



Equine Emergencies Online 'Mini Series'

Session 1: Wounds near Synovial Structures and the Acutely Lame Horse

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Owners are often in considerable distress when their horse presents with severe lameness, as there are many potentially disastrous causes. Despite the severity of lameness in these cases a diagnosis is not always easy to achieve on initial examination, and often requires use of further diagnostic techniques.

On the telephone:

- Establish degree of lameness – ‘is the horse standing with any weight on the leg?’ and ‘will the horse put the foot on the ground when they walk’ are both useful questions.
- If toe touching/non weight bearing lameness advise the owner not to move the horse.
- Only if there is significant haemorrhage tell the owner to apply a pad (e.g. clean folded tea towel) under a tight bandage over and just above the source of haemorrhage. Otherwise they should leave the limb alone.
- Significant haemorrhage, unstable/open fractures and suspensory apparatus breakdown (fetlock hyperextension) are true emergencies which should be attended urgently.

At the yard:

1. History:

- When was the horse first seen lame? Last seen normal?
- Onset of lameness? No ‘hard and fast’ rules but often:
 - Acute onset when exercising: Fracture, tendon/ligament breakdown, solar penetrations most common.
 - Onset shortly after exercise: Tendonitis, SL desmitis, stress fracture
 - More gradual onset: Foot abscess, cellulitis, infected synovial structure
 - Care with non-displaced fractures (e.g. radius) which are normally acutely lame but can improve over the following 24-48 hours.
- Any history of lameness in affected limb or others?
- Tetanus status?
- Known history of trauma?
- When was the horse last shod? (nail pricks normally lame within a few days)

2. Examination from a distance:

- How is the horse standing?
 - e.g. Pointing toe often => heel abscess or pain from palmar/plantar foot/distal limb (e.g. digital flexor tendon sheath)
 - Dropped fetlock: SL/SDFT breakdown
 - Raise toe: DDFT breakdown
 - Dropped elbow: olecranon fracture / radial nerve injury

- How does the horse walk?
 - More painful during stance or swing phase?
 - Foot placement: Heel first => toe abscess/laminitis/dorsal foot pain. Favour medial/lateral side of foot?
 - Toe dragging can indicate radial nerve paralysis/joint pain/digital extensor tendonitis.
 - Is the horse distressed? – sweating / trembling often indicates unstable fracture / subluxation of SDFT from hock

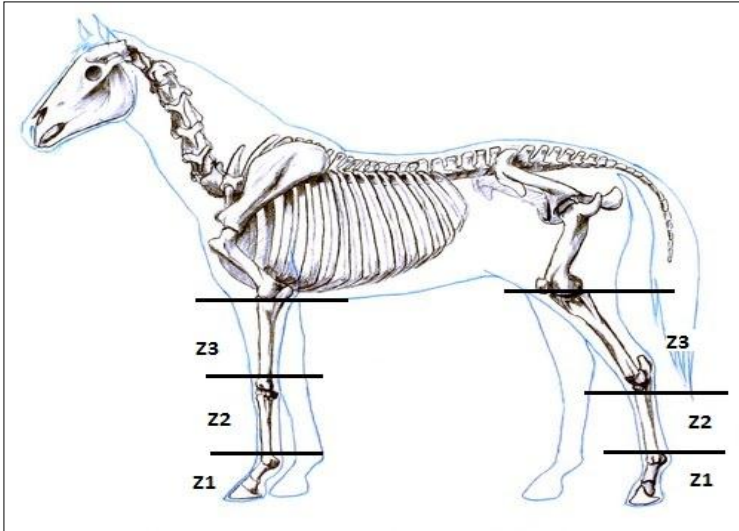
3. Closer examination of the horse

- General physical examination – Elevated heart / respiratory rates normally caused by pain, however also check mm colour / pulse quality if possible internal/external haemorrhage.
- Closer inspection of limb:
 - Palpate limb for any heat/swelling/pain/effusions/digital pulses. If possible when weight bearing and lifted. Compare to contralateral limb.
 - ALWAYS use hoof testers (Unless obvious alternative diagnosis).
 - Assess range of motion in each joint and assess any pain or crepitus on flexion/extension.
 - Sometimes very agitated/painful/young horses are difficult to examine and determine the source of pain. Light sedation can help calm the horse and allow a more useful examination.
 - If proximal limb fracture if suspected listen for crepitus with stethoscope when limb is moved.
 - Rectal examination in suspected pelvic fractures or iliac artery thrombosis can be diagnostic however an unremarkable rectal examination doesn't exclude these diagnoses.

4. Further Diagnostics

- Radiography: Plain radiographs for detection of fractures. Take multiple views as non - displaced fractures are often difficult to detect. Radiography can also help detect foreign bodies or gas within wounds/synovial cavity. Non displaced fractures (e.g. radial) can be difficult to detect on radiographs. Take multiple views and consider repeating in 5-10 days when osteolysis will make fracture line easier to detect.
- Contrast radiography: For detection of synovial sepsis. See synovial wounds notes.
- Ultrasonography: For tendonitis/desmitis or wounds. Tendon lesions will normally be most obvious 7-10 days post injury.
- Scintigraphy: In cases where fractures are suspected but can't be visualised with radiography, either because non displaced or area can't be radiographed (e.g. pelvis). Risk of transporting horse to facility has to be considered.

- MRI: This is very useful for assessing whether foot penetrations have entered synovial cavities.
- Diagnostic analgesia: Contraindicated if a fracture is suspected. Otherwise can help localise the lameness.



- Wound investigation and synoviocentesis if near synovial structure.

Treatment:

After initial examination you will have reached 1 of 3 levels of diagnosis:

1. Limb, location and specific diagnosis known.

Sometimes treatment can be given on the yard, (e.g. subsolar abscess), however often the leg will require stabilisation for box rest or

transport for further treatment.

2. Limb and region of limb determined, but no specific diagnosis (COMMON).
The limb will normally require stabilisation for box rest and/or transport.
3. You know which leg, no localisation.

Generally the limb should not be stabilised for risk of the pendulum effect on proximal injuries. The horse will normally require box resting and reassessment. The benefit of transport for further investigation has to be weighed up against the risk of displacing a fracture during transport. Non-displaced fractures (e.g. radius) can often present in this category.

External limb support for severe lameness

Indicated for support of confirmed or suspected fractures or soft tissue injuries, either for box rest or transport for further diagnosis/ treatment. Often light sedation and analgesia (e.g. detomidine / butorphanol / phenylbutazone) will help with the application of the support bandage.

Diagram showing the different zones (z) for support of suspected fractures

Forelimb:

- **Zone1:** P2 – Distal MCIII: Robert Jones bandage to carpus, lateral and palmar splints from ground to carpus.
If there is disruption of the suspensory apparatus causing dropping of the fetlock, or you know from radiographs that the fracture is not sagittal (sagittal fractures include split P1 and condular fractures) then align the dorsal cortices of the phalanges, and strap splints on the lateral and dorsal aspects of the limb (so the horse has to walk on its toe. Attach splint very firmly at the tip of the toe)

- **Zone 2:** Distal MCIII – Distal radius: RJ bandage to elbow, lateral and caudal splints to elbow.
- **Zone 3:** Distal Radius – proximal radius: RJ bandage to elbow, lateral splint to at least mid scapula and caudal splint to elbow.
- Olecranon fractures and radial nerve paralysis are more comfortable if a thin full limb bandage is applied and a caudal splint used to fix the carpus in extension.

Hindlimb:

- **Zone 1:** P2 – distal MTIII: RJ bandage to tarsus, lateral and plantar splints to tarsus
- **Zone 2:** Distal MTIII – Proximal MTIII: RJ bandage to stifle, lateral splint to stifle and caudal splint to hock
- **Zone 3:** Proximal MTIII – proximal tibia: RJ bandage to stifle, lateral splint to tuber coxae and caudal splint to hock
- Fractures proximal to the stifle and elbow joint do not require stabilisation.

Splints can be made out of minimum 2"x1" wood, thick/double layer plastic guttering or 12mm mild steel rod. Large forces will be placed across the splint so material of sufficient strength must be used.

Euthanasia

- In some cases of severe lameness immediate euthanasia is required:
- The decision for euthanasia takes place when a diagnosis has been reached and if appropriate, treatment options have been discussed.
- Calling for a second opinion from a colleague or a referral hospital is prudent unless the decision is obvious.
- It is a commonly held misconception among owners that all limb fractures are untreatable, and so careful explanation of the treatment options and prognosis is important.
- If the horse is covered under an all risks of mortality insurance policy, the BEVA guidelines should be followed (see attached). To satisfy a claim under mortality insurance the case needs to meet the following requirements:

‘That the insured horse sustains an injury or manifests an illness or disease that is so severe as to warrant immediate destruction to relieve incurable and excessive pain and that no other options of treatment are available to that horse at that time’

- In cases where you are unsure whether these criteria are met it is prudent to call for a second opinion, from a colleague or a referral centre.

Attached with permission of BEVA:

A Guide to Best Practice for Veterinary Surgeons When Considering Euthanasia on Humane Grounds: Where Horses are Insured Under an All Risks of Mortality Insurance Policy

Assessment of wounds near synovial structures

Contamination and infection of a synovial structure (SS) is a potentially life threatening injury in the horse. In adult horses infection of SS is most commonly caused by a penetrating wound, or iatrogenically following intra articular surgery or medication. The haematogenous route of infection is rare in adults, but common in foals. When first presented with a wound, determining whether a SS is involved is not always obvious from external inspection alone, and often further diagnostic techniques are required. Rapid recognition and treatment of an infected SS is important.

Prognosis:

- 85% of horses with infectious arthritis/tenosynovitis survived to discharge, but only 57% of horses which were discharged returned to racing¹
- 53% of horses admitted within 24hrs of injury had established infectious arthritis, and 65% of those survived²
- 92% of horses admitted 2-7 days of injury had established infectious arthritis, 39% of those survived²

There are many studies, (some with conflicting data) but it is generally accepted that after synovial contamination prompt, aggressive treatment improves the chances of survival and return to athletic function.

On the telephone:

- Owners are often unaware of the significance of synovial penetration, and are unlikely to know the relevant anatomy. Careful questions regarding location of the wound are required when deciding on how urgently to see the horse.
- Timing of wound, degree of lameness, any haemorrhage and gross contamination also are useful questions.
- Advice to the owner: If there is significant haemorrhage apply a pad (e.g. tea towel) under a tight bandage over and just above the wound. (normal horse can lose 20-30% of blood volume(= 2% body weight) without significant effects. i.e. ~ 10L in 500kg horse)
- If there is gross contamination of the wound the owner can hose out any debris/ foreign material
- For severe/non weight bearing lameness keep the horse still until you arrive

1. Schnieder RK, Bramlage LR, Moore RM, et al: A retrospective study of 192 horses affected with infectious arthritis/tenosynovitis. Equine Vet J, 24:436-442, 1992

2. Gibson KT, McIlwraith IL, Turner AS, et al: Open joint injuries in horses: 58 cases (1980-1986). J Am Vet Med Assoc 194:398-404, 1989

At the Yard

History:

- When was the wound first seen? When was the horse last seen without the wound?
- What caused the wound – penetrating object (e.g. nail) or blunt trauma (e.g. kick from another horse)?
- Material causing wound? – e.g. wood can leaves splinters
- Was the limb flexed or extended when the wound occurred? E.g. over dorsal carpus skin is in different places when flexed/extended.
- Degree and timing of lameness – lameness from synovial infection often takes several hours to develop
- Any analgesics administered
- Any fluid seen exiting the wound
- Tetanus status

Examination from a distance

Degree of lameness:

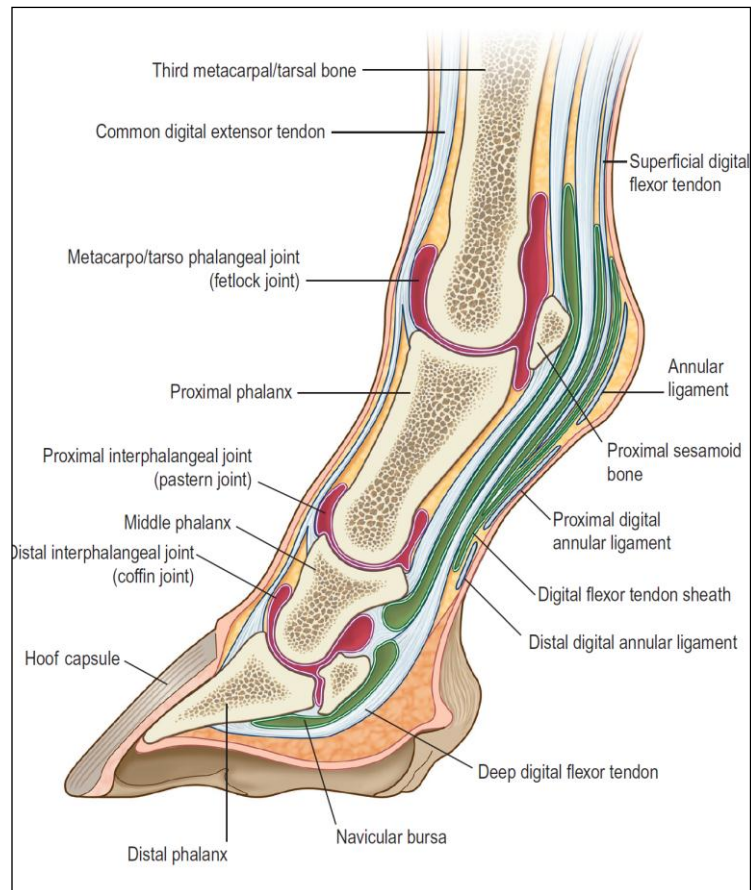
- Shortly after a wound has occurred, when the SS is contaminated but not infected, horses can be sound.
- An infected SS normally causes marked toe touching/non weight bearing lameness. Exceptions to this are if the horse has been given analgesia or the synovial structure is open/draining.
- Horses with non-synovial soft tissue infections (e.g. cellulitis) are often very painful to palpation and during the swing phase of the walk, but will normally bear weight during the stance phase. Closed synovial infections are normally lame during the stance phase.

Closer examination

- Pyrexia is not a consistent finding. In one study² temperature was > 101°F (38.3°C) in 54% of horses with infected SS at time of admission.
- Pain on palpation – Difficult as there is often localised pain associated with the skin wound/cellulitis. If a SS is infected it will normally be painful in all areas, not just at the wound (e.g. a septic tendon sheath will be painful along its entire length). Flexion of an infected joint is normally painful.
- Consider other causes of non weight bearing lameness – e.g. fractures/soft tissue injury. Palpate for crepitus/instability etc

Examination of the wound

- Infected SS are usually effused, or draining synovial fluid.
- Consider whether the wound might have occurred when the joint was flexed or extended. E.g. skin wound over carpus is in a different place according to degree of joint flexion.
- After applying gel around the wound and clip the hair. Then scrub the skin and flush the wound with sterile saline.
- With some wounds useful information about the extent of the wound can be obtained using a sterile gloved finger and/or blunt sterile probe (e.g. closed haemostats) to feel for e.g. cartilage surfaces, joint space etc, however this must be weighed up against the risk of pushing surface contamination deeper into the wound.



Synovial structures of the distal limb (red = joint, green = tendon sheath/bursa). From Archer, D. *Handbook of equine emergencies* 2013

Further diagnostics

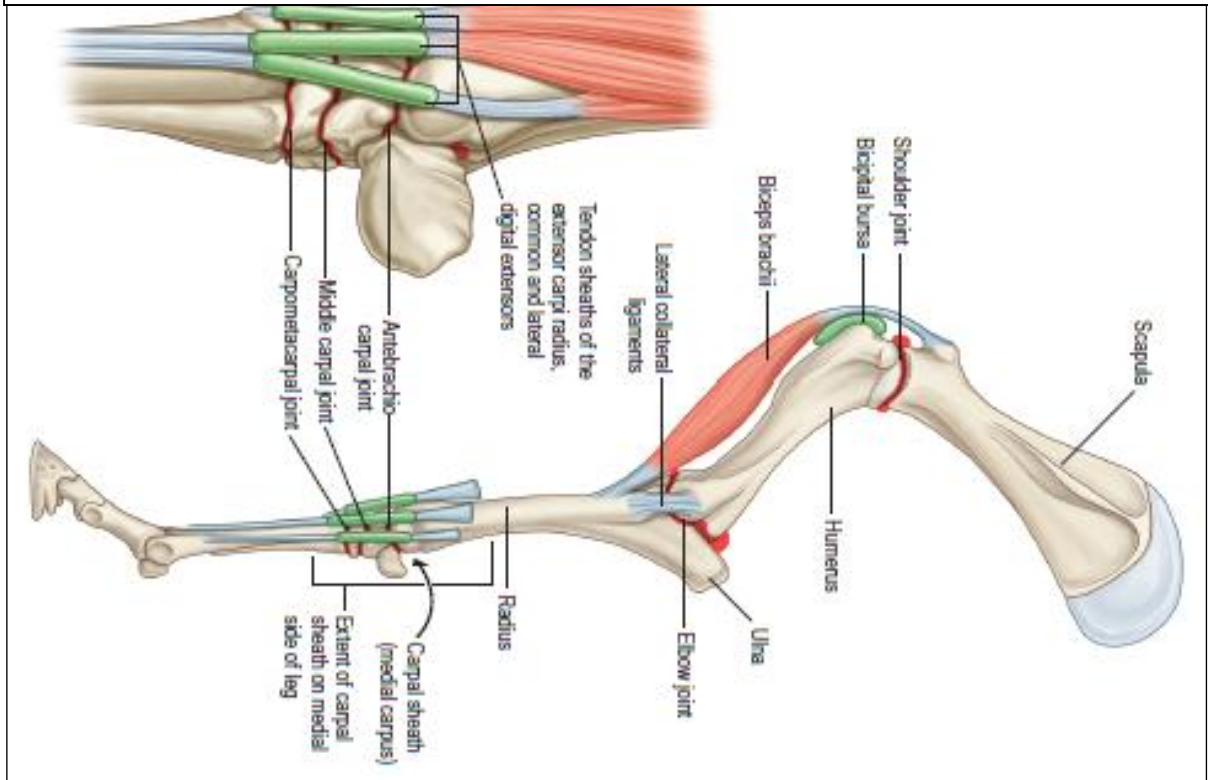
These are procedures which, depending on the circumstances, are easiest performed at a clinic/hospital, but can be done at the yard.

Plain radiography: Survey radiographs of the wound and synovial structure

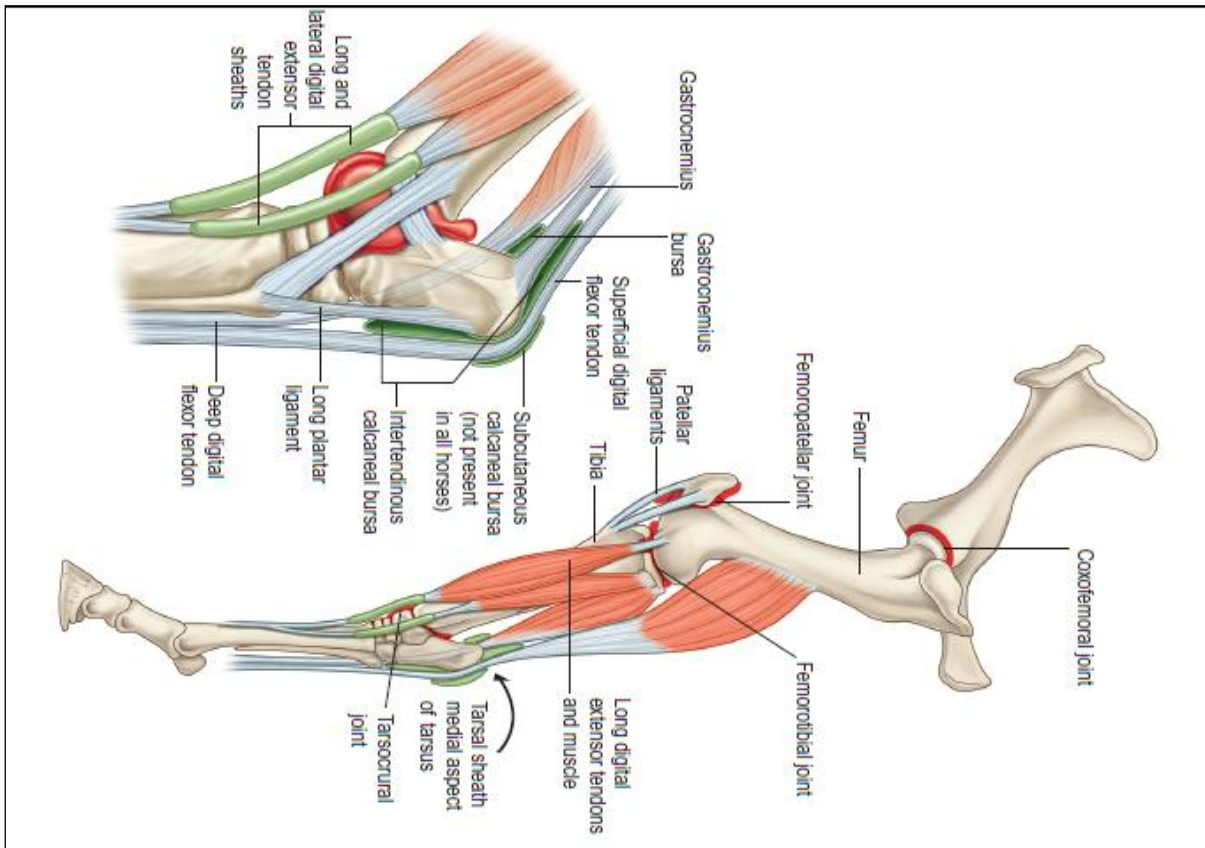
- rule in/out fractures / bony fragments / radiopaque foreign bodies
- Look for evidence of synovial penetration: gas lucencies in SS
- Insert sterile blunt metal probe into wound for indication of direction/depth

Joint tap (see below): If possible choose a site distant from the wound or any associated cellulitis to avoid iatrogenic contamination of the SS.

Synovial structures of the proximal forelimb and hindlimb (red = joint, green = tendon sheath/bursa). From Archer, D. *Handbook of equine emergencies*. 2013, Saunders



Technique for performing joint tap to investigate synovial sepsis:



Sedate horse

1. Clip/ Sterile scrub site.
2. Prepare sterile needles (e.g. 20 Ga 1½ inch needles, syringes, +/- 60ml syringe of sterile saline, +/- sterile antibiotic solution (e.g. amikacin or gentamicin), +/- sterile radiographic contrast agent
3. Put on sterile gloves
4. Insert needle, aspirate joint fluid or have assistant catch drips.
5. Put joint fluid sample into EDTA and plain tubes. For culture ideally put plain sample into blood culture bottle and send to lab for culture and sensitivity
6. +/- Inject sterile saline under pressure and look for fluid leaking from wound
7. +/- inject sterile radiographic contrast agent (e.g. Iohexol) and radiograph
8. +/- follow up with sterile intraarticular antibiotic. 2-5 vials (2-500mg) of amikacin ('Amikin') is ideal.

Analysis of synovial fluid:

	Normal	Infected
Colour	Clear - Yellow	Yellow – orange - creamy
Turbidity	Clear – read print through	Cloudy
Viscosity	Sticky – forms strings	Thin
Total protein (on refractometer)	< 25 g/L	>40 g/L
Total nucleated cell count	< 1 x 10 ⁹ cells/L	> 10 X 10 ⁹ cells/L suggestive >30 X 10 ⁹ cells/L very likely
% Neutrophils	< 10%	> 90%

Below: A penetrating wound of the DIP investigated using intra-articular positive contrast radiography. On the radiograph a tract can be seen exiting dorsally which corresponded to the site of the wound.

Management of infected synovial structures



1. Short term management of unconfirmed/suspected cases (e.g. If you are leaving the horse at the yard to take synovial fluid back to the practice for analysis):
 - Clip (put sterile gel in wound for clipping) and scrub surrounding skin
 - Flush wound thoroughly with sterile saline under pressure (through needle)
 - If joint tap performed then follow up with intraarticular antimicrobials (e.g. amikacin)
 - Apply sterile dressing
 - Give dose of systemic antibiotics (i/v penicillin / gentamicin is good choice)
 - Tetanus prophylaxis if required
 - Analgesia (e.g. phenylbutazone) although care in undiagnosed cases as this can hide lameness associated with infected SS.
2. When synovial infection is confirmed:

Always recommend arthroscopy/large volume lavage under GA => hospital.

If GA/arthroscopic lavage is cost prohibitive, needle flush of the SS can be attempted.

- Often performed standing, can be done (much easier) under GA
- If standing: Sedation and local analgesia: Ideally use regional nerve block otherwise distend joint with sterile 2% mepivacaine and leave for 5-10 minutes, and put subcutaneous bleb at needle sites.
- Wide clip and sterile scrub
- Place large (e.g. 14-16 Ga) needle into SS distant to wound and distend with sterile saline
- If fluid flows out of wound – can be used as fluid egress, otherwise place another needle in SS as far away from the first needle as possible.
- Attach wide bore, high flow extension set, and lavage ideally 4-5L sterile saline through SS (takes a very long time through needle). A pressure bag around saline helps speed it up.
- If the egress needle keeps blocking – you can use stab incision with #11 scalpel as egress hole. Suture afterwards or keep covered with sterile dressing.
- Follow flush with intraarticular antibiotics.
- Debride the wound, perform primary closure if appropriate
- Reassess daily and repeat intraarticular/intravenous regional antibiotics.
- Maintain on broad spectrum systemic antibiotics and analgesia

- Repeat sterile flushes may be required – according to clinical response. Synoviocentesis can be repeated on day 2. Ideally cell count $<10 \times 10^9$ cells/L.
- If the SS structure has been infected for $> 1-2$ days repeated flushing / open joint drainage might be required.

Further reading:

Moyer W, Schumacher J and Schumacher J. *Equine joint injection and regional anesthesia*. Academic Veterinary solutions. 2011.