Palmar digital neurectomy

Occasionally used to treat chronic heel or navicular area pain

Used when no longer responding to other medical treatment methods

Foot pain

- Shoeing
- NSAIDS
- Intra-articular medication coffin joint
- Medication of the navicular bursa

Palmar digital neurectomy

Final treatment option

May prolong athletic usefulness

Owner convenience

Owner education vital to success
Candidates for surgery

• > 90% of lameness resolved after PDN block
• Not an acute ligament or DDFT injury

Candidates for surgery

• Correctable hoof abnormalities addressed

Candidates for surgery

• Age of horse
  • Baxter 1985
  • Taylor 2010
  • 70% sound for 2 years
  • 60% @ 3 years
  • 50% @ 4 years
  • 40% @ 5 years
• Medical options for younger horses i.e. less than 10 years of age if possible

Timing of surgery

• A traumatic surgical technique
• Post-operative care key to success
• 3 months time off
• 1 month stalled
• 1 month small turnout
• 1 month increasing exercise
Candidates for surgery

• Owner understands potential complications of surgery

Potential complications

• Painful neuroma formation (< 3%) [Haugland et al. Vet Surg 1992]
• Nerve regrowth and reinnervation
  – Most cases at some point
  – Inform owners 1.5 to 3 years of soundness
  – Missed accessory branches contribute to failure
  – Post operative care key to success

57 cases PDN neurectomy

(Jackman 1993)

• Transection + coagulation 47 horses
• Guillotine only 10 horses
• All blocked 90% to PDN
• Most QH/ Tb geldings, mean 10 yrs
• 46% hunter/jumpers
• 85% had radiographic changes NB

57 cases PDN neurectomy

• Post-op 60% stalled for 4 to 6 weeks
• Complication rate 34%
• Painful neuroma 6% (all coag)
• Recurrence of pain 28%
• 74% sound @ 1 year
• 63% sound @ 2 years
Potential complications

- Undetected sub-solar infection
- Step on foreign body
- DDFT rupture
- Luxation DIP joint

---

PDN neurectomy complications

$$$ Cutting horse and breeding
Bilateral septic coffin joints

---

NFR barrel horse

3 weeks post neurectomy

1 month post foot surgery
P3 fractured into coffin joint

Coffin joint subluxation

- Did not rec NB injections
- Horse did well on daily Bute as rope horse for yrs
- Neuretomy at another clinic 1 week previous
Deep flexor tendon rupture

• Pole horse
• Horse required NB injection twice a year
• Ruptured DDFT 1 month post sx
• Adhesions to navicular bone

Case selection important

• Defect on flexor surface or DDFT calcification
• Increased risk of DDFT rupture
• Fracture of navicular bone

Palmar digital neurectomy

• Numerous techniques described
• Aimed at reducing complications by manipulation of proximal stump or stopping nerve function

Palmar digital neurectomy

• Guillotine 23-40% neuroma (Evans 1980)
• Cryoneurectomy 15% neuroma (Tate 1980)
• Co2 laser 9/10 sound 4-23 mos (Haugland 1992)
• Perineural capping (Adam 1974)
• Doxorubicin 50% (Fubini 1980)
**Comparative study**  (Daherreiner et al 1997)

- Evaluate long term outcome of 4 surgical techniques for PD neurlectomy
- Guillotine
- Perineural capping
- CO2 laser transection
- CO2 laser transection + coagulation

**Results-Neuroma formation**

- Guillotine = 0.83 *
- CO2 coagulation = 2.2
- CO2 transection = 2.2
- Perineural capping = 2.2
- * significantly different than other techniques

**Conclusions**

- Guillotine sx method less painful neuroma’s and nerve regeneration

**Current techniques used**

- A lot of middle-aged QH’s
- Usually good dispositions
- A lot of financial constraints
- Standing surgery
**Palmar digital neurectomy**

- Safer & easier in recumbent horse
- Less hemorrhage
- Easier on surgeon
- Possible to perform in standing horse
- $1800 +

**Reasons to consider standing neurectomy**

- Economics ($600 vs. $1800)
- Risks of general anesthesia
- Older horses - broodmares
- Obese horses
- Recovery stall accidents

**Prerequisites for standing surgery**

- Dust-free area
- Tractable horse
- Sedation = 3 mg detomidine
- Technical help
- Stocks helpful - not necessary

**Prerequisites for standing surgery**

- Groom horse
- Pick feet
- +/- wrap feet for cleanliness
Considerations prior to surgery
- Basisesamoid nerve block
- Then clip hair coronary band to above fetlock

Considerations prior to surgery
- Circumferential surgical scrub

Instrumentation
- # 10 scalpel blade
- Curved mosquito hemostat
- Gauze sponges
- Good technician

Surgical positioning
- Technician lifts limb off ground
- Surgeon operates lateral of left limb and medial of right from left side of horse and vise versa
**Surgical procedure**

- (Black, Honnas)
- 2 incision pull-thru technique
- 2 – cm incision through skin & SQ
- Proximal to collateral cartilage

**Surgical procedure**

- Apply closed tips of hemostats perpendicular to long axis of nerve
- Open tips with firm pressure to strip fascia from nerve
- Repeat as needed

**Surgical procedure**

- After isolation transect distal end
- Gentle traction to identify proximal incision site at base of sesamoids

**Surgical procedure**

- Transect distal segment
- 2 – cm proximal incision over palpable nerve
- Isolate nerve and apply traction to remove nerve from proximal incision
Surgical procedure

- Flex fetlock
- Apply traction to nerve and transect at proximal extent of incision
- Allows nerve stump to withdraw into tissues unaffected by surgical trauma

Removed nerve segment

- Usually 6 to 7 cm of nerve removed
- 2-incision technique
- Black 1992

Tensing proximal nerve segment

- Proposed advantage – allows nerve stump to withdraw into tissues not having sx trauma
- Pull through technique also get accessory nerve branches

Tensing proximal nerve segment

- Possible contraindications
- May rupture epineurium and allow axonal sprouting
- Nerve trauma may contribute to neuroma formation
Surgical procedure

- No buried sutures
- Minimize tissue reaction
- Skin staples only

Other considerations

- Hemorrhage
  - Usually minimal
  - Delay surgery at that site for several minutes
- Nerve branches
  - Can usually be identified if both incisions explored carefully

Post-operative care important

- Bandage for 2 weeks
- Bute – 2 gm daily for 5 days then 1 gm SID for 5 days
- Important to minimize movement and inflammation at surgery site
- Decrease scar tissue

Staple removal at 2 weeks

- 6 mg triamcinolone at proximal nerve stump SQ
- Decreases post-op painful neuromas
- Rebandage for 2 more weeks
**Post-operative care**
- 30 days stall rest
- 30 days small area
- Then gradual return to normal activity

**Standing surgery**
- Viable alternative in selected cases
- Patient & owner selection important
- Requires minimal instrumentation
- Not enjoyed by all surgeons
- Removal of long segment may contribute to longer soundness
- 200 TAMU cases with 2 incision technique
- 70% stay sound for 2 to 5 years

**One-incision technique**
- Nerve lies palmar to digital artery and vein
- Usually just beneath ligament of ergot
- 4 to 5 cm incision in pastern region just abaxial to DDFT

**One incision technique**
- Perineural fascia carefully incised and freed from nerve with hemostats
**Nerve identification**

- Digital palpation
- Stretch nerve and watch for crimping pattern
- Vascular tissue will quickly recoil to original shape
- 25 ga needle

**Surgical procedure**

- #15 blade to transect distal segment
- Proximal end stretched over sterile tongue depressor and transected under tension

**Surgical procedure**

- Proximal stump retracts
- 4 to 6 cm of nerve transected
- Careful inspection for accessory branches
- about 50%

**Post-operative care the same**

Skin staples only

Questions ??
Deep digital flexor tenotomy
Robin M. Dabareiner DVM PhD
Diplomate ACVS
Texas A&M University

DDFT tenotomy
- Chronic refractory cases alternative to euthanasia
- Acute, progressive, severe P3 rotation, unresponsive to medical mgmt
- Laminitic horses with recurrent sepsis or P3 osteomyelitis

- P3 rotation caused by separation sens and insens laminae from dorsal hoof wall and unopposed pull DDFT
- Tenotomy reduces forces causing the separation
- Reduces pain associated P3 osteomyelitis and direct weight bearing stress of P3

Salvage procedure for refractory chronic laminitis
- Separation of damaged laminae
- No opposing force to pull of DDFT
- Tension of DDFT pulls tip of P3 towards sole
**Surgical candidate**
- Chronic P3 rotation
- Plagued by recurrent abscesses in toe region
- P3 osteomyelitis
- Resolution in 10 to 14 days after surgery

**Chronic laminitis**

**Surgical candidate**
- Refractory pain
- > 10 to 12 degrees rotation
- Pain relief
- Not for horses with P3 sinking or that rotate slowly

**DDFT tenotomy**
- Most horses will do well for 1 year than invariably the tendon will contract
- Can repeat procedure

Abscess esp in wet weather
**Assists farrier**

- Selected cases
- Farrier aggressively lowers the heels
- Attempt to shift weight-bearing caudally
- Away from painful toe area

**Trimming the hoof capsule around rotated P3**

- When heels are lowered
- Excessive tension is placed on DDFT
- May exacerbate pain and lead to further P3 rotation
- These cases may benefit by DDFT tenotomy

Grade 4 of 5 lame; 12 degrees P3 rotation
8/29/2011

Sound horse; no rotation, 1/30/2012
Returned to calf roping

7-02-2011
Grade 4 lame

8-12/2011
Grade 2 lame
Surgery assists farrier to be aggressive in lowering the heels

Laminar thickness acute cases
2.4/6.2 = 38 mm  28 mm is normal for QH

Measuring P 3 rotation

2.7/6.5 = 41 mm laminar thickness
Surgical procedure

• Standing sedation
• Mid McIII or pastern level
• Eliminate risk of digital tendon sheath sepsis with mid-McIII
• Can be re-done in pastern area later if needed usually under general anesthesia

Surgical procedure

• Standing sedation
• 3 mg detomidine + tetanus vaccine
• Mid-metacarpal region clipped and scrubbed for surgery
• Local anesthesia
  – Palmar and palmar metacarpal nerves
  – Local infiltration with 6 to 8 mls carbocaine

Instrumentation

• A # 15 and # 10 scalpel blade
• Large curved hemostats
• Or bistoury knife
• Modified butter knife
• Skin staples

Surgical procedure

• A # 15 scalpel blade
• 2-cm vertical incision over the DDFT on lateral aspect of limb
• Incise paratendon
Surgical procedure
- Large curved hemostats or mayo scissors are used to bluntly isolate DDFT
- Isolation is facilitated by flexing the limb

Surgical procedure
- Transection of DDFT
- Digital palpation to assure complete transection
- Ultrasound
- Scalpel blade

Surgical procedure
- Transection of DDFT
- Digital palpation to assure complete transection
- Ultrasound
- Bistoury knife
- Vessels

Surgical procedure
- “Snapping sound”
- Gap in tendon can be visualized
**Post-operative care**

- Simple interrupted suture pattern using 0-PDS or nylon
- Support bandage for 4 weeks/stall
- 3 mos small area
- Most show decreased pain

**Complications**

- Few cases may flip their toe up when walking
- Easily managed by applying a heel extension shoe

**DDFT tenotomy at pastern level**

- Usually under general anesthesia
- Tendon sheath sepsis
- Incision close to abscess foot
- 2 cm vertical incision midpastern

- Incise through digital flexor tendon sheath
• Isolate deep flexor tendon with hemostats

• Transect deep flexor tendon

• Suture digital tendon sheath opening
• Skin staples
• Support bandage

Long term follow-up on 37 cases [Eastman et al 1998]
• 29 mares
• Mean age 9 yrs
• All chronic laminitis
• All Obel grade III or IV
• Mean follow-up 6 years after surgery
Long term follow-up on 37 cases
[Eastman et al 1998]

- Follow-up on 30 horses
- 60% survived (mean 4.5 years)
- 9 returned to light riding rest were broodmares
- Horse weight, degree rotation, grade lameness had no effect on survival

DDF tenotomy in 20 acute cases
[Hunt et al 1991]

- Only 6 of 20 alive at 6 months post surgery
- Not for acute cases

DDFT tenotomy prognosis

- Goal of breeding animal or comfortable pasture pet
- Some have returned to light riding activity

Questions