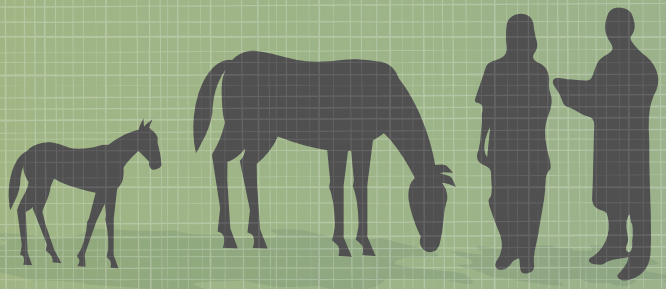
BEVA 2022 CONGRESS

7 - 10 Sept
ACC, Liverpool

Championing the Equine Vet

60th Handbook of Presentations



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Avoiding technical failures in fracture repair in the horse

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Lecture objectives

- Identify technical errors in internal fixation in the horse
- Critique internal fixation repairs for technical errors
- Analyse internal fixation errors for biomechanical reasons for failure

Technical errors using screws and plates occur to all surgeons and under all circumstances. Obviously, with experience, the failure rate is reduced (we hope!). Technical failures occur in the following categories: poor preoperative planning; improper intraoperative radiographic control; improper use of the equipment; improper application of the implant; and any combination of the above. This lecture will demonstrate many of the technical errors that can happen in plate fixation of fracture repairs in the horse.

Fig 1: Improper tapping; Inaccurate measurement and poor radiographic control.

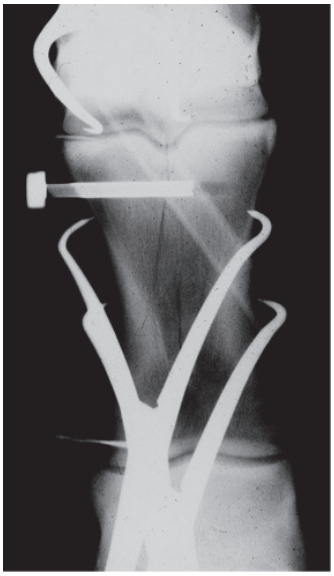

Fig 2: Drilling of glide hole too far with 4.5 mm bit.

Careful preoperative radiographic evaluation and technique will reduce the rate of technical errors. Imaging control during surgery, whether by radiographs, fluoroscopy or computed tomography, will prevent errors, ensure proper placement and use of implants, improve results and allow the surgeon to gain confidence in the surgical techniques.

In my personal encounters with technical failures, failure to understand the biomechanical forces of the fracture, improper use of the equipment and failure to have adequate radiographic control has led to the most frequent cause of failure.

Some examples of mistakes in equine facture repair include:

Poor preoperative planning

- Inadequate understanding of the fracture biomechanics
- Inadequate familiarity with surgical anatomy
- Failure to identify all fracture lines – post-operative fracture or poor reduction
- Inadequate or improper implant inventory to complete task
- Inadequate understanding of techniques and pitfalls of specific fractures

Inadequate radiographic control (Figures 1 and 2)

- Screwhead incompletely seated – reduce compression, soft tissue pain
- Screw has bottomed out – failure to compress fracture
- Screw in fracture line – additional fractures
- Screw too long – soft tissue problems
- Screw does not enter into medullary cavity where appropriate
- Plate placed incorrectly – not central to bone, insufficient length

Improper use of equipment

- Instrument breakage – little morbidity
- Improper compression of fracture
- Poor staggering of plates inhibits screw placement – especially with locking compression plates

Improper application of implants (Figures 3 and 4)

- Poor understanding of biomechanics of fracture or specific issues with individual fracture
- Improper technique of inserting implants

Lag screws reduce shear forces and provide interfragmentary compression of fracture fragments. They should be used whenever possible, even through plates or in concert with other repair techniques. When high torsional, bending or compressive

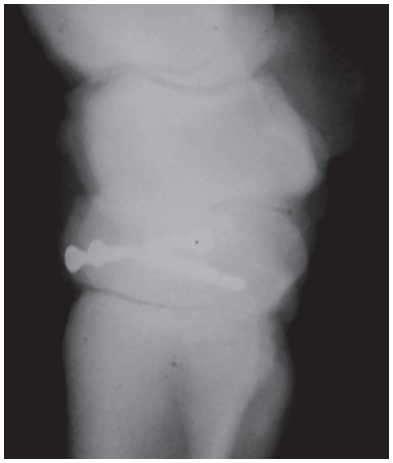

Fig 3: Breakage of 3.5 mm screw due to bending force.

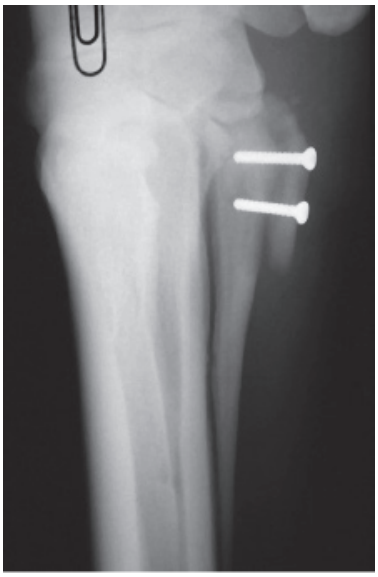

Fig 4: Failure of splint bone fracture repair to counteract tension force of collateral ligament.

forces are present, lag screws are relatively weak when compared with plate fixation. It is common and recommended to use lag screw function, when possible, in plate fixation. Cortex screws used in plate fixation provide stability by compressing (lagging) the plate to the bone. Fixed angle screws lock their heads in the plate for stability but do not compress the plate to the bone and cannot be angled. They may also create a problem during placement in areas with large muscle masses. Additionally it is important to anticipate the location of the entire screw length when applying a fixed angle screw to make sure the medullary cavity is entered in long bone repair.

Plates have the ability to function in neutralisation, compression or buttress fashion. Double plating is the rule in unstable fractures except in areas of significant biomechanical advantage like the tension surface of the caudal ulna. In general, the following principles apply when using plates in long bone repairs:

- The plate should span the length of the bone, and should not cross the physis (unless indicated).
- The plate(s) should be centred over the bone so that the ends of the plate make solid contact with the bone and do not impede soft tissues.
- The plates should be contoured well to the bone surface, even fixed angle plates.
- In double plate application, the plates should be staggered or placed in such a way to avoid impediment of the screws on each other, cross threading and/or single cortex placement.
- All holes in the plates should be filled when possible.
- The plates should be placed in a biomechanically advantageous position based on the fracture location.
- At least one plate should be placed over the distal end of a proximal fracture fragment in an oblique fracture to capture that leading edge under the plate.