all time points matured into 3D enteroids. Plating efficiencies and enteroid size were decreased from intestine stored greater than 24hr prior to plating.

**Discussion/Conclusion:** Stem cells expand into enteroids following prolonged storage, however plating efficiency and growth potential decrease. Successful culture of equine intestinal crypts from stored tissue allows for possible sample shipment following procedures including surgery or necropsy, as well as offering the opportunity for future intestinal stem cell banking.

## COMPLETE RESECTION OF THE ALAR FOLDS IN THE STANDING HORSE

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**Introduction:** Alar fold (AF) collapse is a known cause of poor performance in equine athletes. Surgical excision of redundant/flaccid AFs is the treatment of choice. Traditionally, excision is performed under general anaesthesia (GA) via an incision on the lateral alae of the external nares. A minimally-invasive technique was developed, allowing complete resection of the AFs via the natural orifice, performed under sedation and local anesthesia. The objectives were to reduce the procedure cost, shorten the rehabilitation time and avoid risks associated with GA.

**Materials and Methods:** Description of 4 cases that underwent surgical treatment of AF collapse. Surgery was performed in stocks with the horses (n=4) sedated and locally anesthetized. Sedation was achieved by a combination of acepromazine, detomidine and xylazine. Bilateral infraorbital nerve blocks, incisive angle blocks plus bupivacaine tampons provided local anesthesia. AFs were resected using a curved, small-jaw, open sealer/divider LigaSure® device. Specifically, the instrument was “walked” from rostral to caudal for the dorsal incision line, and the same was repeated ventro-axially until the transection lines met caudally. The entire AFs were removed, including a rostral section of the ventral conchae.

**Results:** The surgical procedure was short (20-30 min) with minimal to no bleeding and it was well tolerated in all

cases. Complete resection of the AFs along with 3-5cm of the ventral conchal cartilage was achieved. No complications were observed post-surgery with satisfactory healing, allowing return to training/racing 4-6 weeks post-surgery in all cases.

**Discussion/Conclusion:** These preliminary results suggest that standing AF resection using bipolar electrosurgical energy is a good alternative to the traditional surgical approaches performed under GA.

## THE SEARCH FOR AN IMMUNE PRIVILEGED ALLOGENEIC MESENCHYMAL STEM CELL FOR USE IN EQUINE MEDICINE.

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**Introduction:** As the search for an immune privileged allogeneic donor mesenchymal stem cell (MSC) lines continues in equine medicine, a thorough understanding of the immunologic reaction to foreign cells is needed. Our research seeks to identify the most ideal candidate for MSC donation by comparing the MSC surface antigens between different breeds. Furthermore, we intend to determine if blood donor horses may have MSCs that would go unrecognised by the immune system as is the case for their erythrocytes.

**Materials and Methods:** Eighteen Thoroughbreds and 18 Standardbreds, including 8 blood donor-type horses, were used. Bone marrow was taken for culture of MSCs. Samples from several passages were evaluated by direct immunofluorescence using flow cytometric analysis. The cell surface expression of CD11a/18, CD44, CD90 and MHC class II were assessed. Trilineage assays were performed.

**Results:** There were significant differences in mesenchymal stem cell marker expression between breeds and blood antigen-type groups over time. Standardbred and blood donor horses showed a significantly lower expression of MHC class II. CD90 was significantly higher in blood donor horses as compared to non-blood donor Standardbreds. All MSC samples showed high expression of CD44 and low expression of CD11a/18.

**Discussion/conclusion:** Clinicians should understand that MSC survival may be poor when treatments are given in an allogeneic manner. Based on our findings, blood donor-type Standardbred MSCs from passages 2- 4 are the most ideal source for donor bone marrow-derived MSCs.

## INCREASED REGIONAL LIMB PERfusion VOLUME IMPROVES ANTIBIOTIC CONCENTRATIONS IN SYNOVIAL AND INTERSTITIAL FLUID

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**Introduction:** To evaluate the effect of intravenous regional limb perfusion (IVRLP) volume on amikacin concentrations in the metacarpophalangeal joint and metacarpal interstitial fluid in horses.

**Materials & Methods:** From 8 horses, each forelimb was randomly assigned to receive a large volume (LV), 60 mL or small volume (SV), 10 mL IVRLP. Under anesthesia, an IVRLP was performed using the lateral palmar digital vein. The tourniquet remained in place for 30 minutes. Venous blood pressure within the distal limb was recorded throughout the procedure. Synovial fluid was obtained at times 0, 30 min (before tourniquet removal), and 24 hours. Interstitial fluid (from capillary ultrafiltration probes) was obtained at times 0, 6 hours, and 24 hours. Systemic blood samples were obtained at times 0 and 30 minutes. Data were analysed using linear mixed-effects modeling and Wilcoxon signed-rank test. A significance value of  $P<0.05$  was used for all tests.

**Results:** Synovial mean amikacin concentrations at 30 min for LV IVRLP (mean 459  $\mu$ g/mL) were significantly greater than SV IVRLP (mean 70  $\mu$ g/mL). Interstitial mean amikacin concentrations at 6 hours for LV IVRLP (mean 723  $\mu$ g/mL) were significantly greater than SV IVRLP (mean 21  $\mu$ g/mL). Peak venous pressures following LV IVRLP were significantly higher than SV IVRLP, but there was no difference between treatments in time required for venous pressures to return to baseline. Amikacin was not detected in any systemic blood samples throughout the study.

**Discussion/Conclusion:** The LV IVRLP resulted in significantly greater synovial and interstitial amikacin concentrations than the SV IVRLP.

## ULTRASONOGRAPHIC EVALUATION OF THE NORMAL EQUINE LINEA ALBA

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**Introduction:** Further research on the anatomy of the normal equine linea alba (LA) is required to reduce the risk of incisional complications and decrease rehabilitation time after

colic surgery. The aim of this study was to evaluate the normal width and thickness of the LA ultrasonographically in a horse population at an equine referral hospital.

**Material and methods:** The LAs of 45 horses were evaluated ultrasonographically at five reference points. The width and thickness of the LA were measured at these five reference points using an automatic ruler. The horses were divided into groups according to breed, age, weight, BCS, height and level of work. Results were statistically analysed with SPSS 23, for correlation and significant differences between groups ( $P<0.05$ ).

**Results:** There was a wide range of values at each of the five reference points measured. In general the LA was smaller at the xiphoid process, increasing in size caudally. Three different shapes of LA were seen; a horizontal shape, a round shape and a triangular shape. The weight was positively correlated to thickness and width of the LA. Level of work was negatively correlated to width of the LA. Thoroughbred horses were found to have a smaller LA compared to the other breeds.

**Discussion/conclusion:** Ultrasonography is a useful and easy tool to evaluate the equine LA. The width, thickness and shape of the LA showed a wide range of values irrespective of the size of the horse, which could have an effect on incisional closure and healing.

## WHAT ARE THE FACTORS ASSOCIATED WITH SURGICAL SITE INFECTION IN HORSES? A PROSPECTIVE STUDY: 2011-2013

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**Introduction:** Post operative surgical site infections (SSIs) are a significant complication in equine surgery. This demonstrates an urgent need to broaden our knowledge and capabilities regarding SSIs. The current study evaluates the incidence, the bacteria involved and possible risk factors for SSIs in equine surgery.

**Materials and Methods:** All 198 surgical procedures performed in 167 animals between November 2011 and February 2013, were included in the study. The parameters evaluated included: type of surgery, the surgeon involved, age, weight, sex and breed of the animal, duration of the procedure, time of day, season and duration of hospitalisation.

**Results:** The general incidence of infection during the study period was 16.7%. Risk factors were: type of surgery, repeat surgery, sex, and weight. Abdominal procedures had a

higher risk of developing SSI than other procedures. Pregnant mares had higher risk of developing an infection than others. Heavier body weight increased the risk for the development of SSIs as well. Nineteen samples were sent for culture and sensitivity, and the most common bacteria isolated were Methicillin Resistant *Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa*.

**Discussion/Conclusion:** Based on univariable analysis, the factors that had an association with SSI, were the weight of the patient, the type of surgery, repeat surgery, sex and reproductive status, and hospitalisation time. Logistic regression analysis revealed that the patient's weight, repeat surgery, type of surgery, and sex and reproductive status of the patient, had a direct effect on the development of SSI.

## SUCCESSFUL TREATMENT OF EQUINE LYME BORRELIOSIS CAUSING POLYARTHRITIS, UVEITIS AND HYPERESTHESIA

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**Introduction:** Lyme borreliosis is a vector-borne, infectious disease caused by at least three genospecies of *Borrelia* (B.) transmitted by prolonged attachment and feeding of infected ixodic ticks. The clinical relevance of Lyme borreliosis in horses remains controversial. This case report documents a successfully treated, confirmed case of equine Lyme borreliosis.

### Materials and Methods: Case description

**Results:** A 13-year-old Warmblood gelding presented with a history of severe left hindlimb lameness and weakness of 3 months duration. Furthermore the horse demonstrated severe hyperesthesia over the left hindlimb area and marked effusion of several joints. Ultrasonography of the left hock displayed severe capsulitis and synovitis of the tarsocrural joint and synovial fluid analysis revealed a septic arthritis that was PCR positive for *B. burgdorferi* sensu lato DNA. Additionally the gelding exhibited signs of anterior uveitis in the right eye and panuveitis with marked posterior manifestation in the left eye. *B. afzelli* DNA (PCR) was detected in aqueous humour of the right eye and vitreous fluid of the left eye. Treatment included arthroscopy of the left tarsocrural joint, oral doxycycline administration for 6 weeks, topical and systemic non-steroids and intravitreal injection of low-dose gentamicin. Three months later all clinical signs had significantly improved and synovial fluid tested negative for *B. afzelli*.

**Discussion/conclusion:** *Borrelia burgdorferi* infection may be associated with septic arthritis in the horse. Lyme borreliosis should be considered as differential diagnosis in complex equine lameness, particularly when effusion of multiple joints and hyperesthesia is present. The potential role of *B. afzelli* in pathogenesis of uveitis in horses remains unknown.

## GUILLOTINE VS. PULL-THROUGH TECHNIQUE FOR PALMAR DIGITAL NEURECTOMY: A RETROSPECTIVE STUDY ON 40 HORSES

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**Introduction:** Palmar digital neurectomy (PDN) is used to manage chronic foot pain that is refractory to other treatments, and is most often performed using the guillotine technique or the pull-through technique.

**Materials and Methods:** Medical records of horses undergoing PDN under general anaesthesia (2008-2015) were reviewed. Outcome was obtained by telephone questionnaire.

**Results:** Forty horses (90% Warmbloods) were included (25 guillotine technique, 15 pull-through technique). The guillotine technique eliminated lameness in 19/25 (76%) cases. After 1 year, 13/25 (52%) horses were performing, but after 2 years, this decreased to 8/25 (32%). The median time that horses were performing was 18 months (range 0-84 months). Postoperatively, delayed wound healing and swelling were noticed in 4/25 (16%) cases. Thirteen of 22 (59%) owners evaluated the intervention positively. The pull-through technique eliminated lameness in 13/15 (87%) horses. After 1 year, 8/15 (53%) horses were performing, but after 2 years, this decreased to 6/15 (40%). The median time that horses were performing was 12 months (range 0-78). Postoperatively, delayed wound healing was observed in 2/15 (13%) horses. Ten of 13 (77%) owners evaluated the intervention positively. There was no significant difference between treatment groups for the return to athletic activity, for residual/recurrent lameness, occurrence of postoperative complications, and owner satisfaction.

**Discussion/conclusion:** The outcome was similar for both techniques, albeit with highly variable individual responses. Setting realistic client expectations is very important, and based on the limited proportion of horses without recurrent lameness when time progresses, proper case selection based on diagnostic analgesia and imaging should be emphasized.

## IN VITRO EFFECT OF PLATELET-RICH PLASMA ON HISTOLOGY CHARACTERISTICS OF THE SUSPENSORY LIGAMENT OF HORSES

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**Introduction:** Degenerative suspensory ligament desmitis (DSLD) is an important cause of lameness in horses. Currently, therapies that delay degenerative changes and avoid the adverse effects caused by conventional treatments are being studied. However, scientific limitations restrict the use of biological therapeutic alternatives such as platelet-rich plasma (PRP).

**Materials and Methods:** The study included the evaluation of 5 experimental groups of suspensory ligament explants (SLE): SLE without addition of any PRP (T1) and 4 SL groups cultured with leukocyte concentrate -PRP and leukocyte reduced -PRP. We obtained initially one SLE control group for normal comparison. All groups were cultured at 48 h. for histopathological evaluation. Allogeneic venous blood from 6 clinically healthy horses was used. Platelet concentrates were obtained through a manual double centrifugation tube method (activated with calcium gluconate (50 uL/mL).

Next the culture, SLE samples were stained (haematoxylin and eosin or alcian blue stains). The following were assessed: roundness of the nuclei of the fibroblasts, cell density, vascularisation, the pattern of the collagen fibers and determine the deposition of ground substance.

**Results:** Fibroblasts, cellular density, structural substance and vascularisation histology score were not significantly different between all the SLE groups evaluated. Collagen fibre arrangement was significantly different (P 0.05) among SLE treated with PRP at different concentrations compared with the Control and T1.

**Discussion/conclusion:** The results suggest that PRP could be maintaining some histologic characteristics in SLE. The observed difference in collagen could be associated with the action of some growth factor, but further studies are required to investigate the potential anti-inflammatory effect of PRP.

## RHEOLOGICAL CHARACTERIZATION IN SYNOVIAL FLUID OF THOROUGHBRED AND WARMBLOOD HORSES WITH OSTEOARTHRITIS

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**Introduction:** In the equine industry, lameness due to joint injury and disease is the most prevalent cause of diminished athletic function and wastage in athletic horses.

Synovial fluid is a viscous ultrafiltrate of plasma in direct contact with synovium and cartilage that lubricates articulating joint surfaces. The rheological properties of synovial fluid are crucial to the performance of joint function. In an osteoarthritic joint, damage to the articular cartilage alters the rheological properties of synovial fluid, thus reducing the viscoelasticity and increasing the friction between articular surfaces. The aim of the present research was to evaluate qualitatively and quantitatively, the rheological properties of equine synovial fluid from healthy and osteoarthritic fetlock joints.

**Materials and Methods:** For this purpose, synovial fluid was aspirated by aseptic arthrocentesis from 24 Thoroughbred horses and 24 Warmblood horses. Full rheological sample characterisation was performed in order to measure the elastic G' and viscous G'' moduli respectively, at the normal horse's body temperature (37.5°C).

**Results:** The ANOVA findings indicated a statistically significant effect of radiographic osteoarthritis on the mean values of logG'' and logG' measurements. Horses with a positive radiographic diagnosis had lower logG'' and logG' measurements compared to the reference category (normal horses). Moreover, the mean values for logG'' and logG' were higher for Warmblood, compared to the mean value for Thoroughbreds.

**Discussion/conclusion:** The viscoelastic properties of synovial fluid from osteoarthritic fetlock joints of Warmblood and Thoroughbred horses seem to be significantly lower compared to samples obtained from healthy subjects.

## CONCENTRATION OF DIPOTASSIUM ETHYLENEDIAMINETETRAACETIC ACID BUT NOT LITHIUM HEPARIN AFFECTS TOTAL PROTEIN DETERMINATION IN EQUINE SYNOVIAL FLUID.

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**Introduction:** The aim of the study was to evaluate the effect of different concentrations of dipotassium ethylenediaminetetraacetic acid (K2EDTA) and lithium heparin (LH) on total protein (TP) determination by using a hand-held refractometer in equine synovial fluid.

**Materials and Methods:** Synovial fluid obtained via synoviocentesis was separated into different aliquots of K2EDTA and LH at four different concentrations (1.76mg/ml, 3.52mg/ml, 7.04mg/ml and 17.6mg/ml for K2EDTA; 16 I.U./ml, 32 I.U./ml, 64 I.U./ml and 160 I.U./ml for LH) using commercially available collection tubes. Refractometric TP determinations were performed with an Atago MASTER-SUR/No hand-held refractometer. Total protein content was also determined by spectrophotometric Biuret method as the gold standard.

**Results:** Refractometry overestimated the TP content in SF samples containing 10 times the recommended K2EDTA concentrations. Refractometric TP determinations were not affected by LH concentration.

**Discussion/Conclusions:** To avoid erroneous TP determinations, the use of LH containing collection tubes may be an appropriate alternative when the SF volume available is not enough to fill the K2EDTA collection tube.

## RECURRANCE OF A PARANASAL OSTEOMA FOLLOWING SURGICAL REMOVAL IN A 6-MONTH-OLD WARMBLOOD FILLY

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**Introduction:** Osteomas are benign tumors of the bone that occur more commonly in younger horses. It has been suggested that regrowth is uncommon even after incomplete removal of the mass. This report describes recurrence of an osteoma in a weanling horse following surgical removal.

### Materials and Methods: Case description

**Results:** A six-month-old warmblood filly presented for evaluation of a left sided unilateral mucopurulent discharge of 5 weeks' duration. Upper airway endoscopy revealed a large, smooth mass in the area of the ethmoid turbinates. Dorso-ventral and lateral radiographs of the head revealed a large opacity in the left sinus area. A biopsy was performed under general anesthesia and an osteoma was diagnosed. Computed tomography (CT) was performed to guide surgical removal. Surgery was performed under general anesthesia and a large mass was removed that was 12cm X 9cm in size. A CT 3 months following surgery revealed 3 small areas of increased mineralisation. It was difficult to determine if these were areas of regrowth or were part of the original mass that had not been entirely removed. A CT examination around 8 months later revealed one of the areas had increased moderately in size. A second surgery was performed standing to remove the growth. A final CT examination a further 8 months later revealed no further evidence of a bone growth.

**Discussion/conclusion:** This report describes the successful treatment of an osteoma that had regrown following intial

surgical removal. This case highlights the importance of serial follow up imaging after surgical removal as osteoma regrowth occurred in this case.

## SINGLE INTRA-ARTICULAR INJECTION OF HIGH CONCENTRATED HYALURONIC ACID - A PILOT STUDY IN HORSES

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**Introduction:** The aim of this study was to objectively evaluate the effects of a single intra-articular (IA) injection of high concentrated (88 mg) and high molecular weight (HMW) hyaluronic acid (HA) in horses with clinical osteoarthritis (OA).

**Materials and Methods:** OA was diagnosed through lameness evaluation, anaesthetic blocks and digital radiographic examination. Lameness examination was performed subjectively and asymmetry was measured objectively using an inertial sensor device at weeks 1, 2, 4 and 8 after treatment. Synovial fluid (SF) analysis (viscosity, total protein (TP), and cytological examination) were evaluated before treatment and at the end of the study.

**Results:** Eight horses were included. One week after treatment 6 individuals subjectively improved, being significantly less lame ( $P = 0.020$ ), but only 2 remained clinically better after two months. Subjective flexion test response improved in 4 horses at week 8.

Decreased asymmetry was observed in a straight line (week 1), after flexion in the forelimbs (week 1 and 2) and in the hind limbs (week 8) ( $P = 0.016$ ). Synovial fluid showed significant reduction in TP at the end of the study ( $P = 0.042$ ).

**Discussion/Conclusion:** In conclusion, a single 88 mg HMW-HA is safe, induces modest improvement in subjective lameness and asymmetry and reduces TP in SF. This could represent an alternative, in the short-term period, to drugs that are prohibited in competition for pain relief while preserving joint metabolism. A randomised, double blind, controlled study to further evaluate this therapy is warranted.

## NOSOCOMIAL INFECTIONS WITH MULTI-RESISTANT BACTERIA IN COLIC PATIENTS.

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**Introduction:** Nosocomial infections are an important complication acquired by the patient in the health-care setting. Antimicrobial-drug resistant bacteria are a growing threat in human and veterinary medicine. Studies have demonstrated increased duration and higher costs of hospitalisation, as well as increased mortality due to infection with multi-resistant

(MDR) bacteria in comparison to susceptible microorganisms.

**Materials and Methods:** Horses undergoing colic surgery at the University Equine Clinic between 1.10.2014-30.9.2017 were analysed (age, sex, breed, incisional infection, number of isolates, bandage, fever and other complications) via medical records for comparison. Antimicrobial resistance was diagnosed via bacterial culture and sensitivity of wound secretions.

**Results:** A total 204 horses underwent colic surgery. MDR bacterial infection of the abdominal wound was confirmed in 18 horses (8.82%). Within 18 patients, 44 bacterial isolates were confirmed. Sixty one percent of horses survived to discharge. One horse was euthanised as a direct result of acute dehiscence of the abdominal incision. In all other horses the reason for euthanasia was gastrointestinal-related.

**Discussion/conclusion:** Colic horses often suffer from systemic disorders and are therefore prone to complications including surgical site infections (SSIs). Management can be extrapolated from human medicine, but strategies to further minimize risk factors are necessary.

## **SURGICAL TREATMENT OF A DEPRESSED, COMMINUTED ZYGOMATIC ARCH FRACTURE IN A THOROUGHBRED COLT FOAL USING A LOCKING COMPRESSION PLATE**

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**Introduction:** Fractures of the zygomatic arch of the frontal bone are common in equines. If managed conservatively, facial asymmetry occurs and reduction and fixation are necessary for an improved cosmetic outcome.

**Materials and Methods:** Case Description of a 4-month-old Thoroughbred colt foal presented for surgical treatment of a right periorbital swelling. Computed tomography (CT) confirmed a depressed comminuted fracture of the zygomatic arch of the frontal bone which was repaired using a 10-hole 2.7mm LCP. Following surgery, a loss in motor function to the upper eyelid was noted which failed to resolve by 5 weeks postoperatively. The plate was removed under general anaesthesia, and a temporary lateral tarsorrhaphy performed.

During recovery, the foal sustained a Type 1b left olecranon fracture which was repaired using a DCP.

**Results:** The foal was immediately weight-bearing post-operatively and slow improvement in motor function was noted in the upper eyelid. Follow-up radiographs indicated healing of the olecranon fracture. Eyelid motor function was almost completely restored 12 weeks post-operatively. However, the foal developed contralateral limb lameness due to osteoarthritis of the proximal interphalangeal joint. Based on the poor racing prognosis, the foal was euthanised.

**Discussion/Conclusion:** The use of an LCP for repair of a zygomatic arch fracture has not been reported, nor has the development of contralateral limb osteoarthritis following olecranon fracture. This report also suggests more time may be required for return of motor function to the upper eyelid than previously thought.

## **EFFICACY OF FAECAL MICROBIOTA TRANSPLANTATION FOR TREATING ACUTE COLITIS IN HORSES FOLLOWING COLIC SURGERY**

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**Introduction:** Enteritis and colitis of the equine gastrointestinal tract are associated with high morbidity and mortality in adult horses. The disease is characterized by high fever and severe watery diarrhoea. The treatment involves the improvement of the general condition of the horse and restoring the balance of intestinal flora, emphasizing the importance of microbiota optimizers as probiotics and faecal microbiota transplantation (FMT). The principle of FMT is that restoration of a balanced nonpathogenic bacterial population may be the primary defence mechanism against colonization of pathogenic bacteria. The present report describes the outcomes of 4 horses treated with homologous FMT for acute colitis.

**Materials and Methods:** Description of horses developed diarrhoea and fever a few days after a laparotomy to treat gastrointestinal disease. FMT was performed once immediately upon identification these signs. Fresh faeces from a healthy horse were obtained via rectal evacuation (1.5-2.0 kg), mixed with 4 L of fresh water and strained by compression using cotton fabric until all liquid was drained (4.5 L). Then, 40 g of sodium bicarbonate was added and the mixture was immediately transferred via nasogastric tube.

**Results:** Clinical signs of colitis were controlled within 24 hours and normal defecation was restored in 1 to 8 days.

**Discussion/Conclusion:** Further clinical studies are necessary to determine the optimal preparation and to further determine the efficacy of FMT for treating acute colitis following colic surgery. The technique has the potential to be an inexpensive, safe and highly efficient tool for the prevention and treatment of infectious gastrointestinal diseases in horses, preventing antimicrobial resistance.

## ARTHROSCOPIC ULTRASOUND TECHNIQUE FOR QUALITATIVE ASSESSMENT OF LIGAMENTS, MENISCUS, CARTILAGE AND SUBCHONDRAL BONE IN THE CRANIAL COMPARTMENT OF THE MEDIAL FEMOROTIBIAL JOINT IN 6 HEALTHY ADULT HORSES.

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**Introduction:** Arthroscopic ultrasonography has not previously been reported in horses. This study was undertaken to describe the structures that could be imaged in the cranial compartment of the medial femorotibial joint.

**Material and methods:** The cranial medial femorotibial joints of 6 healthy adult horses were explored bilaterally. Two instrument portals for the ultrasound probe were performed one between the middle and the medial patellar ligaments, one more caudally. An 11 MHz, 4mm diameter ultrasonographic probe was used. The operator focused on imaging the medial condyle cartilage and subchondral bone, the meniscus, the cranial attachment of the meniscus and both cruciate ligaments.

**Results:** Gas in the joint impaired the acquisition of images. A “non contact” approach, using the fluid as an acoustic medium, improved image quality. The cartilage and subchondral bone were imaged on almost all the exposed surface of the medial condyle. The axial part of the cranial medial meniscus and its ligament could be imaged in all horses. The cranial cruciate ligament and its tibial attachment could be reached in all horses. The caudal cruciate ligament could be imaged in only 2 horses.

**Discussion/Conclusion:** Diagnostic quality ultrasonographic images of most structures of the cranial pouch of the medial femorotibial joint were obtained. Limitations were due to the straight configuration of the probe, and limitation of movements due to the position of the portal incisions. This device may be useful in clinical cases to assess subchondral bone defects, cartilage thickness, meniscal tears, meniscal attachments and cruciate ligaments or to perform ultrasound guided procedures.

## CAUDAL MAXILLARY SINUSITIS ASSOCIATED WITH SUPERNUMERARY CHEEK TEETH IN THREE HORSES

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**Introduction:** Supernumerary cheek teeth (SCT) most commonly occur at the caudal aspect of the maxillary cheek teeth row. Their presence may give rise to clinical problems. In the presence of advanced periodontal disease, oral extraction of the SCT may be indicated. In the horse, clinical signs attributed to SCT are rarely reported and there are limited reports documenting oral extraction of supernumerary cheek teeth.

**Materials and Methods:** Description of case details of 3 adult horses that were referred with a history of unilateral nasal discharge or chronic sinusitis. Orosopic examination revealed SCT 111bis. Caudal maxillary sinusitis associated to the SCT was diagnosed in all cases. Both 111 and 111bis CT were orally extracted in two cases and it was highly recommended in one case.

**Results:** Complete oroscopic examination permitted identification of the SCT. In all cases, SCT were located in the maxillary arcade. Oral extraction of the supernumerary teeth 111bis and teeth 111 were performed per os with forceps, because of its irregular shape, the 111bis was particularly challenging to extract in one case. Follow-up information showed complete clinical improvement following oral extraction in those two cases. In one case, the horse was lost for follow up.

**Discussion/Conclusion:** Deep ascending periodontal disease may lead to sinusitis necessitating oral extraction of SCT. SCT should be considered in the differential diagnosis of cases with signs of dental disease. Methodical and detailed oral inspection and radiographic survey of the maxilla is essential to confirm SCT diagnosis. Outcome associated with SCT removal is favourable when oral extraction is performed.

## MYCOTIC RHINITIS AND PARANASAL SINUSITIS IN SIX HORSES (2013-2017)

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**Introduction:** Mycotic rhinitis and paranasal sinusitis are uncommon diseases in horses and treatment can be prolonged to get a favorable outcome. The aim of this study was to describe and document clinical findings, results of

diagnostic investigations, treatment and outcome of horses with mycotic rhinitis and paranasal sinusitis.

**Materials and Methods:** The clinical findings, results of diagnostic investigations, treatment and follow-up of equine mycotic rhinitis (n=1) and paranasal sinusitis (n=5) were retrospectively reviewed from 2013 - 2017.

**Results:** Mycotic plaques were observed in the nasal cavity and ethmoid turbinates during nasal endoscopy in 1 horse and in the sinuses during sinoscopy in 5 horses. The aetiology was unknown for 5 horses and one case presented with a tooth fracture, requiring tooth extraction. Fungal culture was positive in 4 horses with a predominance of *Aspergillus* spp. (n=3) and *Scedosporium* spp. (n=1). Surgical mechanical debridement was performed under nasal endoscopic guidance, sinoscopy or a bone flap approach. Medical treatment included local application directly to the affected area of clotrimazole, enilconazole, nystatin or amphotericine B (mean of 9 applications) and additional inhalation of nystatin or amphotericine B (mean of 22 days of nebulization). Up to 6-months follow-up was necessary to observe complete regression of mycotic plaques.

**Discussion/conclusion:** This study provides further information regarding the treatment of mycotic rhinitis and sinusitis in horses. Long-term follow-up demonstrated that these cases can be effectively and safely treated with repeated surgical debridement and topical antifungal therapy.

## CLINICAL FINDINGS AND MANAGEMENT OF 7 CASES WITH SUBTENDINOUS BURSITIS OF THE LONG DIGITAL EXTENSOR TENDON IN THE FETLOCK

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**Introduction:** The bursa of the common digital extensor tendon is beneath the common digital extensor tendon at the level of the fetlock and pastern joints. In the literature the bursa of the long digital extensor tendon is described as being over the tibia but not over the fetlock. As general consideration of bursa conditions, bursitis is defined as an inflammatory reaction within a bursa.

**Materials and Methods:** Review of hospital records for cases of subtendinous bursitis of the long digital extensor tendon in the fetlock.

**Results:** Seven cases were found that had presented in the past 19 years and these had similar clinical signs. These were predominantly inflammation/distention beneath the long digital extensor tendon, at the level of the fetlock, without associated lameness. The main problem was the

cosmetic defect and concern about horses functional use in the future. Three of the seven cases presented were treated surgically through bursoscopic debridement of the bursae. The cosmetic results were excellent in 2 of the 3 cases treated surgically. One horse suffered recurrence of bursitis.

**Discussion:** To the best of our knowledge, this is not a commonly diagnosed problem. Therefore, its clinical management and prognosis as well as results have not been previously reported. We believe this is a rare condition. Our conclusion is that bursoscopy is an appropriate technique to manage bursitis in this location and has a good prognosis (both cosmetic and functional).

## COMPARISON OF A CLAMPED WITH A NON-CLAMPED DRILL GUIDE FOR DRILLING EQUINE 3RD METACARPAL/TARSAL CONDYLES

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**Introduction:** Techniques to improve fracture repair in the standing equid are sought. It is hypothesised that use of a C-style clamped drill-guide will improve drilling accuracy and reduce surgery time compared to a hand-held drill-guide.

**Material and Methods:** Eighty equine cadaver distal limbs were randomly assigned to hand-held or clamped groups. One of 4 surgeons then drilled a 4.5mm hole from the middle of the lateral to the medial epicondylar fossa. Times were recorded and the drilled holes were evaluated on images obtained with a Pegaso CT scanner. Accuracy was assessed by deviation of the hole from the joint surface (frontal plane) or the palmar/plantar margins of the condyles (transverse plane). Accuracy and time comparisons were made between guides.

**Results:** The mean deviation in the transverse plane was non-significantly ( $P=0.13$ ) lower for the clamped  $-0.26^\circ$  (range  $-9.72^\circ$ ,  $+6.58^\circ$ ) than the hand-held drill guide  $+0.60^\circ$  (range  $-9.74^\circ$ ,  $+12.33^\circ$ ). The mean deviation in the frontal plane was significantly ( $P<0.05$ ) lower for the clamped  $+0.35^\circ$  (range  $-5.42^\circ$ ,  $+6.61^\circ$ ) than the free-hand drill guide  $+2.05^\circ$  (range  $-5.24^\circ$ ,  $+9.81^\circ$ ). Mean drilling times were significantly ( $P<0.05$ ) shorter in the clamped (mean 41.2s, range 19s, 75s) than the hand-held group (mean 56.6s, range 24s, 159s).

**Discussion/Conclusions:** Limitations include the use of cadavers of varying sizes and ages in a laboratory situation. A clamped drill guide improves accuracy and speed of drilling equine 3rd metacarpal/tarsal condyles.

## CASE SERIES OF 10 HORSES DIAGNOSED WITH MONORCHIDISM BASED ON CLINICAL FINDINGS FROM EXPLORATORY LAPAROTOMY OR STANDING LAPAROSCOPY

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**Introduction:** Monorchidism describes the complete absence of one testis. The aim of this study was to report the clinical findings in 10 horses diagnosed as monorchids by laparoscopy and laparotomy, with a secondary aim to compare techniques and assess effects on morbidity.

**Materials and Methods:** Hospital records for all horses undergoing cryptorchidectomy (2000-2016) in 4 centres were reviewed retrospectively, from which horses diagnosed with monorchidism were identified. Surgery was by standing laparoscopy or pre-inguinal exploration and subsequent laparotomy under GA.

**Results:** Ten horses (age: 1-12 years) were diagnosed as monorchids. Five were diagnosed by laparoscopy and 5 by laparotomy. The right testicle was absent in three horses, and the left absent in 7. The vaginal process was present in all horses, ductus deferens and epididymis present in 80% and the epididymal ligament and testicular vessels were present in 50% of horses. There was no difference in the structures identified between laparoscopy and laparotomy and no post-operative complications in any horses.

**Discussion/Conclusions:** When monorchidism occurs most other associated spermatic structures are likely to be present. Laparoscopy allowed easy identification of spermatic structures enabling a prompt diagnosis of monorchidism. Although horses castrated by laparotomy spent longer on box rest postoperatively, they were successfully castrated using either laparoscopy or laparotomy without reported complications, preventing further meaningful comparison of techniques.

## PERIOSTEAL ROTATIONAL FLAPS IN PRIMARY REPAIR OF EQUINE SINOFACIAL FRACTURES: A REPORT ON 7 CASES.

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**Introduction:** Traumatic fractures of the facial bones of the equine skull are common. Open facial fractures involving the

sinuses are commonly repaired by delayed primary closure due to excessive contamination or epistaxis. Sequelae reported include sinofacial fistulas and chronic wounds due to bone and tissue deficits.

**Materials and methods:** Medical records of horses undergoing surgery for traumatic sinofacial fractures from April 2009 to May 2017 were reviewed. Inclusion criteria included fracture of the facial bones extending to the sinuses and primary surgical repair using a periosteal rotational flap within 24h of the time of injury.

**Results:** Seven horses underwent surgical repair by standing surgery (6 horses) or general anaesthesia (1 horse). Fracture repair was performed in 3 cases. In 4 cases the fragments were removed or elevated and aligned without further stabilisation. In all horses there was a bone deficit >2 cm (ranging 2-7cm) after repair and the fracture site was covered with a periosteal rotational flap obtained from adjacent healthy bone and sutured in place with monofilament synthetic absorbable surgical suture. Long term follow up >6 months was excellent regarding both cosmesis and function in all 7 horses.

**Discussion/conclusions:** This case series describes the benefits of primary repair of traumatic sinofacial fractures using a rotational periosteal flap, providing an excellent cosmetic and functional outcome in 7 horses. Hence, due to the positive outcome demonstrated, timely primary repair should be considered upon encountering a traumatic sinofacial fracture.

## PRESSURE ALGOMETRY AS A TECHNIQUE TO QUANTIFY ABDOMINAL WALL SENSITIVITY IN HORSES AFTER VENTRAL MIDLINE CELIOTOMY.

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**Introduction:** A pressure algometer is a force gauge with a probe area with which the pressure needed to evoke a reaction can be measured. Algometry determines mechanical nociceptive thresholds (MNTs). This study aims to assess the clinical course of abdominal wall sensitivity after ventral midline celiotomy in horses.

**Materials and Methods:** A patient group (n = 13) and a control group (n = 10) were measured at day 1,3, 5, 7 and 9. All horses (n=23) had marked measuring sites around the wound and 2 control sites cranial to the wound. Measurements were performed by one observer that was blinded.

**Results:** Patients showed a decrease in MNTs from D1 to D5 with a significant difference compared to control horses at D5 at the measuring sites of the wound. MNTs at control

sites showed a significant difference on D3 between patients and control horses.

**Discussion/Conclusions:** Low MNT values on day 5 in the patient group could indicate primary hyperalgesia in the wound area, caused by an inflammatory response. Results from this study provides information on the use of pressure algometry in horses after ventral midline laparotomy. In order to further investigate the use of pressure algometry as a predictive value for the development of complications of wound healing, more research is needed.

## INVESTIGATION OF BLOOD SERUM AMYLOID A CONCENTRATIONS IN HORSES TO DIFFERENTIATE SYNOVIAL SEPSIS FROM INFLAMMATION AND DETERMINE PROGNOSIS AND RESPONSE TO TREATMENT.

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**Introduction:** Studies investigating serum amyloid A (SAA) concentrations in blood and synovial fluid (SF) of horses with synovial sepsis have shown that both have diagnostic value and suggested that serial measurements of blood SAA could act as a prognostic indicator for survival. The aim of this study was to evaluate blood SAA concentrations for monitoring and prognosticating horses with synovial sepsis.

**Materials and Methods:** Horses with synovial sepsis who survived treatment (n=17), were euthanized (n=5), had non-septic intra-synovial pathologies (n=14) and extensive extra-synovial lacerations (n=5) referred to a single hospital were included. SAA concentrations were determined on jugular blood samples collected on admission and every 24hours thereafter. The area-under-the-concentration-versus-time-curve (AUC) and blood SAA concentrations at different time points were compared using Kruskal-Wallis and post hoc Dunn's test. Significance was P<0.05.

**Results:** Non-septic pathologies had the lowest SAA values. A significant difference was found between synovial sepsis with good outcomes and non-septic pathologies, as well as between non-septic intra-synovial pathologies and non-responsive sepsis requiring euthanasia. No difference was found between extensive extra-synovial lacerations and any other group.

**Discussion/Conclusion:** Serial monitoring of blood SAA concentration may be useful for monitoring horses with synovial sepsis; - however, its interpretation can be limited by confounding pathologies.

## SMALL ANIMAL

### RESIDENT'S FORUM - SMALL ANIMAL - ORTHOPAEDIC

#### ACCURACY OF PATIENT-SPECIFIC 3D-PRINTED OSTEOTOMY AND REDUCTION GUIDES FOR DISTAL FEMORAL OSTEOTOMY FOR MEDIAL PATELLAR LUXATION IN DOGS.

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**Introduction.** Distal femoral osteotomy (DFO) is a recognised technique for management of femoral varus and/or torsion contributing to medial patellar luxation (MPL) in dogs. Our objective was to compare pre- and post-correctional femoral alignment following DFO using patient-specific, 3D-printed osteotomy and reduction guides, *in vivo* and *ex vivo*.

**Materials and Methods.** This prospective study enrolled 10 dogs that underwent DFO for management of MPL. Osteotomy and reduction guides were designed using CAD software prior to 3D-printing. DFO was performed via a standard lateral approach to the distal femur and stifle. Femoral osteotomy and reduction was also performed on 3D-printed models of each femur using reprinted guides identical to those used *in vivo*. Femoral varus angle (FVA) and femoral torsion angle (FTA) were assessed on post-operative computed tomography (CT) images of all femurs by 3 observers.

**Results.** In clinical cases, the mean difference between target and actual post-operative FVA was 2.29° (+/- 2.29°) (P=0.0076) and FTA was 1.67° (+/- 2.08°) (P=0.300). In the bone models, the mean difference between target and actual post-operative FVA was 0.29° (+/- 1.50°) (P=0.813) and FTA was -2.33° (+/- 3.21°) (P=0.336). Intra-observer intra-class correlation coefficients (ICCs) (0.736 to 0.998), and inter-observer ICCs (0.829 to 0.996) showed excellent agreement.

**Discussion/Conclusion.** Use of 3D-printed osteotomy and reduction guides allowed accurate correction of FTA *in vivo* and both FVA and FTA in bone models. The varus error *in vivo* was likely the result of fixation with over-contoured, non-locking plates.

### MECHANICAL PROPERTIES OF THE CANINE MEDIAL MENISCUS

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**Introduction.** Some properties of the meniscus can be determined by the microindentation, a test used to determine and measure a tissue's biomechanical properties and in particular the reduced modulus, which characterizes a material local stiffness. The main objectives of this study were to determine the biomechanical properties of healthy canine menisci through microindentation, and to create a database of information on young healthy adult dogs in order to compare with abnormal menisci in future studies.

**Material and Methods.** The left medial meniscus was obtained post-mortem from 6 different purebred Beagle dogs. Microindentation was performed on the femoral face of each meniscus, on the three regions (posterior, central, and anterior) and on two different circumferences (central and peripheral).

**Results.** The reduced modulus of canine meniscus was on average  $3.2 \pm 2.8$  MPa. The three regions exhibited different stiffness, the anterior region being significantly more rigid than the central region ( $p = 0.04$ ). The regional differences in stiffness might be related to functional (difference in peak contact pressure between meniscal regions during load transmission), structural (difference in composition and organization of collagen and proteoglycans in particular), or genetic differences. No significant difference in stiffness was found between the two circumferences despite a disparity in vasculature.

**Discussion/Conclusion.** This study provides a unique and reliable database of information on the mechanical stiffness of healthy menisci in a similar canine population. Moreover, this study is fundamental and the results could be used for comparison in future studies of abnormal menisci removed during surgical stabilization of cranial cruciate ligament in dogs.

## KINEMATICS OF THE FELINE ANTEBRACHIOCARPAL JOINT FROM SUPINATION TO PRONATION

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**Introduction:** Cats need to pronate and supinate their antebrachium for activities such as jumping and grooming. Although kinematics of the carpal bones is widely studied in people, this is unreported in cats. In the context of this study, kinematics refers to the movement of the proximal row of carpal bones and radius relative to the ulna. We hypothesized that the intermedioradial carpal bone (RCB) would follow the movements of the radius.

**Materials and Methods:** Eight feline cadaveric forelimbs were moved through a standardized arc from supination to pronation in a testing jig, and computed tomography (CT) was performed in each position. The bones were segmented from CT scans and aligned to a defined ulna coordinate system so that rotations and translations of the radius, RCB, ulnar carpal bone (UCB) and accessory carpal bone (ACB) could be compared relative to the ulna.

**Results:** General linear regression analysis between paired bones demonstrated that there was strong coupling of the movements of the UCB and RCB as well as the RCB and radius. Movement coupling was lowest for the radius and UCB.

**Discussion/Conclusion:** These data suggest that the carpus is not purely a ginglymus joint because rotation around the ulna occurs during supination-pronation movement. The data also suggest that the radius - RCB coupling is not as strong as the UCB - RCB coupling, suggesting a more nuanced kinematic model of the feline carpus than was hypothesized.

## DEVELOPMENT OF A PERSONALISED INTERBODY DEVICE FOR TREATMENT OF CANINE DISC ASSOCIATED CERVICAL SPONDYLOMYELOPATHY

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**Introduction.** The aim of this study was to design and manufacture a personalised 3D printed, intervertebral spacer to treat disc-associated cervical spondylomyelopathy (DACSM) in dogs, and to use advanced imaging to assess implant movement, subsidence and interbody fusion.

**Method.** The interbody devices were designed to maintain distraction, promote fusion and prevent post-operative migration. Generic devices were personalised to fit each dog's endplate anatomy, 3D printed in titanium and implanted. The dogs were evaluated at 0, 2 and 6 months to determine clinical outcome, degree of interbody fusion, implant migration and subsidence.

**Results.** Progressive fusion across the affected intervertebral space was noted by 6 months. The implants shifted cranially in the 2-month interim (1.2-1.4mm). There was minimal or no subsidence of the intervertebral device through the endplates (0.5mm) based on CT. Clinically, the neurological status improved significantly in both dogs.

**Conclusion.** The novel device restored the intervertebral space, resulted in a degree of interbody fusion and resolution of clinical signs. Large case series and biomechanical

evaluation would be required to determine if there are advantages to this technique over previously described techniques. This paper illustrates an end-to-end method and preliminary outcomes in two clinical cases of DACSM treated with a personalised, intervertebral spacer device. Collaboration between clinicians and design engineers with advanced manufacturing technologies can provide a cutting-edge standard of personalised care for patients.

## CERVICAL FUSION AFTER DISTRACTION-FIXATION IN 10 DOGS WITH CAUDAL CERVICAL SPONDYLOMYELOPATHY.

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Introduction. Disc-associated caudal cervical spondylomyopathy (CSM) occurs in large breed dogs. These patients would benefit from stabilisation employing instrumented fusion using an intervertebral cage. This retrospective study determined the long-term outcome of patients treated in this manner.

Materials and Methods. Ten large breed dogs underwent surgery for disc-associated CSM (2013 – 2016). The surgical technique consisted of distraction using a Syncage® (n=9) or a TTA cage (n=1) and fixation with two Unilock® plates. Follow-up included Helsinki pain score questionnaire, neurological grading (Griffith scale), radiography, and computed tomography (CT). Bone fusion through the cage was assessed on radiography and measured on CT. Post-mortem micro CT was performed in 2 dogs.

Results. Follow-up time after surgery was 9 to 47 months. Overall, the Helsinki pain scores improved significantly ( $p<0.01$ ), as did the neurological Griffith score ( $p<0.01$ ). On CT, the mean  $\pm$  SD volume for bone in the cage was  $79.5\% \pm 14.3\%$  versus 48.5% (control) and for compact bone  $53.0\% \pm 23.4\%$  versus 10.9% (control). Implant failure was evident in 4 dogs and plates were removed in 1 dog. No cage removal was necessary.

Discussion and Conclusion. Clinical outcome in dogs with disc-associated CSM treated by distraction-fixation using an intervertebral titanium cage and plates was good. Spinal fusion was reached as evidenced on (micro) CT, but assessment of bone fusion through the cage on CT was hampered by titanium scattering.

## BIOMECHANICAL COMPARISON OF 2.0MM LCP AND 2.0MM LCP NOTCHED HEAD T-PLATE IN A SYNTHETIC DISTAL RADIUS FRACTURE MODEL

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Introduction. The purpose of this research was to compare the biomechanical properties of the 2.0mm straight LCP and 2.0mm LCP notched head T-plate, in a compressed transverse juxta-articular distal radius fracture model.

Materials and Methods. The stiffness of the 8 hole 2.0mm LCP and the 2.0mm LCP Notched Head T-Plate was compared in a synthetic bone model using non-destructive tri-planar four point bending (Instron 5848 MicroTester, Bluehill v2.5.391). Four-point bending was performed on the construct tension side when load was applied parallel to the screw axis (tension bending), then subsequently rotated 180 degrees and parallel loading was repeated on the construct compression side (compression bending), then subsequently rotated 90 degrees with applied load perpendicular to the screw axis (perpendicular bending).

Results. The 2.0mm LCP was significantly stiffer in both compression (160%,  $P<0.0001$ ) and perpendicular bending (126%,  $P=0.0014$ ). No significant difference in stiffness in tension bending was identified between straight LCP and T-plate constructs ( $P=0.1709$ ), with a mean stiffness of 100N/mm (95%CI 82.4-117.6) and 79.9N/mm (95%CI 51-108.8) respectively.

Discussion/Conclusions. In this synthetic bone model, a 2.0mm straight LCP with 2 screws in the distal fragment was significantly stiffer than a 2.0mm notched head T-plate with 3 screws in compression and perpendicular bending, but there was no significant difference for tension bending.

## EVALUATION OF A SINGLE INTRA-ARTICULAR INJECTION OF AUTOLOGOUS ADIPOSE TISSUE FOR THE TREATMENT OF OSTEOARTHRITIS: A PROSPECTIVE CLINICAL STUDY IN DOGS

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Introduction: The purpose of this study was to investigate the clinical safety and efficacy of a single intra-articular injection of autologous adipose tissue, collected from the lumbar lower back, for the treatment of osteoarthritis (OA) in dogs.

**Material and Methods:** Twenty client-owned dogs with OA were recruited. OA was confirmed radiographically and lameness and joint pain were evaluated on physical examination. Dogs were evaluated while walking on a pressure gait analysis walkway at time 0 (pre-injection), 14, 30, 60, 180 days after injection. The asymmetry index of the affected limb compared to the contralateral limb was studied based on peak vertical force (PVF) and vertical impulse (VI). Clinical evaluation was performed using an individual score assessed by the veterinary investigator. Owner perception data regarding levels of physical activity were also collected (Canine Brief Pain Inventory, CBPI).

**Results:** Compared to pretreatment values, adipose tissue treatment data showed a significant improvement in day 180 pain score over baseline: CBPI (improved 25.2%), lameness scores (improved 28.2%), VI (%BW\*s; increased 15%) and PVF (%BW; increased 10.7%). The scores for OA were the same from day 0 to day 180, except in two dogs, resulting in 156 of 160 scores being identical at days 0 and 180. No major treatment side effects were noted.

**Conclusion:** Regenerative autologous adipose tissue injection therapy is a promising alternative to traditional analgesic treatment in patients with OA, associated with reductions in pain and lameness scores, with delayed disease progression, improved quality of life and owner satisfaction.

## EVOLUTION OF RADIOGRAPHIC PARAMETERS OF CANINE PASSIVE HIP LAXITY AT 4, 6 AND 12 MONTHS: A STUDY OF 306 DOGS

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**Introduction:** The distraction index (DI) is reported to be stable over time. The purpose of this study is to evaluate the variation of the DI and Norberg angle in distraction (DNA, as described by Adams in 1998), between 4, 6 and 12 months of age.

**Material and Methods:** Dogs (n=306) underwent stress radiographs, using a Vezzoni distractor, at 4, 6 and 12 months of age. DI and DNA were calculated as previously described.

**Results:** For the total population, the DI showed a significant increase from 4 to 6 months, and a significant decrease at 12 months. For the hips with a DI $\leq$ 0.4 at 4 months, the DI showed a significant increase from 4 to 6 months (0.16 on average). For the hips with a DI $>0.7$  at 4 months, DI at 6 and 12 months showed a significant decrease (0.14 and 0.26, respectively, on average). For the total population, the DNA followed the same pattern as the DI, and the values are significantly related ( $p<0.001$ ).

**Discussion/Conclusions:** The time of radiographic evaluation of hip laxity influences the value of the DI. The DNA is strongly related to the DI, and its use as a more convenient indicator of hip laxity in dogs should be further investigated.

## EX-VIVO CADAVERIC STUDY ON A LATERALLY PLACED LEIPZIG STIFLE DISTRACTOR FOR ARTHROSCOPIC EVALUATION OF THE LATERAL MENISCUS IN DOGS

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**Introduction:** Lateral meniscal injury in dogs is a rarely observed stifle pathology, but it is associated with significant morbidity. Arthroscopic diagnosis and treatment of meniscal pathology is proven to increase sensitivity and specificity of meniscal examination. Extra-articular stifle distraction has been shown to improve evaluation and treatment of the medial meniscus.

**Materials and Methods:** Eight canine cadaveric hind limbs were used. Pins for the Leipzig Stifle Distractor were placed laterally on the limb: in the femur, midway between patellar apex and lateral fabella, and in the tibia on a line perpendicular to the long axis of the tibia at the level of the tibial tuberosity cranial to the fibular head. Safety and accuracy of lateral pin placement were evaluated by anatomical dissection, computed tomography (CT) and arthroscopy. Distraction of the lateral compartment of the femorotibial joint space was evaluated arthroscopically, the meniscus probed and a partial meniscectomy performed in every case.

**Results:** Pin placement for stifle distraction was accurate in all limbs. No damage to surrounding anatomical structures was observed during anatomical dissection, CT or arthroscopy. Sufficient distraction to arthroscopically examine and treat the lateral meniscus was achieved in all stifle joints.

**Discussion/Conclusion:** Lateral placement of the Leipzig Stifle Distractor proved to be safe and effective for distraction of the lateral femorotibial joint space, enabling examination and treatment of the lateral meniscus.

## HYBRIDIZATION OF CEMENTLESS HIP ARTHROPLASTY SYSTEMS IN DOGS: HELICA AND ZÜRICH CEMENTLESS

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**Introduction:** Retrospective study reporting the use, complications and long-term outcomes of total hip arthroplasty (THA) using a hybrid cementless system.

**Materials and Methods:** Medical records of dogs that underwent THA using a combined implant system consisting of Helica cup, Helica head-neck and Zürich cementless (Z-THA) stem components between March 2010 and March 2015 were reviewed. Dogs with a minimum follow up of  $\geq$  two years were included. Signalment, complications and outcome at the latest follow up examination were recorded.

**Results:** Sixteen hybrid THA were performed in 12 dogs. Mean follow up was 42.5 months. Complications occurred in three cases consisting of prosthesis luxation (first case), aseptic cup loosening (second case) and implant failure – breakage of all stem locking screws with subsequent stem subsidence (third case). The first 2 complications were successfully revised and the dogs achieved a full functional outcome. The third case was treated conservatively and achieved an acceptable outcome at the last follow up.

**Conclusion:** Hybridization of the Helica neck/head/cup and Z-THA stem for initial THA surgery is feasible, however the expect reduction of postoperative complication rate compared to Zürich cementless only was not achieved.

## RESIDENT'S FORUM - SMALL ANIMAL – SOFT TISSUE

### A NOVEL SURGICAL APPROACH TO BRACHYCEPHALIC SYNDROME: DESCRIPTION AND LONG-TERM OUTCOME IN 450 CONSECUTIVE DOGS.

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**Objectives:** To describe a new standardised approach for treatment of brachycephalic airway obstructive syndrome (BAOS) in dogs and to report the short-term and long-term clinical outcome.

**Materials and methods:** The records of all dogs treated by a H palatoplasty (specific palatoplasty with tonsillectomy) using a CO<sub>2</sub> laser and rhinoplasty associated with vestibuloplasty from July 2011 to July 2017 were reviewed. Perioperative and short-term follow-up information were obtained from the medical records. A long-term follow-up of at least 12 months was performed through a questionnaire sent to all the owners.

**Results:** The H palatoplasty could be used on all dogs in this series, even dogs previously treated by another surgical approach (7.1%). The mortality rate in the perioperative period was 1.1%. Major complications were dyspnoea

(2.2%), bronchopneumonia (1.1%) and heatstroke (0.7%). Mean follow-up time was 28 months. No dog needed any revision surgery. Multivariate analysis showed that clinical outcome had no correlation with age, breed or the severity of the digestive and respiratory conditions. Respiratory and breathing improvement were reported by 97.8% and 89.4% of the owners respectively. A global rate of 8.1/10 was given by the owners and 99.3% would recommend this procedure.

**Conclusion:** This standardised approach seems appropriate to all the dogs suffering from BAOS no matter what the age, breed or severity of the digestive and respiratory conditions, with good short-term and long-term results.

## A NOVEL MINIMALLY INVASIVE SURGICAL APPROACH FOR PROPHYLACTIC LAPAROSCOPIC GASTROPEXY: STUDY OF 21 CASES

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**Introduction:** The objectives were to describe the operative technique and outcome for a novel laparoscopic gastropexy approach in dogs.

**Material and methods:** Dogs undergoing prophylactic laparoscopic gastropexy with a simple continuous barbed suture without incising the seromuscular layer of the stomach and transversus abdominis were reviewed. Signalment, surgical information (including surgical time, other procedures performed), length of hospitalization, short-term and long-term (minimum of 6 months) complications, and long term post-operative ultrasound were analysed.

**Results:** Twenty-one cases met the inclusion criteria. In 20 cases, additional procedures were performed, comprising 18 ovariectomies and 2 prescrotal castrations. One dog had two prior episodes of gastric dilation without volvulus. The gastropexy took a median of 33 minutes (range 19-43 minutes). The median number of suture bites was 7 (range 6-9 bites). The V-LocTM180 absorbable and the V-LocTMPBT non-absorbable device were used in 8 and 13 dogs, respectively. Minor intraoperative complications occurred in 4 cases, comprising broken suture (1), needle dislodgement (2) and folded needle (1). Minor complications included self-limiting wound (3), abdominal discomfort (2), vomiting (1) and inappetence (2). Postoperative abdominal ultrasound performed at a median time of 7 months (3-36 months) confirmed permanent adhesion at the gastropexy site in all dogs. One dog had a fistula (1 year postoperatively) and another a granuloma (3 months postoperatively) at the gastropexy site.

**Discussion/conclusion:** Prophylactic laparoscopic gastropexy can be performed with knotless unidirectional barbed

suture without creating an incision on the abdominal wall and the stomach. This method created a lasting adhesion, is less challenging and significantly reduced the gastropexy time, compared to previous reports.

## EVALUATION OF A PRE-TIED LIGATURE LOOP FOR CANINE TOTAL LUNG LOBECTOMY

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**Introduction:** Complete lung lobectomy is conventionally performed by suture ligation of the airway and vessels individually, or more commonly using a surgical stapling device. Pre-tied ligature loops (PLLs) are a safe method for biopsy of tissue up to 3cm from the lung lobe margin, however the cartilaginous support and diameter of bronchi at the hilus may be more challenging to occlude with an encircling ligature. This study aimed to determine whether complete lung lobectomy using a PLL reliably resists airway pressures compared to current gold standard techniques.

**Materials and Methods:** Lung lobes from 5 medium-large breed dogs were randomized to 3 lobectomy techniques; 1) stapler, 2) PLL 3) sutures. Following lobectomy, each bronchial stump was submerged in water and the mainstem airway pressure was increased to a maximum of 80 mmHg or until bubbles were seen. The incidence of failure between groups was compared with a Fisher's exact test (2x3 table).

**Results:** Ten lung lobes were evaluated in each group. Three stapled and four sutured lobes leaked. One stapled lobe failed at a physiological airway pressure (5mmHg). No PLL lobectomies leaked. There was no statistically significant difference between methods for failure rate ( $p= 0.15$ ).

**Discussion/Conclusion:** PLLs are a reliable method for hilar bronchial sealing in this canine cadaver model. No failures despite markedly supraphysiological pressures suggests a wide safety margin. Evaluation of the PLL *in vivo* is required to demonstrate effective haemostasis of the pulmonary artery and vein. Readily available and cheap devices may offer an advantage over complex expensive equipment.

## PARTIAL CYSTECTOMY AS TREATMENT OF RECURRENT BACTERIAL URINARY TRACT INFECTION; A RETROSPECTIVE STUDY IN 33 DOGS

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**Introduction:** Urachal anomalies have been identified in dogs with recurrent bacterial urinary tract infection (BUTI) but their association with infection is currently unknown. It is therefore unclear whether removal is beneficial in treatment.

**Materials and Methods:** Client-owned dogs with confirmed BUTI and a diagnosis of urachal anomaly treated by partial cystectomy were selected. Only dogs referred between October 1st 2007 and December 1st 2016 were included. Minimum follow-up period was 9 months and consisted of clinical examination, urine culture and standardized questionnaire.

**Results:** Thirty-three dogs met the inclusion criteria. Median age of onset of clinical signs was 3.2 years (range 1 month- 10 years). Histopathology was performed in 27 dogs, which confirmed urachal anomalies in 19 dog (70%). Median follow-up was 27 months (range 9 months - 114 months). No dogs were lost to follow-up. Twenty-two dogs (67%) showed no clinical signs of recurrence of BUTI, confirmed by negative culture in 10 dogs. Eight dogs (24%) had less severe or less frequent clinical signs after surgery. Three dogs (9%) have had no improvement in clinical signs. When animals with no clinical signs and those with less severe or less frequent signs are combined, 91% of the dogs showed an improvement. The severity of clinical signs due to BUTI reduced significantly after surgery ( $P <0.001$ ).

**Discussion and Conclusion:** Partial cystectomy is a feasible treatment for dogs with an urachal anomaly and recurrent BUTI to improve clinical signs and reduce the risk of recurrence long-term. However, a prospective randomized trial is required.

## COMPLICATIONS OF CANINE TONSILLECTOMY - A RETROSPECTIVE STUDY OF 66 CASES

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**Introduction:** Complications of canine tonsillectomy is reported to be rare, but evidence is scarce. The objective of this retrospective study was to investigate complications of canine tonsillectomy.

**Materials and methods:** Ten years of medical records from the University animal hospital were reviewed. Records from dogs subjected to tonsillectomy were analysed for complications. Minor complications were defined as intraoperative haemorrhage or a postoperative complication that was managed conservatively. Remaining tonsil tissue or complications that required re-anesthetizing the patient were classified as major complications.

**Results:** Twenty-four complications were reported in 22 of the 66 dogs. The most common complication was hemorrhage from the surgical site in 16 cases (24.2%). In 11 (16.7%) cases the hemorrhage was intraoperative and in 5 (7.6%) postoperative. One dog showed signs of laryngeal pain and coughing, and the other one signs of upper respiratory obstruction. Thirteen of the 24 complications (54.2%) were classified as minor complications and 11 (45.8%) as major. Minor complications were handled intraoperatively or conservatively in the postoperative period. Five of the major complications needed emergency surgery. Four cases were re-anesthetized due to hemorrhage and an emergency tracheotomy was performed in 1 dog due to laryngeal edema. At long-term follow-up, 6 dogs had remaining tonsillar tissue.

**Discussion/Conclusions:** Most of the complications were minor. Approximately half of the major complications were re-operated in the immediate post-operative period with an uneventful recovery. Tonsillectomy was a safe a procedure but the surgeon must be aware that serious complications can occur and re-operation may be needed.

## A MODIFIED TEMPORARY TRACHEOSTOMY. A REPORT OF OUTCOME AND COMPLICATIONS IN 23 DOGS (2012-2017)

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**Introduction:** Temporary tracheostomy tubes carry a high reported complication rate. This retrospective study aimed to: describe a modified temporary tracheostomy (MTT), consisting of an H-shaped tracheostomy with placement of a Penrose drain dorsally to ventralise the trachea; report outcomes and complications; and compare complications in brachycephalic versus non-brachycephalic breeds

**Material and Methods:** Records of all dogs that underwent temporary tracheostomy were retrieved (2012-2017). Signalment, diagnosis, outcome and complications of the MTT cases were assessed. Only cases with complete records were included.

**Results:** Twenty-eight dogs underwent a temporary tracheostomy and 21 dogs had a MTT and met the inclusion criteria. The tracheostomy tubes were maintained for a mean of 4.7 days. There were no complications intra-operatively or related to Penrose drain placement. The post-operative complication rate was 38%, including: tracheostomy tube dislodgement (28%); obstruction of the tube (4.5%); subcutaneous emphysema/pneumomediastinum (4.5%); and non-obstructive stomal stenosis (4.5%). 95% of patients were discharged, and one patient was euthanased due to the

primary disease. Clinically significant tracheal stenosis was not identified. Tracheostomy duration longer than 4 days was significantly associated with a higher complication rate ( $p=0.027$ ).

**Conclusion:** MTT appears to reduce tracheostomy tube complications and mortality compared with standard tracheostomy. The complication rate was not significantly different between brachycephalic and non-brachycephalic dogs. MMT carries a higher risk for tube dislodgement but it does not seem to affect final outcome.

## USE OF A CAVITRON ULTRASONIC SURGICAL ASPIRATOR FOR FUNCTIONAL ANATOMIC MODEL BASED HEPATECTOMIES IN DOGS.

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**Introduction:** Solitary hepatic masses, mainly hepatocellular carcinomas, are commonly resected with a good prognosis, compared to multiple hepatic masses. A recent study described a functional anatomic model of the canine liver. This concept has been accepted for decades in human medicine and allows surgeons to perform multiple segmentectomies and nodulectomies, sparing major vessels and liver parenchyma. The objective of this study is to describe the efficiency of a cavitron ultrasonic surgical aspirator to perform one stage single or multiple hepatectomies in dogs based on the functional anatomic model of the canine liver.

**Material and Methods:** Dogs undergoing hepatectomies with a cavitron ultrasonic surgical aspirator were enrolled in a prospective study. All dogs underwent a preoperative triple phase computed tomographic scan. Location, number and type of hepatectomies, duration of hepatectomies, intraoperative blood loss and short-term follow-up were recorded.

**Results:** Surgical duration and blood loss were similar to other previously described techniques. The mean number of hepatectomies during one procedure was 2.2 (1-5). One minor complication (cholangiohepatitis) and one death (acute necrotising pancreatitis) were encountered.

**Discussion/Conclusion:** Skeletonization, based on the functional anatomic model, using a cavitron ultrasonic surgical aspirator allows preservation of essential vasculature and permits sparing of liver parenchyma particularly in front of multiple masses. It appears to be a feasible technique for single and multiple segmentectomies/nodulectomies in dogs. A study is presently ongoing to assess long term follow up and the potential oncological interest of this technique in dogs.

## CLOSED-INCISION NEGATIVE PRESSURE WOUND THERAPY AFTER FRONT LIMB AMPUTATION IN DOGS

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**Introduction.** Closed-incision negative pressure wound therapy (ciNPWT) is a growing and promising technique in human plastic surgery, but is poorly documented so far in veterinary medicine. The aim of this prospective clinical study was to evaluate the effect of ciNPWT on postoperative complications and subcutaneous inflammation following front limb amputation in large breed dogs.

**Materials and Methods.** Client-owned dogs weighing more than 20kg, presented for front limb amputation, were prospectively enrolled and randomly allocated to the control or ciNPWT group. The surgical incisions were clinically and ultrasonographically graded at bandage removal (3 days postoperatively), and 10 days postoperatively, to assess subcutaneous thickness and complications such as seroma formation. All data were compared between groups.

**Results.** Eleven dogs were included so far (6 control and 5 ciNPWT). At bandage removal, 5 dogs in the control group and 3 dogs in the ciNPWT group showed subcutaneous seroma. Surgical site infections did not occur. All mean ultrasonographic subcutaneous measurements were lower in the ciNPWT group than in the control group, but statistical significance was only reached for the middle aspect of the wound 3 days postoperatively ( $p=0.019$ ).

**Conclusion.** This study did not manage to show advantages of ciNPWT that reached statistical significance, likely due to the small number of patients and the suboptimal surgical model. However, application of ciNPWT showed subjectively nicer surgical incisions and thinner subcutis postoperatively. More clinical studies with larger groups based on a more repeatable model are warranted to further explore the potential benefits of ciNPWT.

## INCIDENCE OF INTRAOPERATIVE AND MAJOR POSTOPERATIVE COMPLICATIONS AND OUTCOMES OF DOGS UNDERGOING SURGICAL MANAGEMENT OF EPIGLOTTIC RETROVERSION: 51 DOGS (2003 - 2017)

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**Introduction:** Epiglottic retroversion (ER) is recognized as a cause of airway obstruction in dogs. Information regarding incidence of complications and outcomes of dogs undergoing surgery for ER is limited. Our objectives were to report overall and procedure-specific incidence and type of intraoperative and major postoperative complications in dogs treated surgically for ER, and the clinical outcome.

**Materials and Methods:** Medical records of surgically treated dogs with ER were reviewed. Intraoperative and major postoperative complications were recorded, with the latter subdivided into perioperative, short-to-medium-term (<6months) and long-term (>6months). Statistical tests were performed to detect differences in incidences of major postoperative complications among index (first-performed) surgical procedures, and between index and revision permanent-epiglottopexy.

**Results:** Fifty-one dogs were included. Overall (index and revision procedures), intraoperative complications occurred in 2 (3.9%) dogs (2/73 [2.7%] procedures), major postoperative complications occurred in 22 (43%) dogs (37/73 [50.68%] procedures). Temporary-epiglottopexy, permanent-epiglottopexy, partial epiglottectomy and subtotal epiglottectomy were performed as index surgery in 16 (31%), 21 (41%), 3 (5.8%), and 9 (17.6%) dogs, respectively. Intraoperative complications were recorded in 0 (0%), 1 (4.7%), 0 (0%), and 0 (0%) dogs, respectively. Major postoperative complications were recorded in 7 (43.75%), 9 (42.85%), 2 (66.6%), and 0 (0%) dogs, respectively. A significant difference in incidence of major postoperative complications among index surgical procedures was not identified ( $p=0.07$ ), or between index and revision permanent-epiglottopexy ( $p=0.2253$ ). Epiglottopexy failure and development of aspiration pneumonia were the commonest major postoperative complications. MST was not reached after median follow-up of 706 days (range 3-2805 days).

**Discussion/Conclusion:** Dogs treated surgically for ER had a high overall incidence of major postoperative complications.

## SCIENTIFIC SESSION - ORAL - SMALL ANIMAL ORTHOPAEDICS

### CONTROL OF SIGNIFICANT HEMORRHAGE DURING TPLO SURGERY THROUGH THE OSTEOTOMY GAP: 9 CASES.

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**Objective.** To describe a new technique to control significant hemorrhage during TPLO surgery, and to report subsequent short and long-term complications.

**Study Design:** Retrospective case series.

**Animals:** Nine dogs that experienced significant arterial hemorrhage during the radial osteotomy stage of TPLO.

**Methods.** Medical records of dogs that experienced significant intra-operative hemorrhage during the radial osteotomy stage of TPLO at two institutions over an 8 year period were reviewed retrospectively. Inclusion criteria were: significant intra-operative arterial hemorrhage controlled with bipolar electrocautery or hemostatic clips placed along the cranial tibial artery through the osteotomy, complete medical records, radiographic follow-up for at least 8 weeks postoperatively and completion of long term follow-up questionnaire by the owner.

**Results.** Age at time of TPLO was 4.6 +/− 1.8 years and body weight was 36.6 +/− 9.7 kg. The number of hemostatic clips used was 3 +/− 1 per stifle. Hemostasis was achieved in all cases during surgery. Only one of the first cases received blood transfusion during the procedure; post transfusion PCV was 37%. One dog had a fibular fracture noticed at the 8 week radiographic follow up. No other short or long-term complications related to the surgery or the technique were identified in the post-operative period.

**Conclusion:** Significant hemorrhage during TPLO can be efficiently controlled by gaining access to the compromised artery through distraction of the osteotomy gap. This technique was not associated with long-term complications.

### SHORT- AND LONG-TERM OUTCOMES AFTER SHOULDER EXCISION ARTHROPLASTY IN SEVEN SMALL BREED DOGS.

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**Objective.** To report short- and long-term clinical outcomes following excision arthroplasty in seven small breed dogs with shoulder pathology.

**Materials and Methods.** Lameness and pain were scored pre-operatively, and reassessed along with range-of-motion (ROM), scapulo-humeral angles of extension (EA) and flexion (FA), and muscle girth (MG) at short- and long-term follow up (≥12 months). All measurements were compared to the contralateral limb. Pre- and post-operative radiographs were also reviewed, and a long-term outcome questionnaire was completed by owners.

**Results.** Following excision arthroplasty, all dogs improved clinically in terms of lameness and pain at short- and long-term follow-ups. ROM, EA and FA of the operated limb were not significantly different compared to the contralateral limb at short-term follow-up, but ROM and EA were significantly decreased at long-term follow-up. Muscular girth was not significantly different compared to the contralateral limb at short- or long-term follow-up. Radiographic re-evaluation showed bony proliferation along and around osteotomy sites without interosseous union in 5 of 6 dogs. All owners were satisfied with the surgical outcome.

**Conclusion.** Excision arthroplasty seems to be an effective treatment for chronic shoulder pathologies in small breed dogs. ROM and EA were decreased and a mild lameness remained present at long-term follow-up.

### RETROSPECTIVE EVALUATION OF OUTCOME FOLLOWING CLOSED REDUCTION AND EHMER SLING APPLICATION FOR CRANIODORSAL HIP LUXATION IN DOGS: 92 CASES (2007-2017)

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**Study Design.** Retrospective multicenter cohort study.

**Materials and Methods.** Information was collected on baseline characteristics of the study population, Ehmer sling placement and management, and outcome at sling removal.

**Results.** Following Ehmer sling removal, 43.5% (n=40) of the hips relaxed. The odds of relaxation were 5 times

higher for dogs that had undergone a known traumatic incident (OR=5.0, 95% CI=1.3-18.7, p=0.02) and 2.8 times higher (OR=2.8, 95% CI=1.1-6.9, p=0.03) after polytrauma. Fifty percent of cases (n=46) developed soft tissue injuries secondary to sling use. Of these (n=46), 37.0% (n=17) were classified as severe, consisting of either open wounds requiring ongoing management (n=12), open wounds ultimately closed surgically (n=4), or vascular injury requiring amputation (n=1). The odds of severe sling injury were 12.5 times higher when owners were poorly compliant with discharge instructions (OR=12.5, 95% CI=2.2-72.2, p<0.01), 4.0 times higher (OR=4.0, 95% CI=1.1-14.9, p=0.03) when the original sling was placed by an intern rather than a boarded surgeon or resident, and 5.7 times higher (OR=5.7, 95% CI=1.7-18.8, p<0.01) when the bandage became soiled or wet.

**Conclusions and Clinical Relevance.** Placement of a traditional Ehmer sling following closed reduction of a crano-dorsal hip luxation has a relatively low success rate and high complication rate. Owners should be informed of the risks of sling placement and dogs monitored closely by medical personnel while the sling is in place.

## CHARACTERISING CANINE TARSAL BONE MOTION DURING LIMB LOADING

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**Introduction.** Intertarsal bone motion in the canine pes is well recognised but its role in normal locomotion and contribution to the development of conditions such as central tarsal bone fractures and proximal intertarsal luxations is unknown. Our aim was to characterise canine tarsal bone motion during loading.

**Materials and Methods.** Ten paired canine cadaver limbs were loaded into a customised, radiolucent limb loading jig. All limbs underwent CT scanning in the jig without application of a weight bearing load, after loading to 600N, and after loading to an overall hock angle of 90 degrees. The motion of each bone was recorded following load application.

**Results.** A motion was recorded for each bone relative to the talus and reported as a single rotation about a single axis (the helical axis). The greatest rotation occurred at the talocentral joint, followed by motion at the tarsometatarsal joints, with the calcaneus undergoing the least rotation. A high level of kinematic coupling between all joints of the pes was identified.

**Discussion/conclusion.** All intertarsal joints contribute to the overall flexion of the canine hock joint. During loading, the pes displays elastic bowing that is facilitated by a highly co-ordinated series of rotations of the individual tarsal bones. The dorsiflexion of the pes may play an important role in energy conservation during locomotion but may also contribute to the development of conditions in which the structural integrity of the pes is lost, such as central tarsal bone fractures and proximal intertarsal subluxations.

## COMPARISON OF EARLY MEASUREMENTS OF HIP PASSIVE LAXITY AND THE OFFICIAL RADIOGRAPHIC EVALUATION OF THE HIPS: A STUDY OF 190 DOGS

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**Introduction:** The purpose of this study is to evaluate the correlation between the distraction index (DI) and Norberg angle in distraction (DNA), as described by Adams in 1998, at 4 months of age, and the official hip score based on the Fédération Cynologique Internationale (FCI) grid at 12 months of age.

**Material and Methods:** The DI and DNA were measured on distraction radiographs of 190 dogs performed at 4 months of age. The FCI score was determined at 12 months of age on a standard hip extended view.

**Results:** For the total population, the mean DI was 0.48, the mean DNA was 86.9°, and 59.4% of hips had an A FCI score. There was a significant negative linear relationship (p<0.001, r<sup>2</sup>=0.6) between the DNA and DI. No correlation was found between the DI values and the 12 months FCI scores, or between the DNA values and 12 months FCI scores. Hips with DNA>91° at 4 months were more likely to have a FCI score of A at 12 months (odds ratio=2.345).

**Discussion/Conclusion:** The DNA at 4 months seems to accurately reflect hip laxity. FCI scores at 12 months cannot be reliably predicted from the 4 month value of the DI, but the threshold of DNA>91° may predict A FCI score at 12 months of age.

## LINK-N IS NOT THE MISSING LINK TOWARDS INTERVERTEBRAL DISC REPAIR IN DOGS

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**Introduction.** Degeneration of the intervertebral disc (IVD) is a frequent cause of back pain in dogs. Link-N stabilizes proteoglycan aggregates in cartilaginous tissues and exerts growth factor-like effects. The human variant of Link-N facilitates IVD regeneration in several species in vitro and in rabbits in vivo. Therefore dogs with IVD disease could possibly benefit from Link-N treatment, but Link-N has not been tested on canine IVD cells. If Link-N appears to be effective in canines, this would facilitate translation of Link-N into the veterinary clinic.

**Materials and Methods.** The objective of this study was to determine the effect of the human and canine variant of Link-N and short (s) Link-N on canine chondrocyte-like cells (CLCs), and compare it to the effect on cells of already studied species, i.e. human and bovine CLCs. Extracellular matrix (ECM) production was determined by measuring glycosaminoglycan (GAG) content and histological evaluation. Additionally, the micro-aggregates' DNA content was measured.

**Results.** Human (s)Link-N induced GAG deposition in human and bovine CLCs, as expected. In contrast, canine (s) Link-N did not affect ECM production in human CLCs, while it mainly induced collagen type I and II deposition in bovine CLCs. In canine CLCs, both canine and human (s) Link-N induced negligible GAG deposition.

**Discussion/Conclusions.** Human and canine (s)Link-N exerted species-specific effects on CLCs from early degenerated IVDs. Both variants, however, lack potency as agents for regeneration of canine IVDs. While these studies demonstrate the challenges of translational cross-species studies, (s) Link-N still holds a regenerative potential for humans.

## COMPARISON OF THE PENN-HIP AND THE VEZZONI DISTRACTORS FOR THE MEASUREMENT OF THE HIP DISTRACTION INDEX IN DOGS

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**Introduction:** Most reports about the distraction index (DI) for screening hip dysplasia in dogs concern the PennHIP device. The purpose of this study is to compare the DI values measured from distraction radiographs with the PennHIP distractor and the Vezzoni distractor.

**Material and Methods:** The DI was calculated from the radiographs of 24 dogs with hips distracted with either the PennHIP distractor or the Vezzoni distractor.

**Results:** Median age was 19.7 weeks (range, 14.6 to 42.6). For the PennHIP device, the median DI was 0.55 (range, 0.29 to 0.89); for the Vezzoni device, the median DI was 0.52 (range, 0.30 to 0.84). The mean difference between the PennHIP and the Vezzoni values for one hip was 0.07 (standard deviation, 0.05). The values from the PennHIP device were higher than the values from the Vezzoni device in 56.25% of the hips. No significant difference was found between the two values for each hip ( $p=0.37$ ). The correlation between the values from the two methods was high ( $r^2=0.70$ ,  $p<0.0001$ ). The difference between the two values for each hip was not statistically significant ( $p=0.4132$ ).

**Discussion/Conclusions:** Our results showed that the Vezzoni distractor gives similar results to the PennHIP distractor for the DI measurement in dogs, and confirm that the Vezzoni distractor can be used as a reliable device in evaluating the DI in dogs.

## COMPARISON OF OUTCOMES ASSOCIATED WITH TIBIAL PLATEAU LEVELING OSTEOTOMY (TPLO) AND A MODIFIED TECHNIQUE FOR TIBIAL TUBEROSITY ADVANCEMENT (TTA RAPID) FOR TREATMENT OF CRANIAL CRUCIATE LIGAMENT DISEASE IN DOGS

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**Introduction.** The objective of this study was to compare outcomes with respect to function and complications in dogs undergoing TPLO or TTA Rapid for treatment of cranial cruciate ligament (CCL) rupture.

**Material and Methods.** Twenty-six dogs were prospectively enrolled and allocated into two groups: TPLO group and TTA Rapid group. Surgery time was recorded for each case. Lameness score evaluation, gait analysis, and radiographic follow-up were performed before surgery, the first 3 days after surgery, and then 1, 3 and 6 months postoperatively. Finally, owners were asked to rate their level of subjective satisfaction.

**Results.** Duration of surgery was significantly shorter for TTA Rapid surgery ( $p < 0.001$ ). Lameness score was significantly higher during the first 3 days after surgery for the TPLO group. The ratio between the front and hind limbs for the total pressure (FH/TP) and the number of sensors (FH/NS) were significantly higher for the TTA Rapid group the third day

after surgery ( $p = 0.04$ ;  $p = 0.02$ , respectively). The symmetry index between healthy and affected limbs for stance percentage during the gait cycle (SI%) was significantly higher for the TTA Rapid group one month after surgery. Owners were 100% satisfied with the TPLO surgery and 84.6% satisfied with the TTA Rapid surgery at 6 months postoperatively.

**Discussion/Conclusion.** TPLO and TTA Rapid were associated with high long-term success rates in dogs treated surgically for CCL disease. Even if recovery looks faster with TTA Rapid, long-term satisfaction of the owner seems better with TPLO procedure.

### 3D KINEMATIC EVALUATION OF TIGHTROPE CCL IN AN EX-VIVO CRANIAL CRUCIATE DEFICIENT STIFLE MODEL

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**Introduction.** The impact of surgical correction of cranial cruciate ligament rupture (CCLR) on 3D kinematics of the stifle joint has been only sparsely evaluated in dogs. Several techniques have been reported to surgically correct the cranial cruciate deficient stifle (CCDS). One of these, the Tightrope CCL, has been proposed to restore the baseline 3D kinematics of the CCDS by using isometric points. Its kinematic impact has never been evaluated. The objective of this study was to evaluate the impact of Tightrope CCL on the 3D kinematics of the stifle joint. We hypothesized that Tightrope CCL would restore physiologic 3D kinematics of the stifle joint in our ex-vivo model.

**Material and Methods.** Pelvic limbs ( $n=10$ ) harvested from euthanized large dogs (27-34 kg) were used for testing, using a previously validated apparatus. Three experimental conditions were evaluated: (a) intact stifle (b) cranial cruciate ligament transection (CCLt) through a limited medial arthrotomy which was sutured, and (c) CCLt stabilized with Tightrope CCL. For each condition, limbs went through 5 gait cycles and kinematic data were recorded.

**Results.** The impact of Tightrope CCL in the CCDS was as follows: it did not limit flexion; resulted in the neutralization of internal rotation without restoring baseline curves; did not restore abduction; could neither neutralize nor restore cranial translation; restored latero-medial and proximo-distal translations.

**Discussion/Conclusion.** Tightrope CCL for surgical correction of CCDS does not seem to restore physiologic 3D kinematics of the stifle joint, and could potentially result in a high incidence of medial meniscal tears (cranial translation  $> 3$  mm).

### NEEDLE ARTHROSCOPY FOR SHOULDER JOINT EXPLORATION. A CADAVERIC STUDY IN DOGS

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**Introduction.** Previous cadaveric studies have described needle arthroscopy (NA) as a less invasive alternative to standard arthroscopy (SA) for stifle and elbow joint exploration in dogs. Our study evaluates the quality and extent of vision using the needle arthroscope (Storz<sup>TM</sup>) for shoulder joint exploration, using SA as reference.

**Materials and Methods.** Ten shoulders from five cadavers (10-55kg) were subsequently explored with NA and SA through a lateral approach under saline irrigation. A visualization score was recorded based on the number of anatomical structures visualized in each joint (total score, score per shoulder joint compartment), and compared between techniques (NA/SA). Anatomical structures included the supraglenoid tubercle, biceps tendon insertion, bicipital groove, subscapularis tendon, medial glenohumeral ligament, infraglenoid tubercle, caudal joint pouch, humeral head, glenoid cavity and joint capsule. If present, pre-existing shoulder lesions were also recorded and compared between techniques (NA/SA).

**Results.** The overall joint score was significantly inferior ( $p=0.0007$ ) with NA (14.5, range 10.5-15.3) compared to SA (16.0, range 16.0-16.0). The NA score was inferior in the cranial and caudal compartments of the joint, but not in the intermediate compartment. For NA, the heavier the dog, the lower the score. Pre-existing lesions observed with NA were confirmed and consistent with SA findings.

**Discussion/Conclusion.** NA through a conventional lateral approach is a procedure to consider for assessment of medial shoulder disorders. Careful case selection towards small to medium-size dog remains mandatory.

### BIOMECHANICAL COMPARISON OF TWO FIXATION METHODS FOR TEMPORARY TARSO-CRURAL ARTHRODESIS USING A 4.5 AO/ASIF CORTICAL SCREW AND AN ULTRA-HIGH-MOLECULAR-WEIGHT-POLYETHYLENE (UHMWPE) SUTURE DEVICE.

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**Introduction:** After injuries of the Achilles mechanism and surgical repair of the injured structures, tensile forces acting on the tendon have to be reduced significantly to allow healing. Historically, a variety of techniques have been described to achieve temporary tarsal immobilisation, but complication rates range from 35.5-46%. We report the results of a comparative biomechanical study using either an 4.5 AO/ASIF screw or an UHMWPE suture device for the immobilisation.

**Material and Methods:** Ten paired hindlegs of dogs were randomly prepared with either the 4.5 AO/ASIF screw or an UHMWPE suture device. Legs were loaded with 6kg, 12kg and 18kg, each for 100 cycles. After cyclic loading, legs were loaded until failure.

**Results:** The main study showed that the calcaneotibial position screw resisted higher forces than the suture device, but the immobilisation was distinctly stiffer. For both systems different modes of failure were recorded, including calcaneal fracture, tibial fracture, tarso-metatarsal luxation or slippage of the Kirschner wires through the drill-hole. Neither screw-breakage nor suture rupture occurred.

**Discussion:** Though mean strength of the suture device was less than for the screw, the higher flexibility of the implant might be an advantage for tendon healing. Ongoing evaluation is warranted.

## FEMORAL HEAD AND NECK EXCISION IN THE DOG AND CAT: RADIOGRAPHIC EVALUATION OF THE QUALITY OF THE EXCISION AND CORRELATION TO CLINICAL OUTCOMES. A RETROSPECTIVE STUDY.

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**Introduction.** The femoral head and neck excision (FHE) is a procedure commonly performed in veterinary surgery for several conditions of the hip. In this study, the quality of the excision was radiographically evaluated, and risk factors influencing long term outcomes were analyzed. We hypothesized that a successful excision line (SEL) and surgical experience (SE) could influence long term outcomes.

**Materials and Methods.** Postoperative radiographs of animals that had undergone FHE were reviewed. The quality of the excision line (EL) was classified as: 1. SEL, 2. Incomplete bone removal (IBR), 3. Excessive bone removal (EBR). Surgeons were divided into two groups according to their SE. Long-term follow up was conducted by telephone

interview (questionnaire). Risk factors affecting outcomes were statistically analyzed. The Helsinki Chronic Pain Index (HCPI) and the Average Disability Score (ADS) were used.

**Results.** Eighty dogs and seventy cats were included for radiographic assessment. Ninety-one and fifty nine procedures were performed by group A and B surgeons respectively. Revision surgery rates were 8.8% and 6.8% for groups A and B. SEL, IBR and EBR were seen in 28%, 47% and 25% post-operative radiographs, respectively. Thirty-five animals were evaluated at long-term. Sixty per cent of the animals were judged normal, and 5.7% had poor outcome. No statistically significant correlation was found between the quality of the excision, or the SE, and the long-term outcomes.

**Conclusions.** This is the first study in which the FHE is performed by surgeons in-training. The procedure, when performed properly, results in good quality of life, as perceived by owners.

### Addendum

#### Group A

Surgeons in-training. These are junior surgeons fulfilling a pre-residency training program (of 1 to 2 year-duration, depending on the individual). Surgeons in group A have a surgical experience inferior to 3 years.

#### Group B

In this group, the surgeons have a surgical experience equal/superior to 3 years. Surgeons of this group are junior surgeons in-training with more than 3 years surgical experience, ECVS diplomates, and Professors. The junior surgeons in-training are ECVS residents or junior surgeons in-training, fulfilling the 3rd year of pre-residency training program.

## LONG TERM OUTCOME AND COMPLICATIONS AFTER RIDGESTOP AND TIBIAL TUBEROSITY TRANSPOSITION FOR THE TREATMENT OF PATELLAR LUXATION IN DOGS AND CATS (30 CASES)

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**Introduction.** Congenital patellar luxation is common, with many different surgical techniques described to improve the associated pain and lameness. The purpose of this study was to assess the complications and long-term outcome in dogs and cats undergoing Ridgestop placement and tibial tuberosity transposition to treat patellar luxation.

**Material and Methods.** This is a retrospective case series. Medical records of dogs and cats with patellar luxation that underwent corrective surgery, consisting of tibial tuberosity

transposition and Ridgestop placement, were reviewed. Complications and veterinary assessed outcomes were retrieved from the records. Long term outcome was assessed by telephone follow-up with the owners.

**Results.** Complications occurred in 20% of cases, 3 Minor (8.6% all seromas), 3 Major I (8.6% - 1 K wire migration, 2.9%, 1 implant associated infection 2.9%, 1 inappropriate Ridgestop placement 2.9%) and 1 Major II (1 surgical site infection 2.9%). Veterinary assessed outcome was full in 2 cases (2/30 6.7%) and acceptable in 28 cases (28/30 93.7%) with a mean ( $\pm$  SD) time to follow up of  $10 \pm 7.2$  weeks (range 5-30 weeks). Long term owner assessed outcome was full in 23 cases (23/26 88.5%) and unacceptable in 3 cases (3/26 11.5%) with a mean ( $\pm$  SD) follow up of  $13.7 \pm 5.6$  months (range 6-25 months).

**Discussion/Conclusion.** Ridgestop placement with concurrent tibial tuberosity transposition has a low complication rate and high success rate in both cats and dogs. Ridgestop is a successful alternative to trochleoplasty in dogs and cats with patellar luxation

## SURFACE ELECTROMYOGRAPHY CHARACTERIZATION OF THE GASTROCNEMIUS, VASTUS LATERALIS, AND BICEPS FEMORIS MUSCLES DURING A SINGLE GAIT CYCLE IN NORMAL DOGS AT TROT

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**Introduction.** Surface electromyography (sEMG) of the vastus lateralis (VL) muscle has been described in normal dogs, and the biceps femoris (BF) and gluteus medius (GM) muscles in normal dogs and dogs with hip osteoarthritis at a walk. The purpose of this study was to describe the sEMG activity pattern of the gastrocnemius muscle (GN) simultaneously with VL and BF muscles in normal dogs at a trot.

**Materials and Methods.** Ten client-owned healthy dogs were selected for the study. sEMG electrodes were strategically placed on the GN, VL and BF muscles. Normalized maximal single sEMG amplitudes (maximum-minimum = %MM) of a gait cycle of all 3 muscles were collected while simultaneously collecting ground reaction force measurements while dogs were maintained at a trot.

**Results.** GN and VL demonstrated a 2-phase peak %MM pattern centered at or near the transition between stance and swing phase, respectively. BF demonstrated a 1-phase peak %MM pattern in early swing phase.

**Discussion/Conclusion.** The VL and BL %MM activity observed in this study was similar to previous reports in dogs at a walk. The addition of GN sEMG data may enhance biomechanical modeling of the canine stifle, provide diagnostic features for, and/or aid in the current and future therapeutic developments for stifle joint-related diseases and associated physical rehabilitation.

## RISK FACTORS FOR PROXIMAL TIBIAL ROTATIONAL CONSTRAINTS DURING TIBIAL PLATEAU LEVELLING OSTEOTOMY (TPLO) AND RADIOGRAPHIC OUTCOME FOLLOWING FIBULAR OSTEOTOMY (FO)

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**Objective:** To identify cases in which TPLO with concurrent fibular osteotomy was performed, determine factors that contribute to constraint of the proximal segment during rotation, and to report short-term post-operative outcomes and complications.

**Study Design:** Retrospective study.

**Methods:** Dogs that underwent TPLO with concurrent fibular osteotomy were selected. Radiographs were used to assess the presence of tibiofibular synostosis, mechanical medial proximal tibial angle (mMPTA), and ratio of fibular width to tibial width (FW:TW).

**Results:** Weight was associated with an increased risk of rotational constraints, with a 1kg increase in weight increasing the odds of undergoing a fibular osteotomy by 1.08 ( $P = 0.008$ ). A FW:TW greater than 0.24 increased the odds of exhibiting rotational constraints by 7.76 ( $P = 0.01$ ). Dogs showing clear signs of synostosis had 61.61 higher odds of undergoing fibular osteotomy ( $P = 0.001$ ). A trend toward an increased risk for rotational constraints was identified as preoperative mMPTA increased.

**Conclusion:** Proximal tibial rotation during TPLO may be inhibited by tibiofibular synostosis and/or a fibular width to tibial width ratio exceeding  $\geq 0.24$ . Increasing weight, required rotation greater than 11mm, and preexisting proximal tibial valgus may also contribute to rotational difficulty. For cases in which rotation is inhibited, a fibular osteotomy may be performed. The use of an additional plate appeared to significantly reduce the amount of rotational loss following surgery. Based on these results, the use of a second plate to aid in construct stability is recommended in all cases undergoing TPLO with concurrent fibular osteotomy.

## POLARIZATION OF MACROPHAGES IN EPIDURAL INFLAMMATION INDUCED BY CANINE INTERVERTEBRAL DISC HERNIATION

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**Introduction.** The canine intervertebral disc (IVD), although physiologically acellular, displays a cell population consisting almost exclusively of macrophages (Mφ) when herniated. Mφ encompass a heterogenous cell population, roughly divided into classically (M1) or alternatively activated (M2) Mφ. Polarization into M1Mφ leads to strong antimicrobial activity and pro-inflammatory response. In contrast, M2Mφ exhibit anti-inflammatory function and regulate wound healing. The purpose of this study was to characterize the phenotype of the Mφ population present in naturally occurring IVD herniation.

**Materials and Methods.** IVD material of dogs with IVD disease was collected during standard decompressive surgery. A negative control consisting of IVD material dogs without IVD degeneration and a positive control consisting of canine liver and lymph node samples were also included. Both negative and positive controls were collected post-mortem. All samples were embedded in OCT and shock frozen. Eight micrometer cryostat sections were prepared, air dried and immunostained without prefixation or permeabilization. CD14 was used as marker Mφ, MHCII for M1Mφ and CD206 for M2Mφ.

**Results.** Fifteen samples of dogs with IVD herniation, 10 negative and 5 positive control samples were obtained. No positive cells were found in the negative control group. The positive control group displayed several MHCII and CD206 positive cells, all of them being simultaneously positive to CD14. All herniated samples displayed a mixed population of M1Mφ and M2Mφ, and some sparse Mφ displaying markers for both M1 and M2Mφ simultaneously.

**Conclusion.** The mixed phenotype encountered shows the plasticity and dynamism of Mφ and evidences the chronic component of IVD disease despite its acute clinical presentation.

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## FOURTH TARSAL BONE ADAPTATION PROTECTS AGAINST CATASTROPHIC FRACTURE IN RACING GREYHOUNDS

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**Introduction:** Stress fractures due to repetitive loading are common in racing greyhounds. We have observed bone remodelling on the dorsal surface of the fourth tarsal bone (FTB) in some greyhounds, in conjunction with central tarsal bone (CTB) fractures. The aim of this study was to evaluate the microstructure and density of the FTB from racing greyhounds. We hypothesized that adaptive remodelling of the FTB associated with repetitive loading reduces the risk of fracturing of this bone.

**Material and Methods:** Paired pelvic limbs of 18 skeletally mature racing greyhounds euthanized after a severe racing injury were radiographed and CT scanned. Isolated FTB specimens were weighed and scanned by DEXA. Bone mineral density (BMD) of the entire FTB and the distal subchondral region of the FTB were measured. Seven pairs of randomly selected FTB were micro CT-ed to provide more detailed analysis of microstructure. For statistical analyses categorical variables were analysed by chi-square test or logistic regression, and continuous variables were analysed using REML with the fixed effect of FTB adaptation.

**Results:** Fracture of the right CTB was found to be present in the limbs of 10/18 dogs. Bone proliferation evident on the dorsal aspect of the distal end of 50% of FTB, together with increased BMD, were significantly associated with lack of fracture in this region.

**Discussion/Conclusion:** Our findings suggest that adaptation protects the FTB against catastrophic fracture distally. Clinically this might be a useful means by which to monitor bone response to training, using CT.

## SCIENTIFIC SESSION - ORAL - SMALL ANIMAL SOFT TISSUE

### SERIAL BLOOD AND CEREBROSPINAL FLUID AMMONIA CONCENTRATIONS IN DOGS WITH CONGENITAL EXTRAHEPATIC PORTOSYSTEMIC SHUNTS BEFORE AND AFTER SURGICAL ATTENUATION

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**Objective:** To describe the change in ammonia concentrations in blood (arterial, venous) and cerebrospinal fluid

(CSF) in dogs with extrahepatic portosystemic shunts (EHPSS) that underwent surgical attenuation.

Study Design: Prospective clinical trial

Animals: 19 dogs with congenital EHPSS

Methods: Ammonia concentrations were assessed on the day of diagnosis (T0; arterial, venous and CSF), the day of surgery (T1; arterial and venous), and 1 (T2; venous), 3 (T3; arterial, venous and CSF) and 6 (T4; venous) months after surgery.

Results: At the end of the study, the closed group contained 12 dogs and the acquired group 7 dogs. At T0, ammonia concentrations were above the upper reference limit in all dogs. Despite medical management, ammonia concentrations at T1 were not lower than at T0. At T2, ammonia concentrations were below the upper reference limit in all dogs and at T3, ammonia concentrations were below the upper reference limit in 11/12 in the closed and in 3/7 in the acquired group. Arterial and CSF ammonia concentrations demonstrated a strong positive correlation to the venous concentrations (95% and 89%, respectively). The CSF ammonia concentrations were higher than the venous upper reference limit in 17/19 dogs at T0 and the concentrations decreased from T0 to T3 in the closed group.

Conclusion: Postoperative venous ammonia concentration is not an accurate indicator of the degree of shunting. CSF ammonia concentration in dogs with EHPSS had a strong positive correlation with blood ammonia concentration, suggesting permeability of the blood-brain barrier to ammonia.

## ADRENALECTOMY WITH CAUDAL VENA CAVA VENOTOMY IN 18 DOGS

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Introduction: Caudal vena cava invasion is reported in phaeochromocytomas and adrenocortical adenocarcinomas. Tumour invasion characteristics affect vascular occlusion and venotomy techniques, but there is limited related information in the veterinary literature. The purpose of this retrospective study was therefore to describe perioperative and surgical details of adrenalectomy with venotomies.

Material and Methods: Records for dogs undergoing adrenalectomy with caval venotomy between October 2010 and October 2017 were reviewed. Details of signalment, peri-operative management, surgery, peri-operative complications, mortality, and histopathology were recorded. Computed tomography images were reviewed to describe tumour morphology and invasion. Risk factors for peri-operative

morbidity and mortality were assessed using logistic regression.

Results: Fifteen dogs were included with phaeochromocytomas (80%) and adrenocortical carcinomas (20%). Thrombi extended to the pre-hepatic (73.33%), hepatic (13.33%) and post-hepatic (13.33%) caudal vena cava. Median caval occlusion time was 6 minutes, using between 2 and 5 tourniquets. Left-sided ureteronephrectomy was performed in 33% of cases. No risk factors were identified for peri-operative complications (80%) or mortality (27%).

Discussion/Conclusion: Peri-operative morbidity and mortality were similar to previous reports. Ureteronephrectomy may be more likely with left adrenal tumours due to the closer proximity of the left phrenicoabdominal and renal veins, increasing the likelihood of neoplastic invasion or intra-operative damage to the renal vein. Longer caval occlusion than previously reported may be tolerated in clinical cases. The details of variation in surgical techniques provided here contribute useful additional information for surgeons treating these cases.

## PROSPECTIVE COMPARISON OF TWO LAPAROSCOPIC VESSEL SEALING DEVICES FOR MINIMALLY INVASIVE ADRENALECTOMY IN DOGS

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Objective: to report surgical outcome and complications associated with use of two vessel sealing devices (Harmonic scalpel [HS], EnSeal [ES]) in dogs undergoing laparoscopic adrenalectomy.

Study design: prospective case series.

Animals: 10 client-owned dogs with unilateral non-invasive adrenal tumors.

Methods: Anesthetized dogs were positioned in sternal recumbency, and three 5-mm ports were placed in the paralumbar fossa. Dissection of the adrenal gland was performed either with HS or with ES. Surgical variables compared between groups included: surgical time; intraoperative, perioperative, and postoperative complications; hospitalization time and outcome. Overall median survival time (OST) was calculated.

Results: Mean surgical time was shorter in the ES group (86  $\pm$  32.28 minutes) than in the HS group (96.6  $\pm$  13.97 minutes). Intraoperative complications occurred in 4/5 dogs in the HS group and 1/5 dog in the ES group. Intraoperative complications associated with use of HS were hemorrhage (2/5 dogs), inadequate visibility due to generation of

smoke (2/5 dogs) and tumor capsule rupture (1/5 dogs). Conversion to an open approach was necessary in 2 dogs in the HS group. Two dogs in the ES group died perioperatively due to respiratory complications, while 1 dog in the HS group developed fatal respiratory signs within 21 days from surgery. Mean hospitalization time was 4.67 days in the ES group and 4 days in the HS group. OST was 178 days (range 0-610 days).

Conclusion: ES was more rapid and reliable in sealing vessels during laparoscopic adrenalectomy. HS may be correlated with a lower perioperative mortality.

## CHANGES IN REGIONAL CEREBRAL BLOOD FLOW IN DOGS WITH DIFFERENT GRADES OF HEPATIC ENCEPHALOPATHY BEFORE AND AFTER SUCCESSFUL CLOSURE OF EXTRAHEPATIC PORTOSYSTEMIC SHUNTS

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Introduction: Dogs with portosystemic shunts (PSS) often have concurrent hepatic encephalopathy (HE). The aim of this study was to assess differences in regional cerebral blood flow (rCBF) in dogs with PSS with mild or overt HE and to determine if changes in rCBF are reversible after PSS closure.

Materials and methods: Dogs undergoing PSS attenuation were divided in 2 groups (mild and overt HE). Single photon emission computed tomography (SPECT) with 99m-technetium-hexamethylpropylene amine oxime (99mTc-HMPAO) tracer was performed before and 6 months after surgery, if closure of the shunt was confirmed 3 months postoperatively, using transsplenic portal scintigraphy. Regional brain perfusion indices were calculated for different brain regions.

Results: A total of 21 PSS dogs, 15 with overt HE and 6 with mild HE, had a pre-operative SPECT scan. Pre-operatively, regional perfusion indices were significantly increased in subcortical regions of dogs with overt HE ( $p<0.001$ ). Dogs with mild and overt HE had significantly lower regional brain perfusion in the left and right temporal cortices (mild HE, left  $p<0.001$ , right  $p=0.011$ ; overt HE, left  $p=0.003$ , right  $p=0.016$ ). 5 dogs with overt and 3 with mild HE also had a postoperative SPECT scan. No significant differences between pre-operative and post-operative regional brain perfusion indices were found in individual dogs.

Discussion: Dogs with PSS have altered brain perfusion. Dogs with overt HE have a more distinct pattern of redistribution of rCBF from cortex to subcortical regions than dogs

with mild HE. Postoperatively, rCBF did not normalize within 6 months despite clinical improvement.

## FINE-NEEDLE BIOPSY OF CUTANEOUS, SUBCUTANEOUS AND INTRACAVITARY MASSES IN DOGS AND CATS USING 22-VERSUS 25-GAUGE NEEDLES

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Fine needle biopsy (FNB) is the most common method for collecting cytologic specimens in small animals. To compare the quality of cytology samples obtained via FNB using 22-gauge or 25-gauge needles and to evaluate the influence on cytological diagnosis, a prospective randomized study was performed using a total 50 cutaneous, subcutaneous or intracavitory masses in 40 animals. Fine needle biopsy of each mass was performed with both 22 and 25 gauge (G) needles randomly assigned using either of the following two sequences: 22G-25G-22G or 25G-22G-25G. Each needle was inserted into the mass 10 times in various directions using a non-aspirating technique. A 6ml syringe attached to each needle was used to expel the material onto a microscope slide. The sample was stained with Wright-Giemsa stain. Samples were evaluated by two board-certified clinical pathologists to assess cellularity, blood contamination, amount of cellular debris, degree of cellular trauma and overall ability to make a diagnosis for each sample. Results revealed no significant difference between 22- and 25-gauge needle samples for cellularity. A significant difference was present for blood contamination, amount of cellular debris, and degree of cellular trauma. Overall ability to make diagnosis was not significantly affected by the size of the needle gauge. Degree of cellular trauma was significantly more severe in intracavitory samples. In conclusion, both 22-gauge and 25-gauge needles provided cytologically diagnostic samples of similar cellularity. Twenty-two-gauge needles caused more sample blood contamination. Cellular trauma and the amount of cellular debris were increased with samples obtained with 25-gauge needle.

## EFFECT OF TOPICAL KLOX BIOPHOTONIC SYSTEM ON CUTANEOUS INCISIONAL WOUND HEALING IN DOGS: A PROSPECTIVE BLINDED CONTROLLED CLINICAL TRIAL.

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**Introduction:** Klox BioPhotonic System (KBS) represents an innovative and effective treatment for human wound healing and skin disorders. In dogs, clinical trials have confirmed its safety and efficacy in the treatment of pyoderma and otitis. The aim of this study was to investigate effects of KBS on cutaneous incisional wounds.

**Materials and Methods:** Ten dogs undergoing orthopedic surgery, were prospectively recruited. On the first day after surgery (T0) and every 3 days until Day 13 (T4), 50% of the length of the wound was treated with the KBS (a 2mm layer of photoconverter gel spread on the wound and illuminated with a LED lamp for 2 minutes, at approximately 5cm distance) and the remaining 50% was treated with saline solution. The evaluation protocol consisted of: clinical assessment (ASEPSIS scale) taken from T0 to T4, histological and immunohistochemical analysis of treated and control samples taken at T4.

**Results:** The KBS-treated parts showed lower histology scores ( $p=0.001$ ) with better and more complete re-epithelialization, lesser inflammation of the dermal layer, less neo-angiogenesis and higher synthesis activities of the connective matrix. Immunohistochemistry results showed a statistically significant greater expression of FVIII, EGF, Decorin, Collagen III, and Ki67 in the treated parts ( $p<0.04$ )

**Conclusion:** These results indicate that KBS could potentially represent a novel wound care technology, which utilizes fluorescence biomodulation to treat wounds by stimulating critical cellular pathways. These findings encourage new research on using this technology, that may potentially become an alternative wound healing therapy and fill unmet medical needs.

## PROSPECTIVE EVALUATION OF OPEN WOUND TREATMENT USING NEGATIVE PRESSURE WOUND THERAPY OR POLYURETHANE FOAM DRESSINGS IN DOGS.

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**Introduction:** Negative Pressure Wound Therapy (NPWT) has gained increased acceptance in veterinary wound care, but prospective randomized studies are currently not available. The aim of this study was to evaluate NPWT for wound treatment in dogs.

**Materials and methods:** Dogs (n=26) undergoing open-wound treatment were randomly assigned to one of two groups: Group A (n= 13) NPWT; Group B (n=13) silver-coated foam dressing. Pairs of patients were matched based on wound conformation, location and underlying cause and

compared in terms of duration of previous treatment, development of wound size (wound planimetry), time to closure, bacterial bioburden and complications. Wound dressing changes were performed every three days during the first nine days of therapy for both groups. Statistical analysis was performed.

**Results/Discussion:** Pre-treatment signalment, and bacterial status were comparable between groups. Total time to closure was significantly ( $p=0.018$ ) shorter in Group A (14.2 days) compared to Group B (28.6 days), and wound planimetry on days three, six, and nine showed significant greater reduction in total wound area for Group A at all time points ( $p<0.05$ ). Furthermore, wounds in Group A showed less progression of local infection than did wounds in Group B ( $p=0.01$ ).

**Conclusion:** NPWT-treated wounds showed faster closure, improved macro-deformation, and less local signs of infection.

## SURGICAL REPAIR OF CONGENITAL CLEFTS PALATES IN DOGS WITH AN OVERLAPPING TECHNIQUE: A RETROSPECTIVE STUDY OF 11 CASES (2007-2017)

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**Introduction:** Surgical repair of congenital palatal defects is challenging. Few data on surgical treatment outcome of this rare anomaly are available in the literature. Frequent wound dehiscence resulting in persistent, often disabling communication between the oral and nasal cavities is documented. Two currently used techniques are the sliding and the overlapping flap techniques. A 44% and a 78% clinical success and surgical revision rates, respectively, were reported with the sliding flap technique (12 dogs) whereas a 100% and a 0% clinical success and revision rates, respectively, were reported with the overlapping technique (9 dogs). Our objectives were to describe the complications and outcome associated with the latter technique on dogs with congenital cleft of the secondary palate.

**Material & methods:** Medical records of 11 dogs that underwent repair of congenital hard palate defects with the overlapping technique were reviewed (2007-2017). Signalment, clinical signs, surgical treatment, complications and outcome were recorded.

**Results:** Five dogs were clinically cured. Complete closure occurred in 3 dogs, all of which had undergone a single surgery. Revision surgery, performed in 7 dogs, did not result in complete healing.

**Discussion/Conclusion:** This study is the largest clinical study ever reported on the overlapping technique for treatment of congenital hard cleft palate in dogs. Revision rate and outcome were similar to the ones reported with the sliding flap technique and contrasted with the results obtained in

two studies with a smaller number of cases. The first surgery was the most critical one as successful closure declined with subsequent repair attempts.

## PLACEMENT OF SUBCUTANEOUS URETERAL BYPASS SYSTEM WITH ULTRASOUND GUIDANCE IN CATS WITH URETERAL OBSTRUCTION: 25 CASES (2013-2017)

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**Introduction:** The purpose of this study was to describe complications and outcomes in cats with ureteral obstructions by placement of a Subcutaneous Ureteral Bypass (SUB) device with ultrasound guidance.

**Materials and Methods:** Data were obtained retrospectively from the medical records of cats that underwent SUB placement with ultrasound guidance.

**Results:** Twenty-seven SUB devices were placed with ultrasound guidance in 25 cats.

Median renal pelvis size on abdominal ultrasound was 13.5 mm (range 7-60 mm). Successful placement was achieved in all cats with only 1 intraoperative complication (haemorrhage from renal pelvis). All 25 cats recovered from the surgical procedure. Postoperative SUB complications included urinary tract infection (5), non-infectious cystitis (3) and SUB device obstruction (4). One cat developed an abscessation on the caudal side of the kidney and 1 cat had a kink in the catheter. Median postoperative duration of hospitalization was 2.2 days (range 1-4 days). Fifteen cats (60%) were still alive at median follow up of 330 days. Survival rate after 1 month was 92%, after 6 months was 84% and after 1 year was 76%. Eight cats died of chronic renal failure, 1 cat died because of hypertrophic cardiomyopathy and 1 cat died of hyperthyroidism. Owners were completely (90%) or mostly (10%) satisfied with the SUB device placement.

**Discussion/Conclusion:** SUB device placement with ultrasound guidance seems to be an effective and safe option for treating ureteral obstruction in cats. This study has shown that it is a good alternative for fluoroscopic guidance.

## CLINICAL AND LARYNGOSCOPIC CHARACTERIZATION OF NORWICH TERRIER UPPER AIRWAY SYNDROME (NTUAS): PRELIMINARY RESULTS

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**Objective:** To characterize upper airway pathology of Norwich terriers to develop a universal scoring system for use by clinicians.

**Design:** Prospective study.

**Study groups:** Norwich & Norfolk terriers, brachycephalic & mesaticephalic dogs.

**Methods:** Following a detailed owner questionnaire, a standardized upper airway endoscopic examination is performed. Any medical or surgical intervention is recorded, and resected tissues undergo histopathology. Norwich terriers (n=150) are compared to Norfolk terriers, brachycephalic and mesaticephalic breeds (n=25 per group). A subgroup of dogs additionally undergoes head CT to compare intranasal features. All data enter REDCap online database.

**Summary of results:** Descriptive results only are presented in this abstract. The study was over-enrolled at 260 of 225. All Norwich, Norfolk and mesaticephalic dogs had normal nares. The main abnormalities in Norwich terriers were partially/fully everted laryngeal ventricles (92%), partially/fully obliterated piriform recesses (80%), redundant laryngeal mucosa (29%), mildly elongated soft palate (36%), redundant dorsal pharyngeal tissue (36%), laryngeal collapse (21%) and narrowed infraglottic lumen (91%). A wide variety of inflammatory cell infiltration was seen in the 40 tissue samples. The main brachycephalic abnormalities were stenotic nares, significantly elongated soft palates, everted laryngeal ventricles and macroglossia. Nasal CT analysis shows Norwich terriers similar to mesaticephalic breeds, unlike brachycephalic breeds.

**Conclusions:** Laryngeal abnormalities are widespread in Norwich terriers, even with minimal clinical signs. The abnormalities documented so far do not appear to include stenotic nares or intranasal changes consistent with brachycephalism. NTUAS may be a primary pharyngeal/laryngeal abnormality.

## POSTERS: SMALL ANIMAL ORTHOPAEDICS & NEURO

### THE EFFECT OF INFLAMMATORY ACTIVITY OF CURRENT TREATMENTS IN DOGS WITH OSTEOARTHRITIS

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In this study, a single intra-articular injection of autologous platelet rich plasma (PRP), platelet poor plasma (PPP), adipose stem cells (ASC), and combinations, which are the common intra-articular current treatment options dogs with osteoarthritis, were investigated by clinical findings, diagnostic imaging, and synovial fluid analysis (IL-1 $\beta$ , IL-6, IL-10, TNF $\alpha$ , PGE2). The study was conducted as a randomized, controlled trial. Thirty-six dogs were used for the study. The dogs had clinical evidence of unilateral lameness localized to a single joint, and no systemic disease. Osteoarthritis was classified as primary or secondary depending on the cause. Secondary osteoarthritis was diagnosed when abnormalities causing joint instability (e.g. cranial cruciate ligament rupture) were evident. Dogs with suspected meniscal damage were excluded from the study. Only dogs with no previous treatment, including administration of nutritional supplements, were included in the study. The affected joint was examined by radiography and ultrasonography. The study was approved by the Institutional Animal Care Committee.

The groups were divided as group I PRP, group II ASC, group III (PRP + ASC), group IV (PPP), group V (PPP + ASC) and group V (saline control). Autologous PRP and PPP were prepared using Genesis Cell System. Allogeneic adipose stem cells were produced in preparation by Biovalda Health Technology Education Research Industry Trade Inc. Ankara. Inflammatory mediators in synovial fluid samples were measured using the ELISA in pre-treatment samples, and post-treatment samples taken at 0, 15, 30, 60, and 90 days, and clinical and radiographic examinations were also undertaken.

In the control group, IL-1 $\beta$  (pg/ml), IL-6 (pg/ml), IL-10 (ng/ml), TNF- $\alpha$  (pg/ml) and PGE2 (pg/ml) concentrations in synovial fluids increased statistically within 15 days ( $p<0.05$ ). There were no changes in groups PRP, PPP, ASC and PPP+ASC compare to pre-treatment. There was a statistically significant decrease within 15 days after treatment for all mediators in PRP+ASC group ( $p<0.05$ ). In conclusion, our study demonstrates potential for the use of PRP+ASC combination as an alternative treatment option for osteoarthritis.

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**Keywords:** Dog, Osteoarthritis, Synovial fluid, PRP, Stem Cells, PPP, Metalloproteinases, Inflammatory mediators

## OBJECTIVE EVALUATION OF DAILY ACTIVITY LEVELS AND QUALITY OF SLEEP IN GERIATRIC DOGS WITH OSTEOARTHRITIS OR SPONDYLOPSIS DEFORMANS

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**Introduction:** In recent years, the relationship between chronic pain caused by osteoarthritis (OA) or spondylosis deformans (SD) and sleep disturbances has drawn attention in human medicine. From this background, it has been suggested that sleep disturbances may also occur in dogs with chronic pain. In this study, the daily activity levels and quality of sleep were evaluated objectively using a wearable device in geriatric dogs with OA/SD.

**Materials and Methods:** Privately owned geriatric dogs aged 10 years or older were divided into two groups: dogs without orthopaedic diseases (control group) and dogs with OA or SD (OA/SD group). In all cases, both the owners and veterinarians completed a questionnaire on daily activity levels and/or quality of sleep. To objectively evaluate the daily activity levels and quality of sleep, a wearable device was attached to the collars of all dogs for two weeks, and objective data was collected.

**Results:** The subjective evaluation of chronic pain showed higher scores for all variables in the OA/SD group compared to the control group. Subjective evaluations of the quality of sleep by owners also revealed higher values for all variables in the OA/SD group compared to the control group. Objective evaluation using the wearable device showed that the nighttime sleep time was shorter, and daytime sleep time was longer, in the OA/SD group compared to the control group.

**Conclusion:** Chronic pain causes not only gait abnormalities, but may also cause sleep disturbances in dogs with OA or SD.

## USE OF PLASMA RICH IN GROWTH FACTORS IN VERTEBRAL INJURIES: FOR THE PURPOSE OF A CLINICAL CASE.

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**Introduction.** Intervertebral disc degeneration (IVDD) is one of the most frequent spine pathologies in the canine species (Fluehmann et al., 2006). The common therapeutic strategies for IVDD including, physiotherapy, anti-inflammatory medications and spinal surgery (Cheng et al., 2013). Further investigations have proven the efficacy of Platelet Rich in Growth Factors (PRGF) in intervertebral disc (IVD) repair (Wang et al., 2016).

**Case Description.** A 5 year old male crossbreed dog weighing 25.5 kg was presented to the Veterinary Hospital of the UCH-CEU with hind limb weakness. Computerized Tomography (CT) confirmed the presence of a disc herniation in the C6-C7 vertebral segments. An improvement might have been expected simply with conservative

management over time. However, as no clinical improvement was observed, we considered the application of PRGF guided by fluoroscopy as an appropriate therapy due to the early stage of the lesion. A total of 1 ml of this preparation, which was previously activated with Calcium Chloride (CaCl<sub>2</sub>), was injected into the intervertebral space.

**Results.** A neurological improvement was observed in the follow-up of the patient 2 weeks after PRGF injection.

**Discussion/Conclusion.** In the early stage of IVDD, PRGF is able to promote the proliferation and matrix accumulation of the remaining functional cells within the discs which further helps to restore the function of degenerated IVD (Wang et al., 2016).

### TEMPORARY TARSO-CRURAL ARTHRODESIS IN 3 DOGS AND 1 SHEEP USING AN ULTRA-HIGH-MOLECULAR-WEIGHT-POLYETHYLENE SUTURE DEVICE - A REPORT OF 4 CASES

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**Introduction:** After injuries of the Achilles mechanism and surgical repair of the injured structures, tensile forces acting on the tendon during gait have to be reduced significantly to allow healing. Historically, a variety of techniques have been described to achieve temporary tarsal immobilisation to protect the tendon suture, such as application of a splinted bandage, external fixation or temporary placement of a calcaneotibial position screw. Observed complication rates range from 35.5-46%.

**Case Description:** Medical records of 4 cases of traumatic and atraumatic rupture of the Achilles tendon in 3 dogs and 1 sheep diagnosed at the Tierklinik Dr. Reif between December 2015 and October 2016 were reviewed to assess outcome and complications of a new technique for temporary tarsal immobilisation using an UHMWPE suture device.

**Results:** The implant was used in 3 dogs and 1 sheep. Major complications included implant failure of the suture-fixation in 1 patient. Long-term outcome is available for all patients, with full functional recovery being observed.

**Discussion:** The UHMWPE suture device may be a suitable implant for temporary tarsal immobilization in patients with injuries of the Achilles mechanism. Ongoing evaluation is warranted.

### COMPLICATIONS WITH VENTRICULOPERITONEAL SHUNTS IN DOGS AND CATS: A LITERATURE REVIEW

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**Introduction:** Clinicians should be able to present viable treatment options, recommendations and prognostic estimations to owners of dogs and cats with hydrocephalus. The aim of this literature review was to find out the type and risk of complications, and to provide a general comparison between dogs and cats after VPS placement.

**Material and Methods:** The database CAB was used. Idiopathic hydrocephalus, feline/canine patients, ventriculoperitoneal shunting, complications and outcome were inclusion criteria. The data was statistically analyzed.

**Results:** Fourteen articles were analyzed. Fifty-nine dogs and 11 cats were included. The most common complications in dogs were in the following order: seizures (11.9%), shunt obstruction (10.2%), pain (6.8%), shunt infection (5.1%), disconnection (5.1%), overdrainage (3.4%), underdrainage and kinking of the catheter (1.7%). In cats, seizures (18%), kinking (9%) and migration of the catheter (9%) were the most common complications.

**Discussion:** Seizures were the most common complication that occurred, with an overall incidence of 12.8%. This is a well-recognized complication in children after VPD placement. Obstruction, the most feared complication in humans, occurred in 6 patients (10.2%). Interestingly, migration of the catheter occurred in cats, a complication that was not observed in dogs. Maybe a special fixation of the VPS in cats is necessary to prevent migration. Due to the small case numbers statistical analysis was not appropriate, but complication rates could be identified.

### SAFETY STUDY OF ALLOGENOUS BONE MARROW DERIVED STEM CELLS APPLICATION IN DOGS

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**Introduction.** The main goal of this study was to investigate the safety of canine mesenchymal stem cell (MSC) product and its potential benefits. The hypothesis was that substances contained in the secretome will have a beneficial effect in dogs suffering neurological disease with paresis of hind legs due to spinal cord or cauda equina injury.

**Material and Methods.** The harvested bone marrow was suspended in growth medium, purified by centrifugation, discarding of supernatant and re-suspending with culture medium. The culture was repetitively passaged. Seven dogs with neurological disease were given a slow intravenous infusion of the test product from 1,000,000 cells/1ml at the dose 1.0ml/kg of product added with 1.0ml/kg of saline. The product dosing was adjusted according to patients' response to 1ml/5kg and 1ml/10kg.

**Results.** The dose 1ml/kg induced a generalised response in two dogs resulting in whole-body tremors and spasms, and one dog vomited. This response completely disappeared after the end of administration. We continued with a dose of 1ml/5kg in the next three dogs, and in two dogs we started at the dose 1ml/10kg and continued for 4 days with no visible negative side effects. The neurological score did not deteriorate after this therapy in any of the dogs and only one has improved.

**Discussion/Conclusion.** Even though we did not observed a positive effect of the product of stem cells, this is an approach to the dosage regimen and preliminary verification of the safety of these products in clinical patients.

### STRESS RADIOGRAPHY FOR THE DIAGNOSIS OF MEDIAL GLENOHUMERAL LIGAMENT RUPTURE IN CANINE SHOULDERS

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**Introduction.** The objective of this study was to describe a new technique for stress radiography allowing an accurate diagnosis of medial glenohumeral ligament (MGHL) rupture and medial shoulder instability (MSI).

**Materials and Methods.** Twelve shoulders from six adult Beagle cadavers were randomly allocated into 2 groups: a normal shoulder group (NS group) and an affected shoulder group (AS group) in which the MGHL was arthroscopically transected. Goniometry, image analysis, and radiography (normal and stress views) were performed before and after the arthroscopic procedure. The new radiographic stress view allowed shoulder abduction with the patient positioned in dorsal recumbency and placed in a radiographic positioning device. An abduction angle was measured from each stress view, and evaluation of the repeatability and reproducibility was performed. Correlations between goniometry findings, image analysis and radiographic techniques were determined.

**Results.** Abduction angles were significantly larger in the AS group as measured by goniometry ( $p < 0.001$ ), image

analysis ( $p < 0.001$ ), and radiographic stress view ( $p < 0.001$ ) compared to the NS group. The difference in abduction angle varied from  $12^\circ$  to  $29.3^\circ$  (median difference of  $19.4^\circ$ ) between the normal and affected shoulders. There was good intra-observer, and very good inter-observer agreement. A very good ( $r = 0.74$ ;  $r = 0.72$ , respectively) significant ( $p < 0.001$ ) positive correlation was found between goniometric and radiographic techniques, and between image analysis and radiographic techniques.

**Discussion/Conclusion.** Shoulder abduction angles measured from a specific new radiographic stress view provide objective data that may contribute to the diagnosis of MSI in dogs. Future clinical studies are mandatory.

### ULTRASONOGRAPHIC FINDINGS IN THE ELBOW JOINTS OF DOGS WITH OBSCURED MEDIAL CORONOID DISEASE: 9 CASES

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**Introduction.** The objective of this study was to determine the usefulness of ultrasonography for examining the elbows of dogs suspected to have medial coronoid disease (MCD), in which radiographic and CT scan examinations had proved inconclusive.

**Material and Methods.** Dogs were prospectively enrolled into the study. The same orthopedic examination was performed on all dogs, with two lameness scores, elbow palpation and a Campbell test, followed by elbow radiographs and a CT scan. If the imaging results were inconclusive, the dogs were included in the study, and the elbows were examined ultrasonographically prior to being explored arthroscopically.

**Results.** Nine elbows (8 dogs) met the inclusion criteria and were enrolled in the study. All dogs were found to have MCD on arthroscopic examination. During ultrasonography, the surface of the radius, ulna (except coronoid process) and humerus (medial and lateral epicondyles) appeared regular in all dogs. None of the dogs had soft tissue injury of the elbow (medial and lateral collateral ligaments, tendon of the brachial biceps, flexor muscle tendons). The medial coronoid process of the ulna appeared irregular in 7/9 elbows (77.8%), fragmented in 1/9 elbows (11.1%), and well-defined in 1/9 elbows (11.1%). Joint effusion was present in 5/9 elbows (55.6%). No cartilage defect was identified in any dog. Only one dog had a completely normal elbow joint on ultrasonographic examination. For the 7 other dogs, at least one abnormality was present.

**Discussion/Conclusion.** Ultrasonography appears to be helpful in the diagnosis of medial coronoid disease in dogs, with abnormalities seen in 8/9 elbows (88.9%), allowing the surgeon to pursue elbow arthroscopy.

## THE INCIDENCE OF MUSCULOSKELETAL INJURIES IN AVALANCHE SEARCH AND RESCUE DOGS IN NORTH AMERICA

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**Introduction.** The objectives of this study were to 1) determine the incidence of musculoskeletal (MS) injuries in trained avalanche rescue dogs, 2) identify potential risk factors for MS injuries, and 3) determine any long-term morbidity that negatively impacted on continued avalanche rescue activities. Data from an in-depth online survey would be collected and used to achieve the study objectives.

**Materials and Methods.** An online survey was developed and distributed to ski patrollers/handlers in the United States and Canada. In-depth questions included information pertaining to the dog's signalment, history of avalanche training and activities, working altitude, diet, previous and current medical and orthopedic history, body condition scores, and avalanche work-based MS injury. Pearson Chi-square analysis was performed to identify potential risk factors associated with the incidence of MS injuries. Significance for correlations was set at  $P < 0.05$ .

**Results.** Fifty-nine percent (36/61) of respondents completed the entire survey. Ten different breeds were represented in the survey population. Twenty-five percent (9/36) of the dogs were reported to have MS injuries associated with avalanche rescue work that involved either a thoracic limb, pelvic limb, or both. MS injuries ranged from muscle strains to fractures. Statistically significant risk factors for MS injury could not be identified.

**Discussion/Conclusion.** Although the incidence of MS injury in the study cohort was low, these injuries may have a negative impact in achieving successful human avalanche rescues. A future survey is currently being developed in attempt to elucidate potential MS injury risk factors in this population of specialized working dogs.

## BIOMECHANICAL PROPERTIES OF THE 1.5MM LOCKING COMPRESSION PLATE: COMPARISON WITH THE 1.5 AND 2.0MM STRAIGHT PLATES.

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**Introduction:** Bone plates are often used for radial fracture fixation in miniature dogs but remain associated with high complication rates. Locking plates provide unique benefits that could prove beneficial for the treatment of those

fractures. We compared the properties of the 1.5mm locking plate (1.5LCP) to those of the 1.5mm straight plate (1.5P), 1.5mm straight plate stacked (1.5PSt) and the 2.0mm straight plate (2.0P), in compression and torsion.

**Material and methods:** A 1mm fracture gap model was created with a bone surrogate stabilized with a 6-hole plate. Sixteen constructs were built for each of the 4 plate configurations. Eight from each group were tested in compression and 8 in torsion.

**Results:** In compression, the 1.5LCP was stiffer than the 1.5P and had the same stiffness as the 1.5PSt and the 2.0P. The yield load of the 1.5LCP was slightly less than the 1.5P. In torsion, the 1.5LCP and the 1.5P had similar stiffness but were less stiff than the other constructs. The 1.5P had the lowest yield torque. The 1.5LCP had similar yield torque to the 1.5PSt but less than the 2.0P.

**Discussion/conclusion:** The 1.5LCP can be considered biomechanically equivalent to the 1.5P under the present experimental conditions. The use of the 1.5LCP can be considered an option for radial fracture repair in dogs in which a 1.5P would have otherwise been used. The use of locking plates to improve success rates in these fractures remains to be confirmed clinically.

## COHORT STUDY OF 70 DOGS WITH ARACHNOID DIVERTICULA, TREATED SURGICALLY IN 37 CASES

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Moissonnier P, Teychené-Coutet A, Manou M, Van den Berghe H, Blot S.

**Cohort study of 70 dogs with spinal arachnoid diverticula, treated surgically in 37 cases**

**Introduction:** Spinal arachnoid diverticula (SAD) result from the accumulation of cerebrospinal fluid in the subarachnoid space after lepto-meningeal adhesions have occurred. They are more frequently diagnosed in specific dog breeds (Rottweiler or Pug). Surgery is currently considered to be the treatment of choice. This retrospective study investigates the epidemiological and surgical aspects of this pathology.

**Material and Methods:** Medical records of dogs diagnosed with SAD in our institution between 1999-2016 were reviewed. Data (sex, age at onset, clinical signs, concomitant lesions, SAD localization, surgical technique and outcome) were collected.

**Results:** Seventy dogs of 18 breeds were included, with French Bulldogs, Pugs and Rottweilers being

overrepresented. SAD were mainly located in the thoracolumbar area in small breeds of any age, and in the cervical area in young adult large breeds. Another condition (vertebral anomaly, chronic disk disease) was found to be associated with the diverticulum in 22/36 and 4/34 small and large dog breeds, respectively. An improvement in gait was observed in all surgically treated dogs. The plateau in recovery occurred at 30d, 75d, 180d, 365d, for 18%, 50%, 75%, and 92% of dogs, respectively. There was no statistical difference among surgical techniques.

**Discussion and conclusion:** Our study confirms that surgery is the treatment of choice for SAD, but full recovery is uncertain and time to recovery is long.

## EXTRADURAL VERTEBRAL TUMOURS IN CATS: A CASE REPORT OF COMPRESSIVE MYELOPATHY INDUCED BY A VERTEBRAL LIPOSARCOMA.

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**Introduction.** Feline tumor-induced myopathies are frequent and represent the second most common cause of myopathy, in 27% of cases. The extradural form is the most common, but the atypical localization of the presented liposarcoma has never been reported.

**Case description.** A 6 year old European domestic short-hair spayed female cat was presented with neurological signs, which started 3 months previously. A progressive ataxia with hindlimb paresis and paralysis associated with urinary incontinence was reported. A CT scan revealed the presence of a paravertebral mass between L1 and L3, associated with osteolysis and spinal cord compression.

**Result.** A L1-L2 hemilaminectomy was performed and the paralumbar mass was found in continuity with an extradural lesion emerging from the vertebral canal through the L1-L2 intervertebral foramen. The mass was removed, and postoperative histopathological analysis revealed a vertebral liposarcoma.

**Discussion/Conclusion.** Vertebral liposarcomas are very uncommon tumours. In cats, liposarcomas are usually associated with subcutaneous injections and several studies suggest a relation with retrovirus infections. Cats affected by spinal tumours exhibit a chronic progressive clinical presentation with mainly unspecific signs. Evolution of symptoms is often progressive and can take weeks to months. Both prognosis and outcome depends on tumour type, infiltration and metastatic properties. Some animals with spinal tumours only present with lethargy or behavioral changes, which may

delay both diagnosis and treatment, as in the present case, whose development and localization remain novel.

## VENTRAL STABILIZATION USING SCREWS AND POLYMETHYL METHACRYLATE FOR ATLANTOAXIAL INSTABILITY IN 4 DOGS.

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**Introduction.** Our purpose was to describe the diagnostic findings and outcome following surgery of dogs with atlantoaxial instability (AAI) that had a modified ventral stabilization with screws and polymethylmethacrylate (PMMA) performed by a single surgeon.

**Material and Methods.** Prospective case series of 4 dogs with AAI that had a modified ventral stabilization. Data on pre and postoperative neurologic status, diagnostic findings (CT and radiograph) and outcome were reviewed. Thicknesses of the ventral arch of C1 and of C1-C2 bodies were performed. Surgical technique was exposed.

**Result.** In 4 dogs with follow up (median: 6.5 months), 100% improved neurologically after surgery. There were no complications that resulted in neurologic deterioration, implant migration or that required additional surgery.

**Discussion/Conclusion.** The surgical objectives for correction of AAI are to decompress the spinal cord and reduce and stabilize the atlantoaxial joint without causing morbidity or mortality. Success of the surgical technique is dependent upon the ability to achieve a rigid and persistent fixation of the C1-C2 segment. Ventral transarticular fixation techniques using transarticular pins and screws associated with PMMA had a risk of fixation failure or migration. In this modified ventral stabilization, screws and position of screws reduce the postoperative complications associated with implants migration. Despite limitations inherent in this small case series, our findings suggest that this is a promising surgical technique, which appears to be safe and effective for treatment for AAI.

## A NOVEL LESS INVASIVE TECHNIQUE FOR TREATMENT OF ANTEBRACHIOCARPAL LUXATION WITH MEDIAL COLLATERAL LIGAMENT DISRUPTION IN A CAT

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**Introduction:** Antebrachiocarpal luxation in cats, in contrast to dogs, can be caused by medial collateral ligament rupture alone. Current treatment recommendations include placement of a ligament prosthesis with screws used as suture anchors.

**Case description:** A cat was presented with palmaromedial antebrachiocarpal luxation after high-rise trauma. Treatment was carried out by primary ligament repair followed by additional sutures anchored in the periosteum and tendon of the abductor pollicis longus muscle, mimicking the direction of the ligament. The limb was supported in a reinforced bandage for 4 weeks. Eight weeks postoperatively, the cat was using the limb with full function. No complications occurred.

**Discussion/Conclusion:** A less invasive approach to antebrachiocarpal luxation in cats is presented in this case report. No implants were used and the abductor pollicis longus tendon was used as support by functioning as a suture anchorage point. Avoidance of implants is beneficial in that it reduces the risk of complications.

**LATERAL ORBITOTOMY WITH ZYGOMATIC ARCH OSTECTOMY COMBINED WITH VERTICAL RAMUS OSTECTOMY ALLOWING INCREASED EXPOSURE FOR REMOVAL OF TUMORS AFFECTING THE VENTROLATERAL FRONTAL BONE IN TWO DOGS**

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**Introduction:** Surgical treatment of orbital tumors or tumors that reside along the ventrolateral aspect of the calvarium provide challenges including obtaining adequate exposure, achieving appropriate working space, preserving vision, and maintaining cosmesis of the face and eye post-operatively. This report describes ostectomies of the zygoma and vertical ramus to increase exposure and working space for resection of calvarial tumors. This modified lateral orbitotomy technique was performed successfully in two dogs.

**Case Description:** A zygomatic arch ostectomy combined with vertical ramus ostectomy (dorsal to the condylar portion of the mandible) was performed unilaterally in dog 1 to remove a tumor affecting the ventrolateral frontal bone and bilaterally in dog 2 for excision of a multilobulated mass which extended from the right maxillary and frontal bones and extended caudally to the level of the frontal and parietal bones. Both dogs' surgeries were performed without complication and their recovery was unremarkable. The masticatory function was unaffected with both dogs eating within 2 days postoperatively.

**Results/Conclusions:** Histopathology results of dog 1 were consistent with an osteoma with complete resection and dog 2 indicated a grade I multilobular osteochondrosarcoma with focal incomplete margins. This modified lateral

orbitotomy surgical approach should be considered for ventrolateral or large orbital tumors arising from the frontal bones. It provides the advantages of giving more exposure and space in the ventrolateral orbit allowing resection of these tumors whilst sparing the eye and maintaining both cosmesis and masticatory function. Both dogs had good quality of life for 1.5+ years post-operatively.

**POSTER: SMALL ANIMAL SOFT TISSUE**

**CHANGES IN CHEMICAL AND ULTRASTRUCTURAL COMPOSITION OF AMEROID CONSTRICATORS FOLLOWING IN VITRO EXPANSION**

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**Introduction:** Ameroid constrictors (AC) are hygroscopic devices used for attenuation of portosystemic shunts (PSS). Studies show that perivascular inflammation, fibrosis, and intravascular thrombosis provide a significant contribution to attenuation of the PSS after AC placement. The purpose of this study was to characterize the chemical and ultra-structural composition of ACs, at a native state and during in vitro expansion and to identify how these changes could contribute to the inflammatory changes seen after AC placement.

**Materials and methods:** Twelve ACs (3 repeats of 3.5mm, 5mm, 6mm and 7mm internal diameter) were evaluated using Time-of-Flight Secondary Ion Mass Spectrometry, Raman spectroscopy, Attenuated Total Reflectance Fourier Transform Infrared spectroscopy and scanning electron microscopy.

**Results:** ACs have a composition consistent with casein. There was little to no intra- or inter-constrictor variation. Microscopic analysis indicated that the topographical features of the AC surfaces were consistent between all constrictors. Following in vitro expansion there was a reproducible decrease in Ca<sup>+</sup> ion content, little to no variation in secondary protein structure and morphological changes including the presence of surface aggregates only at the inner surface of the ACs.

**Discussion/Conclusions:** This study confirms that ACs are fabricated from casein with a high degree of inter- and intra-constrictor homogeneity, with reproducible changes occurring following in vitro expansion. The method of action of AC likely involves the biocompatibility of ameroid but also calcium-mediated inter-protein interactions rather than only the imbibition of water. These findings further reinforce

the theory that perivascular inflammatory changes contribute to AC closure.

## EFFECTS OF PLASMA RICH IN GROWTH FACTORS WITH ADIPOSE-DERIVED MESENCHYMAL STEM CELLS ON CUTANEOUS WOUND HEALING IN RABBITS.

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**Introduction:** During the last years, the prevalence of impaired wound healing has increased due to chronic degenerative diseases associated with aging, which represents a major health problem worldwide. The use of Plasma Rich in Growth Factors (PRGF) and Adipose Derived Mesenchymal Stem Cells (ASCs) are the gold-standard in regenerative medicine. The trend nowadays is to avoid using traumatic techniques and choose low or non-invasive procedures.

**Material and Methods:** A total of 144 rabbits were used for this study. The animals were divided into three study groups of 48 rabbits each depending on the treatment: PRGF, ASCs, and PRGF+ASCs. Two wounds of 8 mm of diameter were created on the back of each rabbit: the first was treated with saline solution, and the second with the treatment assigned for each group. The macroscopic and microscopic appearance of wounds was assessed at 1, 2, 3, 5, 7 and 10 days post-surgery.

**Results:** Wounds treated with PRGF, ASCs and PRGF+ASCs showed higher wound healing rates, a more natural aesthetic appearance, higher epithelialization rates, lower inflammatory response, higher collagen deposition and angiogenesis compared with the control wound. The combined treatment PRGF+ASCs showed the best macroscopic and microscopic results.

**Conclusion:** These results suggest that the use of ASCs combined with PRGF is the best choice to enhance the wound healing process and for the improvement of the aesthetic appearance in acute wounds.

## COMPARISON OF ACUTE-PHASE PROTEINS AFTER LAPAROSCOPIC OVARIECTOMY VERSUS CONVENTIONAL LAPAROTOMY OVARIECTOMY IN THE FELINE SPECIES

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**Introduction:** Elective sterilization of female cats is one of the most common surgical procedures in the current veterinary practice. This surgery can be performed either by conventional open surgery via laparotomy, or by minimally invasive methods via laparoscopy. Currently, minimally invasive techniques are widely accepted due to the advantages of these techniques compared to conventional open surgery. The aim of this study is to demonstrate that laparoscopic ovariectomy produces less alteration of selected biomarkers compared with ovariectomy via laparotomy in cats. **Material and Methods:** Fourteen female cats were included. They were divided into two study groups (seven female cats were ovariectomized by laparotomy, and the other seven were ovariectomized laparoscopically). For each patient, serum was obtained for evaluation of biomarkers (Haptoglobin and Serum Amyloid A) at a pre-surgical time point, and post-surgical time points at 6, 12 and 24 hours. **Results:** The results show that in both groups the levels of biomarkers increased with time, reaching their highest value at 24 hours post-surgery. When comparing both groups, there were no significant differences in any of the evaluated biomarkers. **Discussion/Conclusion:** Both laparoscopic ovariectomy and conventional laparotomy ovariectomy are equally valid surgical methods to perform sterilization of female cats, producing an initial inflammatory phase (up to 24 h) that is similar in both groups.

## GIANT INTRAMUSCULAR HEMOPHILIC PSEUDOTUMOR AS FIRST PRESENTATION OF HEMOPHILIA IN A DOG

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**Introduction:** Hemophilic pseudotumour (HP) is a rare, potentially fatal complication of hemophilia. It has been described once in a dog involving bone, but never in soft tissues, for which reports are scarce in humans. This is the first case report in veterinary literature of an intramuscular HP in a dog with hemophilia.

**Case description:** A 7-year German Shepherd male dog was presented for acute onset of a subcutaneous and intramuscular inguino-abdominal expanding mass and anemia. Based on prolonged aPTT and low FVIII-C, hemophilia was diagnosed. CT, MRI, cytological concurred to show encapsulated blood products in different stages compatible with HP.

**Results:** Blood transfusion and hemostatic therapy (tranexamic acid) were administered initially. However, the dog's condition deteriorated with enlargement of the HP and development of hemarthrosis after few days. FVIII

replacement was added and the arthropathy resolved within 48h and the mass reduced in size. However, this was a serious condition, indicating the need for a life-saving intervention under adequate FVIII replacement, which cannot be continued in the long-term in dogs due to cost and supply reasons. Hence, surgical removal of the HP was elected. However, the dog died from undetermined reasons 12h after surgery. Histology allowed exclusion of neoplasia and confirmed a diagnosis of HP.

**Discussion/Conclusion:** This case described the diagnostic features of HP in a dog. Early diagnosis is imperative for successful outcome and FNA or biopsy is contraindicated. In humans, surgical removal is the preferred therapeutic option, but the mortality rate is as high as 20% and surgical excision may not be possible.

### PLASMA LACTATE CONCENTRATION: IS IT A RELIABLE PROGNOSTIC FACTOR IN DOGS WITH GASTRIC DILATATION-VOLVULUS?

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**Introduction:** Gastric dilatation-volvulus (GDV) is a frequent canine surgical emergency. Plasma lactate concentration (PLC) is the most investigated prognostic variable. Our hypothesis was that cut-offs from Green et al.(2011) are unable to predict gastric necrosis and survival, as well as a decreasing of  $\geq 50\%$  of the initial PLC.

**Materials and Methods:** GDV dogs presented to the Veterinary Teaching Hospital were identified (2012-2017). Animals were excluded when admission PLC was not available and when receiving treatments before arrival. PLC was recorded at admission (T0), 24 (T24) and 48 (T48) hours after surgery. Dogs were categorized by presence of gastric necrosis and outcome. Non-parametric statistical analysis was performed with ROC curve and Cox proportional hazards regression model for survival analysis;  $P<0.05$ .

**Results:** Forty-five dogs were included. PLCs recorded at T24 and T48 were significantly different from T0 PLCs for every category. Their median values showed a significant decrease of  $\geq 50\%$  at T24 in dogs with and without gastric necrosis, as well as in surviving and non-surviving dogs. No significant differences were identified between T24 and T48 PLCs. There was no significantly increased risk of necrosis when T0 PLC $>2.9\text{ mmol/L}$ , nor increased risk of death when T0 PLC $\geq 4.1\text{ mmol/L}$ .

**Discussion/Conclusion:** Our results demonstrated that PLC can not be fully used as reliable predictors of gastric necrosis or outcome in dogs with GDV.

### BILATERAL LARYNGEAL PARALYSIS SECONDARY TO TRAUMATIC NERVE DAMAGE IN TWO DOGS.

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**Introduction:** Cervical injuries are common in dogs and may be catastrophic given the number of vital structures in the region. Traumatic damage to the vagus or recurrent laryngeal nerves is a possible cause of acquired laryngeal paralysis, but its occurrence is rare.

**Case descriptions:** Two dogs (a French Bulldog and a miniature Pinscher) were presented as an emergency for cervical bite wounds. Bilateral laryngeal paralysis, associated with several tracheal tears, was diagnosed by respiratory tract endoscopy in both dogs. The French bulldog needed surgical intervention (temporary tracheostomy and left cricoarytenoid lateralization). A complete right caudal laryngeal nerve transection was observed during surgery. The Pinscher was treated conservatively with only anti-inflammatory drugs, skin wound dressing management and monitoring. The two dogs recovered uneventfully. The Pinscher was examined endoscopically 6 months later and total recovery of laryngeal motion was observed.

**Discussion/Conclusion:** Cervical bite wounds can lead to laryngeal paralysis, which may be transient or require surgical treatment. Endoscopy is recommended in case of cervical trauma, especially for bite wounds. Along with clinical examination, this procedure is a key factor in the management of these cases.

### URINARY HEAT SHOCK PROTEIN AS AN EARLY MARKER FOR KIDNEY INJURY IN DOGS UNDERGOING DIFFERENT TYPES OF SURGERY

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**Introduction:** Early recognition of acute kidney injury (AKI) in surgical patients is important, as early treatment might decrease mortality rate. The aim of this study was to assess the increase of heat shock protein-72 (HSP72), an early urine biomarker for AKI, pre-operatively versus post-operatively

within 4 American Society of Anesthesiology (ASA) categories.

**Materials and Methods:** Urinary HSP72-to-creatinine ratio (uHSP72/uCr) and serum creatinine (sCr) were measured pre-operatively and 24 hours post-operatively in 39 dogs from ASA categories 1-4.

**Results:** There was a significant increase in median uHSP72/uCr post-anesthesia for the entire study group. The proportion of dogs with increased uHSP72/uCr tended to be higher post-operatively compared to the pre-operative values ( $P=0.06$ ). Comparing pre-anesthetic and post-anesthetic uHSP72/uCr within every ASA-status group, there was a significant increase in the proportion of abnormal dogs in ASA-3 group ( $P=0.028$ ). 4 dogs developed AKI postoperatively, of which 3 had abnormal uHSP72/uCr and 1 had normal sCr pre-operatively. The proportion of dogs with abnormal pre-operative uHSP72/uCr concentration increased with ASA-status. There was no significant difference in pre-operative uHSP72/uCr between dogs that did not develop AKI and those who did (0.44 ng/mg [0.42-37.42] vs 3.83 ng/mg [0.27-142.3], respectively,  $P=0.18$ ).

**Discussion:** We show a high proportion of dogs with elevated uHSP72/uCr but normal sCr pre-anesthesia and post-anesthesia. Evaluating this sensitive biomarker prior to anesthesia revealed a proportion of dogs with AKI that are at risk of progression to overt kidney damage. Identifying these animals prior to anesthesia should alert the surgeon, and promote close monitoring and timely intervention.

## RISK FACTORS FOR VENTRICULAR FIBRILLATION FOLLOWING AORTIC CROSS-CLAMPING RELEASE DURING MITRAL VALVE REPAIR IN DOGS

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**Introduction:** Ventricular fibrillation (VF) is a potentially fatal complication of open heart surgery. We characterized risk factors related to VF occurring after the release of aortic cross-clamping during mitral valve repair.

**Materials and Methods:** Two hundred and thirty-seven dogs underwent mitral valve repair under cardiopulmonary bypass, with crystalloid (CCP) or blood (BCP) cardioplegia to induce surgical arrest. Dogs were grouped according to whether or not VF occurred after releasing aortic cross-clamping. We assessed age, body weight, left atrial-to-aortic root ratio (La/Ao), body weight-normalized left ventricular internal diameter in diastole (LVIDDn), aortic cross-clamping time, rectal temperature at release of aortic cross-

clamping, cardioplegia dosage, cardioplegia type, and blood transfusion volume per body weight during surgery.

**Results:** Of the 237 dogs, 44 (18.8%) comprised the VF group. Only rectal temperature at release and cardioplegia dosage were not significantly different between groups. VF occurred significantly more often with CCP (22/72, 28%) than with BCP (22/165, 13%;  $p=0.002$ ) and blood transfusion volume/body weight was also significantly higher in the CCP group than the BCP group ( $p = 0.04$ ). Independent predictors of VF included body weight (OR:1.52, CI: 10.9 - 1.43,  $p = 0.001$ ), LVIDDn (OR: 8.727, CI: 2.68 - 28.3,  $p < 0.001$ ), and use of BCP (OR: 0.314, CI:0.147 - 0.672,  $p = 0.003$ ).

**Discussion/Conclusions:** Surgeons can most easily reduce the risk of VF by using BCP instead of CCP, as it reduces risk related to cardioplegia type and the volume of blood transfusion during surgery.

## SURGICAL CORRECTION OF TYPE II ATRESIA ANI ASSOCIATED TO AN URETHRO-RECTAL FISTULA IN A 2 MONTHS-OLD MALE KITTEN

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**Introduction:** Atresia ani is the most common ano-rectal malformation reported in dogs and cats, and four basic anatomic types of atresia ani have been defined. Rectovaginal, recto-vestibular or urethro-rectal fistulas have been occasionally reported in association with atresia ani. Surgical correction of rectovaginal fistulas associated with atresia ani has been reported in only 11 kittens. Urethrorectal fistulas have been described in 3 kittens with atresia ani but surgical correction has never been recorded.

**Case Description:** Type II atresia ani with urethro-rectal fistula was diagnosed by positive-contrast retrograde urethrography in a 2 month old British shorthair male kitten and surgically treated by anoplasty and fistulectomy.

**Results:** The main early post-operative complications included fecal incontinence, wound dehiscence, urine leakage and anal stenosis that recurred after digital bougienage and necessitated revision anoplasty 3 weeks after initial surgery. Persistent megacolon associated with constipation required total colectomy 1 month later. Then the kitten developed inflammatory perineal dermatitis for 3 weeks. He produced soft to normal feces 6 weeks post operatively.

**Discussion/Conclusion:** The kitten had to undergo multiple surgical corrections and had a prolonged hospitalization time before being able to defecate normally. This paper describes for the first time the surgical treatment of type II

atresia ani associated with urethro-rectal fistula in a male kitten.

## EVIDENCE OF SUCCESSFUL HYPOPHYSECTOMY AS TREATMENT FOR DIABETIC CATS WITH ACROMEGALY.

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**Introduction:** In cats, chronic hypersecretion of growth hormone (GH) by a somatotroph pituitary adenoma causes acromegaly marked by diabetes mellitus. Treatment is usually aimed at regulation of glucose levels with insulin medication, but as long as the primary cause, i.e. the pituitary adenoma, remains untreated insulin requirements usually increase over time. The aim of this study is to present a large cohort of cats with acromegaly that underwent treatment by transsphenoidal hypophysectomy. Plasma GH and insulin-like growth factor 1 (IGF-1) concentrations were measured before and after surgery.

**Materials and Methods:** Eighteen cats with diabetes mellitus and confirmed diagnosis of pituitary adenoma underwent transsphenoidal hypophysectomy. Plasma GH and IGF-1 concentrations were measured before and after surgery to determine successful outcome and evidence for remission and hypoglycemia events were registered.

**Results:** After successful removal of the pituitary adenoma, plasma GH concentrations decreased to normal levels within 5 hours after surgery. The decrease of plasma IGF-1 concentrations took longer and reached only normal levels from 1 week onwards after hypophysectomy. Plasma GH and IGF-1 concentrations were significantly lower ( $P<0.001$ ) after surgery. Life-threatening hypoglycemia after surgery was the most frequent complication.

**Discussion/Conclusions:** The IGF-1 assay is routinely available in clinical practice but evidence of remission after hypophysectomy in acromegalic cats can only be assessed from 1 week after surgery due to the long half-life of IGF-1. The sharp decrease of plasma IGF-1 concentration, simultaneous insulin replacement, and resumption in endogenous insulin secretion places the hypophysectomized cat at great risk for postoperative hypoglycemia.

## LONG-TERM ASSESSMENT OF ABCESSES AND DRAINING TRACTS OCCURRING IN THE HEAD AND NECK REGION OF DOGS

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**Introduction:** Surgical treatment of abscesses and draining tracts (DT) occurring in the head and neck region of dogs is challenging and has not been investigated in the long-term. We aimed to evaluate whether failure to retrieve a foreign body (FB) during surgery would result in recurrence and retrieval of a FB at the time of surgery would consistently result in cure.

**Material and methods:** A retrospective study was conducted in dogs undergoing surgical treatment of a head and neck abscess/DT lasting for at least a week unrelated to a bite wound and in which a CT scan was performed.

**Results:** FB was identified from the CT scan in 10 cases (42%) and was suspected in 14. FB was found at surgery in 10 cases (42%) of which 4 had been identified on CT (40%). Recurrence occurred in 7 cases (39%). Failure to remove FB at the time of surgery was not correlated with recurrence ( $P=0.35$ ), but failure to identify FB on CT tended to be associated with recurrence ( $P=0.08$ ). Animals that were treated with antibiotics pre-operatively were more likely to be cured ( $P=0.04$ ).

**Discussion/Conclusion:** Our study highlights that failure to retrieve a FB during surgery is not necessarily associated with recurrence and removal of FB at the time of surgery did not consistently lead to resolution of the disease. A preoperative CT scan may be useful for preoperative surgical planning, and may allow the diagnosis of a FB or suspicion of its presence. Antibiotic therapy prior to surgery should be investigated further as it seems to reduce the incidence of recurrence.

## ACUTE MESENTERIC ISCHEMIA-LIKE SYNDROME ASSOCIATED WITH S.LUPI ABERRANT MIGRATION IN DOGS.

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**Introduction:** The nematode Spirocerca lupi (S. lupi) has a worldwide distribution. The larvae migrate and eventually induce the formation of nodules in the esophagus. Affected dogs commonly present with signs associated with the esophageal nodules, but signs also may arise due to aberrant larval migration affecting other organs. Acute mesenteric ischemia (AMI) is an uncommon condition in people resulting in intestinal necrosis. Despite aggressive therapy in people, mortality is relatively high.

**Aims:** To describe acute mesenteric infarction due to S. lupi aberrant migration in five dogs.

**Case summary:** All dogs were large breed dogs, none which exhibited typical clinical signs associated with spirocercosis. All dogs were eventually diagnosed with septic peritonitis. On exploratory laparotomy, thickening of the jejunal arteries, surrounding mesojejunum and segmental necrosis were identified. Similar thickening and hematoma formation were found in other regions of the mesentery. In four of the cases, the necrotic segment was located in the distal jejunum. Histology revealed thrombotic mesenteric vessels with intralesional *S. lupi* nematodes. Resection and anastomosis of the necrosed section was performed and all dogs were discharged within 1-6 days.

**Conclusion:** *S. lupi* is a potential cause of mesenteric infarction in endemic areas when no other obvious etiology is identified.

## THE ASSOCIATION BETWEEN INTRAOPERATIVE GROSS FINDINGS OF MITRAL VALVE CHORDAE TENDINEAE RUPTURE DURING MITRAL VALVE REPAIR AND TRANSTHORACIC ECHOCARDIOGRAPHIC FINDINGS OF MITRAL VALVE PROLAPSE

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Myxomatous mitral valve disease (MMVD) is a disease of structural abnormality in mitral valve resulting in mitral valve regurgitation. The main cause of MMVD is mitral valve thickening and prolapse due to myxomatous degeneration of the mitral valve leaflets and chordae tendineae through aging. Echocardiography is routinely performed prior to mitral valve repair at our institution, and severe prolapse of mitral valve is common finding. However, chordae rupture are not always seen under gross evaluation intraoperatively. The purpose of the present study is to compare transthoracic echocardiographic findings of mitral valve prolapse with gross features of mitral valve chordae tendineae rupture, and to investigate the rupture sites and incidence. We retrospectively reviewed cases with mitral valve repair performed between April to August 2017 at our institute. Mitral valve prolapse was evaluated by the right parasternal 4-chamber view of transthoracic echocardiography. Evaluation of mitral valve chordae tendineae rupture was visually inspected during surgery and the sites of rupture were recorded. Seventy-nine dogs were included in the study. All dogs showed septal leaflets prolapse of mitral valve. Mitral valve chordae tendineae rupture was detected in 62 dogs. Our results suggest that evaluation of the association between mitral valve prolapse and chordae tendineae rupture by right parasternal 4-chamber view is

inaccurate. In conclusion, there was no association between transthoracic echocardiography finding of mitral valve prolapse and the intraoperative gross examination of the mitral valve. Anterior leaflet chordae rupture, frequently observed at posterior commissure, was the most common location.

## INVESTIGATION OF LEAKAGE HOLES CREATED BY 4 NEEDLE TYPES USED FOR CLOSURE OF ENTEROTOMY INCISIONS IN CANINE CADAVERS

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**Introduction:** The aim of this study was to compare 4 types of needles used to close enterotomy incisions in canine cadavers in relation to the creation of leakage holes in the intestinal wall as tested by infusion of methylene blue solution into the intestinal lumen. Our hypothesis was that taper, taper-cutting or reverse-cutting needles are secure options for performing a successful enterotomy closure, whereas conventional cutting needles are not.

**Materials and methods:** Twenty four enterotomies were performed in 10 cm jejunal sections obtained from 5 dogs following euthanasia and tested within 3 hours. After placement of Doyen intestinal forceps to the ends of each construct, a 3 cm antimesenteric incision was performed and closed using 4-0 polydioxanone suture armed in a swaged-on needle in a simple interrupted pattern. Group CC was closed with a polydioxanone suture armed in a conventional cutting needle, group RC with a reverse cutting needle, group TPP with a taper point plus needle and group TC was closed with a taper cutting needle. Leak testing was performed by infusing 13.5 mL methylene blue solution into the intestinal lumen.

**Results:** Comparison of group CC constructs showed significant differences among leakage and non-leakage constructs ( $P=0.027$ ). Non-statistical significant differences in terms of leakage were detected among other groups.

**Discussion/Conclusion:** Conventional cutting needles create leaking holes in cadaveric healthy jejunum during needle passage for closing an enterotomy incision. Reverse-cutting, taper-point and taper-cutting needles do not create leaking holes in the intestinal wall.

## TWO NOVEL TECHNIQUES FOR THE ADVANCEMENT OF THE PREPUTIUM OF THE DOG.

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**Introduction:** Preputial advancement to cover even a small length of exposed penis has proven to be ineffective in our hands. The aims of this study were to compare a standard method of preputial advancement to two novel modifications of the technique, and to describe a case in which a novel technique was used.

**Materials and Methods:** The anatomical part of this study was performed on 10 canine cadavers. Prior to performing and testing the techniques for preputial advancement, a stiff male urinary catheter with a centimeter scale glued to it was secured in the penile urethra with a single mattress suture. Phallopexy was performed to prevent cranial/caudal translation of the penis during testing. In each dog the reported technique for preputial advanced was performed followed by two novel modifications of the procedure. After performing

each procedure, the preputium was advanced by sequentially tightening 3 sutures, preplaced between the preputium and three locations on the linea alba cranial to the prepuce.

**Results:** Tightening each suture within each technique resulted in a significant ( $p<0.05$ ) cranial translation of the prepuce. Both modifications resulted in significantly more ( $p<0.05$ ) cranial translation than the standard technique, but no difference was found between the two modifications for any of the cranial translations.

**Discussion/Conclusion:** We showed that modification of the described technique significantly increased the amount of cranial translation of the prepuce in a dog, and we were able to successfully treat a clinical case based on our findings.