

Zeitschrift: Schweizer Archiv für Tierheilkunde SAT : die Fachzeitschrift für Tierärztinnen und Tierärzte = Archives Suisses de Médecine Vétérinaire ASMV : la revue professionnelle des vétérinaires

Herausgeber: Gesellschaft Schweizer Tierärztinnen und Tierärzte

Band: 140 (1998)

Heft: 11: 20 Jahre Schweizerische Vereinigung für Pferdemedizin

Artikel: Carbon screws in treatment of proximal phalanx fractures in horses : preliminary results of biomechanical investigations in vitro

Autor: Klos, Z. / Turek, B.

DOI: <https://doi.org/10.5169/seals-593620>

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

Download PDF: 07.03.2026

ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>

plete the pattern was $2:53 \pm 0:09$ minutes over a distance of about 680 meters. The day before competition serum chemistry, haematology, and plasma lactate were within reference range in all horses. One minute after completion of the pattern mean plasma lactate increased significantly ($p < 0.001$) to 5.1 ± 1.9 mmol/l [2.0 – 8.0 mmol/l]. No correlations were found with time or final score. PCV increased ($p < 0.05$) to $48.6 \pm 2.8\%$ with concomitant significant changes in the number of red blood cells ($10.6 \pm 0.8 \times 10^{12}/l$), haemoglobin concentration (17.5 ± 1.2 g/dl) and related parameters. The number of white blood cells increased significantly to $10.01 \pm 1.50 \times 10^9/l$ with a shift in the percentage of neutrophils from $58.1 \pm 6.8\%$ to $55.1 \pm 8.7\%$ and in lymphocytes from $38.3 \pm 7.5\%$ to $39.5 \pm 8.6\%$. During warm-up heart rate was 62 ± 6 beats per minute (bpm) at walk, it increased to 78 ± 11 bpm at entrance into the arena and to 83 ± 8 bpm while standing in front of the judges. The heart rate increased continuously at the beginning of the performance (1st spin: 105 ± 16 bpm, 2nd spin: 126 ± 16 bpm) until a plateau was reached with 165 ± 23 bpm during galloping. Highest heart rates were induced by roll-backs and stopping with 181 ± 13 bpm. One minute after completion of the pattern heart rate dropped to 86 ± 12 bpm. In conclusion, reining at competitions leads to increased anaerobic glycolysis and subsequent mild to moderate accumulation of lactate. Stops and roll-backs are requiring the highest work efforts. Aerobic conditioning in combination with fast power training seems to be indicated in the training of reining Quarter Horses in addition to practising motoric skills.

Carbon screws in treatment of proximal phalanx fractures in horses – preliminary results of biomechanical investigations in vitro

Z. Klos and B. Turek

Surgery Department of Veterinary Faculty, Warsaw Agricultural University, Poland

Introduction: In years 1994 and 1995 horses with bone fractures formed 22% of all patients treated at the Large Animal Surgery Department in Warsaw. Proximal phalanx fractures made up about 30% of all bone fractures evaluated. The most common proximal phalanx fractures were sagittal longitudinal proximal fractures. Their fixation by using steel orthopaedic lag screws gives good results. Differences between the elasticity of bone and steel screws are causing painful stress in bone which may cause a lameness. That's why it is necessary to remove steel implants what prolongs recovery time. Using screws with a modulus of elasticity which is similar to that of the bones, for example carbon screws, can shorten the recovery time and allow the horse to return to the

race track. The aim of the study was to estimate mechanical properties of fixation achieved by steel and carbon screws.

Materials and methods: Pairs of proximal phalanx bones of horses that died or were euthanised for reasons not related to changes in bones were studied. Elasticity of cortical bone of proximal phalanxes was estimated in a three point bending test. The compression of proximal phalanx bones between a cylinder placed in the furrow on the proximal articulate surface and a metal box filled up with teflon, on which the distal surface of bone stood, were performed to estimate forces causing: a) longitudinal proximal sagittal fractures of proximal phalanx, b) destruction of bone fixation by using steel screws, c) destruction of bone fixation by means of carbon screws.

Results: Modulus of cortical bone elasticity in the proximal phalanx of horses determined in three point bending test ranged between 1,2 and 5,2 Gigapascal [GPa], ($x = 3,21$ GPa $\pm 1,53$ GPa). In order to make a sagittal fracture of proximal phalanx, forces from 10 500 Newton [N] to 48 000 [N] ($x = 24 782$ [N] ± 7734 [N]) are necessary. Forces destroying a fixation by steel orthopedic screws were between 10 500 [N] to 25 000 [N] ($x = 14 192$ [N] ± 4747 [N]). Forces destroying a fixation of proximal phalanx fractures by carbon screws ranged between 4200 [N] and 12 900 [N] ($x = 8400$ [N] ± 3370 [N]).

Conclusions:

1. The calculated modulus of elasticity of cortical bone of the proximal phalanx is more similar to the elasticity of carbon than the steel screw.
2. Forces destroying a fixation of proximal phalanx fractures by carbon screws are 3 times lower than these destroying a fixation by steel screws.
3. Loading capacity of proximal phalanx fracture fixations in vitro achieved by carbon screws may be sufficient in order to use them for fracture fixation of proximal phalanxes in horses.

Krankheiten des Oesophagus beim Pferd – eine retrospektive Untersuchung anhand von 37 Fällen

C. Schwarzwald und K. Feige

Klinik für Wiederkäuer- und Pferdemedizin der Universität Zürich, Schweiz

In die vorliegende Untersuchung wurden 37 Patienten einbezogen, die zwischen Januar 1993 und April 1998 mit einer Erkrankung des Oesophagus an unserer Klinik vorgestellt wurden.

Die Anamnese, die Ätiologie der Krankheit sowie die klinische Symptomatik, Therapie und Prognose wurden anhand der Krankengeschichten retrospektiv analysiert.