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Next Meeting:

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Deep penetrating foot injuries:
How to approach in the field

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Most common:
Nail punctures
Deep foot abscess
Coronary band injuries

Foot punctures

Question to be answered: (punctures in general):
Assess potential severity
Can I treat this safely at home? Now your limits.
Does it need referral?

Nail punctures

Question: is there a synovial cavity or tendon involved?
If yes = emergency and referral

Aim: Prevent disasters

One, did I miss something or was he just unlucky?
Several months old nail punctures of the navicular bursa

Anatomy – Danger zone
Deep penetrating foot injuries
Nail punctures

Anatomy:
- Puncture through danger zone?
- What direction?
- Depth?
- Structures involved?

Which structures and synovial cavities are damaged/punctured?
- Bone? Tendon? Synovial cavity?
- P3, nav. Bone/ DDFT/ DIP joint, navicular bursa, DFTS

Finding the nail tract / synovial cavities punctured?

Degree of lameness is no indicator
HL more difficult to examine
You need helpers
Use perineural anaesthesia
Difficult / dangerous horses: general anaesthesia

Clinical examination

Foreign body (nail) present/visible
Clean entire foot properly
Look carefully for puncture wound in frog sulci
Digital pulse, heat, hooftesters …

Work up:
Sedation
Local block: abaxial base sesamoid bones (+ dorsal branches)
Prepare sole for probing puncture:
Thorough trimming of the sole and frog
Remove all loose horn
Thinning of the horn around puncture
Flush with saline / scrub

Leave foreign body in place if present till after X rays
Rule out other pathology (fracture, bruising, abscess, …)
Deep penetrating foot injuries
Nail punctures

Work up:
Explore puncture tract with sterile probe
Careful (avoid accidental penetration of synovial cavity)
Direction
Depth
Bone contact ? Tendon contact ? No resistance ?

Radiography with probe in place: cheap, fast, easy
LM view most important / Acute cases / no bony changes
✓ Synovial cavities ? DDFT, DIP, DFTS, bursa
✓ Bone P3
✓ Combination: Navicular bone + bursa
✓ Soft tissue: frog, digital cushion

Frog and solar cushion/no synovial cavity
Still need appropriate local treatment of sole horn

DFTS ? Check

P3, lucky but still need appropriate local treatment of sole horn

DFTS ? Check

lucky

lucky
Deep penetrating foot injuries
Nail punctures

Radiography with nail in place:
Digital flexor tendon sheath: check

P 3

Insertion DDFT?
Bursa?

DIP joint through impar ligament

DDFT and Bursa navicularis

Make sure your probe is following the right trac
Deep penetrating foot injuries
Nail punctures
Radiography with probe in place:
Make sure your probe is following the right trac

Other imaging:
- Ultrasonography
- CT scan
- MRI

Limited use in acute cases
More value in chronic cases / complications

Deep penetrating foot injuries
Nail punctures
Nice indication for CT – sequester localisation:
Long term complication after sole puncture
Chronic pain and fistulation due to sequester formation
Takes weeks before sequester becomes visible

No synovial penetration:
Standing treatment at yard
- Use nerve block + tourniquet
- No blood
- Use leg support
- Clean surface in case foot goes down

Deep penetrating foot injuries
Nail punctures
No synovial penetration:
Standing treatment at yard/farm
- Leg support
- Clean surface
- Tourniquet
- No blood

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Deep penetrating foot injuries

Thinning and debridement – general rules in foot surgery:

- Minimal but enough!
- Work clean = surgery = avoid contamination
- All loose horn should be removed until nice attachment with corium
- Resect all infected/contaminated/hypergranulating corium
- Minimal debridement/curettage tendon (DDFT)
- Remove all contaminated bone till healthy bleeding bone

Deep penetrating foot injuries

Nail punctures

Thinning and debridement – exposing the puncture hole:

- Opening frog sulcus
- Thinning of the sole and frog horn
- Exposure corium
- Solid attachment horn on corium

Deep penetrating foot injuries

Thinning and debridement – what is the aim?

- Solid attachment horn on corium, horn should slowly cover a healthy granulation bed

Deep penetrating foot injuries

Thinning and debridement – what is enough?

- Hoof cancer: incomplete trimming
- Hoof cancer: complete trimming

Deep penetrating foot injuries

Thinning and debridement – evolution of healing

- Hoof cancer: 2 days later, bandage
- Hoof cancer: 10 days later, foot cast
Deep penetrating foot injuries
Thinning and debridement – evolution of healing

Hoof cancer: 10 days later
Hoof cancer: 20 days later, foot cast

Hoof cancer: 20 days later, foot cast
Hoof cancer: 40 days later

Hoof cancer: 45 days later, foot cast
Hoof cancer: 48 days later

Hoof cancer: 48 days later
Hoof cancer: 56 days later

Deep penetrating foot injuries
Thinning and debridement – what is the aim?

Complete excision: 0 days later
Complete healing: 64 days later

✓ Keep foot in bandage the first days/week
✓ Change every 3-5 days
✓ After 3-7 days and healthy tissue: FOOT CAST
✓ Change foot cast every 7-10 days and later every 2 weeks.
✓ In DRY/CLEAN box with bandage or cast till COMPLETE healing.

Complete healing: 64 days later
Once it is clean, keep it clean and protected.
Deep penetrating foot injuries

Bandage
Antibiotics locally? Silver dressing? Alginaat?
Rolls of gauze over defect/frog = counter pressure
Bandage (softban/cotton wool/crepe/tape)

Foot cast + picture

Deep penetrating foot injuries

Antibiotics?
Antibiotics systemically: may be the first 5-7 days
Take swabs of wound if delayed wound healing (Ab gram)

Infected wound
No healing
Swab/Ab gram
Ag Alginaat

Deep penetrating foot injuries

Antibiotics
Not very healthy fresh granulation tissue
Small cracks, not 100% attachment horn to corium
Nidus of infection despite foot cast

Debride/open
No Ab sys
Locally:
- Ag Alginaat
- Fucidine

Deep penetrating foot injuries

Foot punctures
Synovial penetration:
Refer to hospital

Deep penetrating foot injuries

Foot punctures
Synovial penetration:
Detailed examination and treatment under general anesthesia
Difficult to treat at the yard/referral

Standing:
Examination as above + X-rays & blunt probe

General anesthesia:
Synoviocentesis of:
- DIP joint
- Navicular bursa
- Digital flexor tendon sheath

Synovial fluid sample: wbc/TP/bacteria/blood culture medium
Deep penetrating foot injuries
Foot punctures
Synovial penetration: DFTS contrast study.

Synovial penetration: treatment

✓ Flush Joint / bursa / tendon sheath
  o Needle through and through lavage
  o Arthroscopy / bursoscopy / tenoscopy
  o André "street nail surgery" = history, too aggressive

Synovial penetration bursa: endoscopic findings

✓ Synovitis (hyperemic, proliferative and fibrinopurulent).
✓ Foreign material
✓ Puncture site through DDFT.
✓ Damage to Nav. bone: fibrocartilage / subchondral bone.
Endoscopic Treatment of Puncture of the Navicular Bursa

- High pressure lavage.
- Remove fibrin, dirt and other foreign bodies.
- Debride defect on flexor surface and in DDFT.
- Remove torn tendon fibrils.
- Debride the puncture tract and use this tract as instrument portal.
- If this is not possible create a medial instrument portal (similar to arthroscope portal).
- Evaluate and treat DIP joint and DFTS if needed.

Medical Treatment of Synovial Penetration after Flushing

**Local Medical Treatment:**
- Regional IV perfusion (several times?)
- Intra-synovial antibiotics (several times?)

**Systemic Medical Treatment:**
- Antibiotics IV/IM + NSAID IV + ATS

**Important:**
- Bandage / foot cast till complete healing of the defect.
Deep penetrating foot injuries

Foot punctures

Debridement
Prednisolone per os 3 weeks
Early treatment gives better results
Duration treatment: 1-3 months

Outcome:
± 40 % cured
± 70 % controllable

Hoof cancer: treatment and outcome

✓ Superficial punctures: good
✓ Digital cushion: good
✓ P3: good
✓ Synovial cavities:

Navicular bursa puncture, needle lavage + RIP, n = 23 (Pille et al, 2005) : 73 % full recovery
Navicular bursa puncture, endoscopic lavage, n = 16 (Wright et al, 1999): 62.5 % full recovery
Bosdreef: 2004-2012: n = 31, bursa + synovial cavities 74 % full recovery
All failures > 3 days standing before referral

Deep penetrating foot injuries

Deep punctures wounds
Prevent disasters

Cases

www.bosdreef.be