The effect of internal lag screw fixation on compression and loading responses of type III distal phalangeal fractures in horses.

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Introduction
Type III distal phalangeal fractures in horses can be treated conservatively or surgically. Intuitively, fracture reduction should improve repair and mitigate secondary arthritis; however, retrospective outcomes do not support this. This study was carried out to determine the effects of lag screw stabilization and loading on these fractures.

Materials and methods
Type III fractures were created in 12 paired digits. Fractures were reduced with 4.5 or 5.5 mm cortical screws in lag fashion, or left as non-reduced controls. Fracture reduction was assessed by comparing pre- and post-reduction fracture gap measurements. Effects of incremental compressive loading and terminal unloading were measured from serial fluoroscopic images.

Results
5.5 mm screws significantly reduced fracture gaps. 4.5 mm screws did not. Under load, articular fracture gaps in all groups were compressed, and were closed at 540 Kg loads. Distally, loading increased fracture gaps in Control and 4.5 mm groups. Reduction with 5.5 mm screws significantly constrained distal expansion. After loading was removed, articular fracture gaps in Controls were wider than the residual gaps in reduced phalanges, although not significantly.

Discussion/conclusion
Only 5.5 mm screws reliably reduced the fracture gaps, and were also more effective than 4.5 mm screws in stabilizing distal fracture gaps under load. Fluoroscopic images clearly showed that loading the articular surface compressed the fracture gap, with complementary expansion of the fracture gap distally. These findings explain the success of conservative management of these fractures, although lag screw fixation does prevent cyclical fracture compression-expansion.

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