Proceedings of the European Veterinary Conference Voorjaarsdagen

Amsterdam, the Netherlands
Apr. 23-25, 2009

Next Meeting:

22-24 April, 2010 - Amsterdam, Netherlands

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A CLOSER LOOK AT EHV-1 CELL-ASSOCIATED VIREMIA
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Introduction
Viremia during Equid Herpesvirus type 1 infections is a necessity to develop neurological disease in horses. Viremia is cell-associated to peripheral blood mononuclear cells (PBMC) in one of the 4 subsets: CD4+, CD8+, B lymphocytes and monocytes. In vivo data, identifying which subset of cells is infected during viremia, is lacking.

Materials and Methods
PBMC were collected from all infected, non-treated/non-vaccinated control animals of 2 independent infection studies. Both studies infected yearlings with a neuropathogenic EHV-1 strain. Study 1 used 8 horses and EHV-1, strain Ohio 03, and study 2 used 7 ponies and EHV-1, strain Ab4. Daily isolated PBMC were further separated into 4 cell subsets using specific antibodies and magnetic bead separation technique. Individual fractions were submitted for quantitative PCR analysis using 2 PCR assays, one providing the number of viral genome copies (PCR EHV1 gB), and the second the number of nucleated cells in the sample (PCR Equine β-actin).

Results
In study 1 virus was primarily found in CD8+ lymphocytes, and to a lesser degree in B lymphocytes. In study 2 we found virus in CD8+, B lymphocytes and monocytes. In both studies viral genome copies were undetectable (study 1) or at extremely low numbers in CD4+ lymphocytes.

Conclusions
Differences regarding viral presence in subsets of PBMC were noted between the two studies. Differences could be attributed to differences in strain properties of EHV-1, or due to differences between horses, used in study 1, and ponies (study 2). Significant finding in both studies was the absolute scarcity of CD4+ lymphocyte infection. Now, the mechanism of CNS endothelial cell infection needs to be elucidated.

TOPICAL HYDROCORTISONE ACEPONATE SPRAY IN THE HORSE: UNAUTHORISED MEDICATION?
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Introduction
Topical corticosteroids are often efficacious for a variety of dermatoses. A concern is the risk of systemic absorption that may result in laminitis or in a positive medication test. In many European countries hydrocortisone aceponate (HcA) spray (Cortavance®, Virbac) is registered for the treatment of inflammatory and pruritic skin conditions in dogs. HcA is in the form of a diester, which promotes the penetration through the skin and the deposit in the stratum corneum. Cutane esterases hydrolyse HcA to hydrocortisone-17-propionate, a potent metabolite with a powerful anti-inflammatory activity in the keratocytes. Inside the skin structures there is a further deactivation, which produces simple hydrocortisone and this is eliminated by systemic route in the same way as natural endogenous cortisol. The aim of the study was to evaluate the extent of systemic absorption in horses.

Materials and methods
Six horses of different breeds (1-18 years old, 5 geldings and 1 mare) with insect bite hypersensitivity were used. The spray was applied to all affected areas once a day for 5 days (dosage of 10-17 mg/day/horse). Blood was collected before the first application, after 1 day treatment, on the 5th (last day) of treatment and on the 2nd day after the last application. Spontaneous urine was collected as often as possible (3 horses before any treatment, and 3 horses 1-3 samples during and after treatment). Blood and urine were analysed for hydrocortisone and hydrocortisone aceponate concentrations by the official FEI laboratory (Laboratoire des Courses Hippiques, Paris).

Results
None of the blood and urine samples tested positive for hydrocortisone or hydrocortisone aceponate.

Conclusions
The present study shows that the use of hydrocortisone aceponate spray did not result in a positive medication test in horses, even when large open lesions were treated.
Introduction
Culicoides hypersensitivity and atopic dermatitis are the main causes of chronic seasonal pruritus in horses. In this study we evaluated the efficacy of allergen specific immunotherapy based on intradermal skin reactions to *Culicoides* antigens and serological testing for *Culicoides* and environmental allergens.

Materials and methods
A total of 20 horses from two different studs were included in the study. All horses had seasonal pruritus and a positive intradermal reaction to a whole *Culicoides* antigen extract prepared from *Culicoides sp* captured in Spain (Diater Laboratorios, Madrid). Twelve of the horses also had positive IgE titers mainly specific to *Culicoides*, other insects and pollens (Allercept, Heska Corp.). After randomisation, ten horses received allergen specific immunotherapy combining all positive results, and the rest a placebo solution. Treatment efficacy was estimated by a clinical scoring system based on the severity of pruritus, alopecia, excoriations and skin thickness at 10 different body regions (maximum achievable score 168). Horses were not stabled, but for ethical reasons insect repellents were used along the study in both groups. Evaluations were performed every four months during one year.

Results
Sample size provided a 95% power to detect a difference between mean clinical score of 21.7. Clinical scores at the end of treatment had significantly improved in both groups (P<0.01); however differences between treatment and placebo groups at any evaluation time were statistically non-significant (repeated measures ANOVA).

Conclusions
Allergen specific immunotherapy failed to provide a significant improvement in horses with seasonal pruritus caused by *culicoides* hypersensitivity or *culicoides* hypersensitivity and increased IgE antibodies specific for environmental allergens.
horses (p<0.0016 – Bonferroni correction). Sensitivity and specificity at one hour (1.0 and 0.7 respectively) and four hours (1.0 and 0.8 respectively) were highest for C. obsoletus non-blood-fed extract 1:1000 w/v compared to both other extracts.

Conclusion
These results confirm that intradermal allergy testing with different native Culicoides extracts may be helpful in the clinical confirmation of IBH in horses.

TISSUE DOPPLER IMAGING: A NEW WAY TO VISUALISE THE EQUINE HEART
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Introduction
Although myocardial capacity is closely related to athletic performance, assessment of equine myocardial function is poorly documented. In human medicine, myocardial strain (deformation) and strain rate are quantified by color-coded tissue Doppler imaging (cTDI). The goal of this study was to assess normal values and the feasibility of this method for evaluating equine ventricular function.

Material and methods
Echocardiographic examinations were performed in 6 healthy untrained Standardbred horses (7,3 ± 3,3 years; 506 ± 45 kg; 5 geldings, 1 mare) from a right and left parasternal short-axis view. Five ventricular segments were evaluated at chordal level: right ventricular free wall (RV), interventricular septum (IVS), and left, right and caudal regions of the left ventricular free wall (LLV, RLV, CLV). Systolic and diastolic radial strain and strain rate were measured.

Results
TDI-parameters could be obtained in all horses. Myocardial strain (%) reached a peak positive value in end-systole (RV = 138,2 ± 30,1; IVS = 56,4 ± 6,2; LLV = 127,3 ± 30,3; RLV = 80,3 ± 11,0; CLV = 74,6 ± 16,2), corresponding to maximal thickening of the ventricular walls. Strain rate (s-1) was positive in systole (S) and showed negative peaks in early (E) and late (A) diastole, indicating a biphasic relaxation. Peak E was significantly higher than peak S and A. Strain rate values were lower in the IVS than in the ventricular free walls.

Conclusions
Radial ventricular wall motion can be quantified using cTDI strain and strain rate imaging. Further research is ongoing in a larger group of horses to determine the reference values, repeatability and reproducibility of this technique.

BONE EDEMA / BONE NECROSIS AS MRI DIAGNOSIS: LOCATION, PRESENTATION AND THERAPY IN A SUMMARY OF 17 CASES
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Introduction
MRI is a new imaging modality in veterinary medicine. This multiplanar, three dimensional imaging technique is superior in assessing pathologies in both soft tissue and bone. It provides us with relative new diagnoses as bone edema and bone necrosis, not diagnosed with other modalities. Bone edema/ bone necrosis replaces the medullary fat with fluid and/or necrotic material. Therefore the signal of the trabecular bone changes on the T1, T2 * and STIR (Short Tau Inversion Recovery) sequences.

Material and Methods
The criteria for inclusion in this study included bone edema/bone necrosis as one of the main pathologies and subsequent treatment for this pathology at our clinic. Eight cases were selected. This communication describes the location and presentation of the lesion and the therapy. The horses were examined with a low-field standing MRI especially developed for horses.

Results
Pathologies found were located in the navicular bone, phalanges and metacarpus/-tarsus. Low-field standing MRI accurately demonstrates the different structures and the presence of bone edema/ bone necrosis. Dependent on the location and presentation of the bone edema/bone necrosis the therapy consisted ofTildren© infusion, Interleukine-1 Receptor Antagonist Protein (IRAP) i.a., box confinement, orthopedic shoeing, rehabilitation protocol or a combination of these. Five horses returned to normal work, two are still in the rehabilitation period and one horse was euthanized.

Conclusion
With the availability of the MRI the new diagnosis of bone edema/ bone necrosis was presented to the clinician. This pathology can be found in every bone. The

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differentiation between bone edema and bone necrosis can only be made on histopathology (1). Therefore in a clinical situation the choice of therapy must be based on the location of the lesion, the presentation and the presumable etiology of the pathology. Ongoing prospective research will hopefully present us with more answers.

References

NUCLEAR SCINTIGRAPHIC ASSESSMENT OF THE METACARPOPHALANGEAL AND METATARSOPHALANGEAL JOINTS OF 74 HORSES WITH FETLOCK REGION PAIN
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Introduction
There is a standard pattern of radiopharmaceutical uptake (RU) in metacarpophalangeal and metatarsophalangeal joints of clinically sound horses1. The aim of the current study was to evaluate RU in horses with lameness related to the fetlock joints. We hypothesized that there would be a difference in RU between lame and contralateral limbs in unilaterally lame horses and between lame and sound horses.

Material and methods
Lameness was substantially improved by intraarticular analgesia of the fetlock joint, or by perineural analgesia of the palmar/plantar (at the junction of the proximal 3/4 and the distal 1/4 of the metacarpal/metatarsal regions) and palmar/plantar metacarpal/metatarsal nerves. All images were assessed subjectively. Quantitative image analysis was performed using profile analysis in lateral images and region of interest analysis in lateral and dorsal/plantar images1. Ratios of RU were compared for each region between lame and contralateral limbs in lame horses compared with control horses for the distal aspect of the third metacarpal/metatarsal bone and the proximal sesamoid bones.

Results
Scintigraphic images of 43 horses with forelimb and 30 horses with hindlimb lameness were evaluated. There was a significant difference in the ratio of RU in the proximal aspect of the proximal phalanx between lame and non-lame forelimbs in unilaterally lame horses and in both lame and contralateral limbs of lame horses compared with control horses for the distal aspect of the third metacarpal/metatarsal bone and the proximal sesamoid bones.

Conclusion
Horses with fetlock region pain have different RU compared with sound horses. Abnormal bone modelling in the non-lame limb may reflect sub-clinical injury or adaptive response to increased loading.

References

COMPUTED TOMOGRAPHY TO ASSIST INTERNAL FIXATION OF THE DISTAL SESAMOID BONE
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Introduction
In internal fixation of sagittal fractures of the distal sesamoid bone, precise implant insertion is essential to avoid penetration of the articular surface or the flexor surface. The length of the screw should be optimal to limit interference with soft tissues. This study assessed whether an Equine XTC 3000 pQCT scanner can be an accurate imaging modality to assist internal fixation of the distal sesamoid bone.

Material and Methods
The insertion under CT of a cortical screw into non-fractured distal sesamoid bones was evaluated in two groups (3.5 mm and 4.5 mm) of eight paired limbs. Scores were generated from the following outcome measures: penetration by the screw of the surface of the facies flexoria and the articular surface, contact of the screw with the bone at the near and far cortex. The lengths of the distal sesamoid bone obtained by CT, and by callipers after dissection, were compared. Reduction
of the fracture with a 3.5 mm lag screw was also evaluated in eight artificially fractured sesamoid bones.

**Results**

The rate of satisfactory insertion of screws was 0.63 for 4.5mm implants, and 0.87 for 3.5 mm implants both in fractured and non-fractured bones. 3.5 mm screws were associated with increased odds of good outcomes, however it failed to reach statistical significance (OR = 4.2 (95%CI, 0.33-53.12), p = .27). Fracture reduction was satisfactory in only 25 % of fractures. The length measured by CT was systematically shorter from 3.72 mm (SD±2.57) than the length obtained with callipers (consistency = 78.4% (95%CI, 53.2-90.9), F (19, 19) = 8.27 p = .000; absolute agreement = 54.6% (95%CI, 9.8-84.3), F (19, 19) = 8.27, p = .000).

**Conclusion**

A pQCT scanner is useful to identify anatomical landmarks for insertion of a 3.5 mm cortical screw along the transverse axis of the distal sesamoid bone but the reduction of the fracture and the size of the implant may not be satisfactory.

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**MAGNETIC RESONANCE IMAGING OF THE EQUINE STIFLE: NORMAL ANATOMY**

**STIFLE IMAGING COMPARISON BETWEEN MAGNETIC RESONANCE IMAGES AND MACROSCOPIC GROSS-SECTION IN A GROUP OF NINE PONIES AND NINE ADULT HORSES: NORMAL ANATOMY**


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**Introduction**

The equine stifle is a complex joint that may be the site of equine lameness, but diagnosis of pain can be frustrating using standard imaging techniques. Magnetic resonance imaging (MRI) of the equine distal limb has led to improvements in understanding of lameness pathogenesis. Until recently, MR imaging has been limited to the distal limb, but recently the use of MRI for clinical evaluation of the equine stifle has been reported. However, there is limited information on normal MRI anatomy of the equine stifle and normal variation for horses without lameness. The aim of this study was to describe normal MRI anatomy and variation in immature and adult equine stifles using comparison between anatomical cross-sectional slices and MR images.

**Materials and Methods**

Post-mortem stifles from 9 immature ponies and 9 adult horses without hind limb lameness underwent MRI using a 1.5 Tesla GE Signa Echospeed MRI system with spoiled gradient echo, T2* gradient echo, short tau inversion recovery, proton density, and fast dual echo sequences in 3 planes. Stifles were then sectioned in sagittal, dorsal or transverse planes, to obtain anatomical slices for comparison with MR images. MR images from different sequences and planes were described and compared with digital photographs of the anatomical sections.

**Results**

Soft and osseous tissues of the immature and adult equine stifle could be clearly defined on MR images and corresponded well with macroscopic anatomy of the cadaver sections and the anatomy described in literature. Incidental findings included small lesions in cartilage, subchondral, cortical and cancellous bone, and ligamentar tissues likely indicative of normal variation.

**Conclusions**

This study provides an atlas of normal anatomy of the equine stifle, which could assist in future clinical evaluation and as a reference for improving understanding of stifle anatomy.

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**EXPRESSION OF CYTOSOLIC PHOSPHOLIPASE A2 IN EQUINE ENDOMETRIUM**

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**Introduction**

Pulsatile release of prostaglandin F2α (PGF2α) is responsible for luteolysis in horses. Phospholipase A2 (PLA2) is a key enzyme for biosynthesis of PGF2α. Cytosolic PLA2 (cPLA2) is believed to be the main PLA2 isoform in the uterus.

**Materials and methods**

Endometrial biopsy and blood samples were collected from cycling mares on (d) 8, d11, d15 and d18 (estrus) ([Day 0 = Day of ovulation; n = 5 for each day]) and from pregnant mares (n= 4) on d15. Real-time RT-PCR and
immunohistochemistry were used to determine transcription and cellular distribution of cPLA2 in the endometrium.

**Results**
Except for mares on d18 and some cyclic mares (n=2) on d15 with low progesterone (P4) concentrations (<1ng/ml), P4 concentrations were high. cPLA2 was mainly localized in the luminal epithelium and stroma was negative. cPLA2 expression was negatively correlated with P4 concentration (r= -0.7, P<0.001) and differed according to the stage of the estrous cycle (P<0.05). cPLA2 expression was high during estrus and declined significantly to basal levels on d8. Thereafter cPLA2 expression increased non-significantly as luteal phase progressed. However, as P4 dropped below 1ng/mL on d15, cPLA2 expression increased significantly (P<0.05). In pregnant mares, cPLA2 expression was not different from cyclic mares on d15 with high P4 concentrations. However, it was significantly lower than cyclic mares with low P4 concentrations.

**Conclusions**
cPLA2 is a very important enzyme controlling PGF2α secretion. P4 is a potent inhibitor for cPLA2 expression. Cytosolic PLA2 expression was not affected by pregnancy and may not play a direct role in maternal recognition of pregnancy.

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**PRODROMAL FRACTURE OF THE PROXIMAL PHALANX IN THE THOROUGHBRED RACEHORSE: CLINICAL AND IMAGING FEATURES OF 3 CASES SUPPORTING POSSIBLE STRESS FRACTURE AETIOLOGY IN SOME CASES OF EQUINE ‘SPLIT PASTERN’**

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**Introduction**
In recent years, advances in diagnostic imaging have led to the recognition that many orthopaedic injuries sustained by racehorses are the result of stress fracture pathology, rather than being acute or traumatic in nature as thought previously. Sagittal fracture of the proximal phalanx (‘split’ pastern) is one of the few injuries still widely regarded as being acute in onset, rather than propagating from pre-existing stress injury. The authors have identified features of some clinical cases that lend support to possible stress-injury aetiology for proximal phalanx fracture in the Thoroughbred racehorse.

**Materials and Methods**
Three cases of prodromal injury of the proximal phalanx of Thoroughbred racehorses are described. All horses were in full work and subject to regular veterinary inspection. All displayed mild and transient unilateral (1-2/10) forelimb lameness with subtle consistent pain response to firm digital palpation of the dorsoproximal proximal phalanx (P1) of the affected limb. Affected joints were free from palpable synovial distension and pain on flexion. All cases underwent radiographic and scintigraphic examinations and in 2 cases low-field MR imaging.

**Results**
In each case initial, comprehensive radiographic assessment of the site was unremarkable; subsequent gamma scintigraphic examination of the forelimbs confirmed the presence of a focus of increased radiopharmaceutical uptake at the dorsoproximal P1 site in the lame limb. Standing low-field MR imaging in 2 cases revealed evidence of focal fluid accumulation consistent with prodromal fracture pathology. Convalescent MR imaging in one case permitted documentation of presumed healing of this pathology. Following rest all cases returned to full athletic use free from lameness.

**Conclusions**
Stress fracture pathology may be responsible for a proportion of P1 injuries in Thoroughbred racehorses. Awareness of clinical features and utilisation of scintigraphy or MRI may avert progression to complete fracture in these cases.

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**REIN FORCE MEASUREMENTS TO EVALUATE HORSE-RIDER INTERACTION**

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**Introduction**
The interaction between rider and horse is important for an optimal performance and in order to prevent injuries. One important device to interact between rider and horse is the bit. To evaluate this interaction, rein force measurements are available.

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Methods
Rein forces are measured using stain gauges. Rein forces during lunging and during two riding conditions were studied. Measurements were performed during stance, walk, trot and canter. The study was performed with 12 horses and one rider. The rider was asked to apply the maximal and minimal rein force. The step length of the horses in the ridden conditions was also evaluated.

Results
The magnitude of the forces differed significantly between the three conditions and the gaits (p<0,001 and p=0,025). The forces were lowest during lunging (stance: 2,29 ± 2,29 N) and highest during the high rein force condition (stance: 38,15 ± 17,19 N). Rein force magnitudes showed a regular, sinusoidal pattern during lunging, which could be related to the stride frequency. Rein force pattern with a rider were not as consistent. The step length of the horses at walk and at trot deceased in the high rein force condition compared to the low rein force condition (p=0,046 and p=0,013).

Conclusions
Rein force applied by the rider, has effect on the movement of the horse. The rein force measurement system might be valuable in the evaluation of different riding techniques.

References

THE EFFECT OF PLATELET RICH PLASMA ON THE REPAIR OF SURGICALLY INDUCED SDF T LESIONS
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Introduction
Tendon injuries, a common pathology in both equine athletes and recreational horses, are notorious for their slow and functionally inferior healing. Many therapies have been tried over time, but none of them thus far has succeeded in significantly improving the functional recovery rate of horses suffering from tendon injury. Recently intratendinous application of platelet-rich plasma (PRP), an autologous concentrate of platelets in a small volume of blood plasma, has been reported to stimulate the speed and quality of the repair process of tendon injuries, but so far there is little conclusive evidence to this. For an objective evaluation, PRP was evaluated in a blinded placebo-controlled experimental study, in which artificially induced tendon lesions were treated by either PRP or placebo.

Material and methods
In 6 horses tendon lesions were created surgically in the Superficial Digital Flexor Tendons (SDFT) of both front limbs; one week post-surgery one injury was treated with PRP and the contralateral injury with saline as intra-individual control. After 24 weeks the horses were euthanized and the tendons were harvested for biochemical, biomechanical and histological evaluations.

Results
Extracellular matrix constituents collagen and glycosaminoglycans were significantly higher in PRP treated tendons (p = 0.039 and 0.038 resepctively). Cellularity in the PRP group (indicated by DNA content) was higher (p= 0.034) The scars/repair tissue in the PRP group had better tensile properties, evidenced by a higher strength at failure (Fmax; p=0.021) and Elastic Modulus (EM; p=0.019) Histologically PRP treated tendons featured better organization of the collagen network (p=0.031) and increased metabolic activity (p=0.031).

Conclusions
PRP treatment accelerates and enhances the repair of experimentally induced tendon lesions, evidenced by better biochemical and biomechanical properties at 24 weeks after the original trauma. These findings suggest that PRP treatment might be beneficial in acute tendon injuries.

“TO OPERATE OR NOT TO OPERATE ‘PALATAL INSTABILITY’ IN THOROUGHBRED RACEHORSES IN TRAINING, THAT IS THE QUESTION”.
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Introduction
Palatal instability (PI) is a progressive dorso-ventral billowing movement of the caudal portion of the soft palate, with flattening of the ventral surface of the epiglottis against the dorsal surface of the soft palate. The
etiology behind this phenomenon is still unclear. It has been recognized that upper respiratory tract obstructions compromise exercise capacity in the equine athlete. Thoroughbred racehorses referred for investigation of poor performance, showed a palatal instability in approximately 33% of the cases with dynamic collapse of the nasopharynx/larynx.1 ‘Laryngeal tie-forward’ is a surgical technique that has a measurable effect on the position of the larynx and offers an alternative therapy for treating horses affected with displacement of the soft palate.2 The aim of this study was to evaluate 2 treatment options for PI.

Materials and Methods
Eighteen horses were diagnosed with PI during high-speed treadmill endoscopy, and subsequently treated conservatively (C group; n=8) or with a “laryngeal tie-forward” procedure (LTF group; n=10). Race records were compared between groups. A standard starts index (SSI) and performance index (PIndex) were used, to objectively evaluate each horse’s postoperative performance.

Results
No postoperative complications where reported. Eight horses in the conservative and 4 in the surgical group raced and earned more money after surgery compared to before. Only Group LTF horses had an improved PIndex score postoperatively.

Conclusions
Placing the larynx in a more rostral and dorsal position may have improved the performance in 80% of the horses affected with palatal instability, where conservative treatment only showed a 50% improvement.

References

LAPAROSCOPIC INCISIONAL HERNIA REPAIR IN HORSES
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Introduction
Incisional hernias following midline celiotomy occur with a reported frequency of 8-16%. Open hernioplasty techniques are associated with complications including seroma, wound or mesh infection, fistula, and recurrence. Minimally invasive techniques are becoming the treatment of choice to treat the condition in people. A technique for laparoscopic mesh hernioplasty in horses is described.

Materials and Methods
After the administration of antimicrobial and anti-inflammatory medications, horses were anesthetized and prepared for aseptic surgery using established methods. Abdominal access (a telescope and 2 instrument portals) was achieved bilaterally distant from the hernia margins. When necessary, adhesiolysis was conducted using endoscopic scissors. Following circumferential exposure of the internal rectus sheath by removal of retroperitoneal fat, a prosthetic mesh was introduced into the abdomen and secured intraperitoneally using transfascial sutures and endoscopic hernia tacks. Following recovery from anesthesia horses had commercial abdominal bandage applied and maintained for 3-6 weeks. Abdominal bandaging was continued for 3-5 weeks after surgery.

Results
Successful placement of the prostheses was achieved without serious operative or short-term postoperative complications in all 5 cases. At follow-up (5-23 m), all repairs were intact clinically and ultrasonographically. Local adhesions, suture tract or prosthesis infections or recurrences were not recorded. Cosmetic results compared favorably to those typically achieved using conventional, open techniques.

Conclusion
Laparoscopic incisional hernioplasty shows potential to be a safe, effective technique for the management of incisional hernia in horses. Additional experience with the technique is required to determine if it holds promise to reduce the incidence of complications associated compared to conventional open repairs such as seroma, infection and hernia recurrence.