Neurogenic Exertional Leg Pain in Athletes

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None
Objective

• Describe evaluation and management of neurogenic leg pain in athletes
  • Common peroneal neuropathy
  • Deep peroneal neuropathy
  • Superficial peroneal neuropathy
  • Saphenous neuropathy
  • Sural neuropathy
  • Sural neuropathy
  • Sural neuropathy
  • Proximal tibial neuropathy
Neurogenic Leg Pain

• 10-15% of leg pain in runners

• Etiology
  • Compression
    • Extrinsic
    • Intrinsic (eg, anatomic variant, hypertrophy)
  • Traction/stretching (eg, instability)
  • Adjacent injury (eg, contusion, strain)
  • Iatrogenic/surgery
  • Proximal neuropathy, plexopathy, radiculopathy

General Principles – *History*

- Often insidious onset
- Pain
  - Quality (burning, lancinating)
  - Location (sensory nerve pattern vs vague)
  - Rest vs exercise (often worse)
- Paresthesias/numbness
- Weakness
General Principles – Physical Exam

- Sensation abnormalities
- Weakness
- Percussion (Tinel’s sign)
- May be normal at rest
  → Post-exercise exam
General Principles – Diagnostic Tests

- **NCS/EMG**
  - Confirm & localize lesion
  - Assess severity
    - Demyelinating vs axonal damage
  - Assess chronicity
  - ? Post-exercise NCS

- **X-rays** – Potential compression/traction sites

- **MRI** – Nerve morphology and signal change

*Meadows Curr Sports Med Rep 2014*
General Principles – *Diagnostic Tests*

- Diagnostic US
  - Nerve enlargement
  - Hypoechogenicity
  - Loss normal fascicular architecture
  - Dyskinetic motion
Diagnostic Ultrasound: Muscle Atrophy/Fatty Infiltration

*Damarey Eur J Rad 2011*
General Principles – *Diagnostic Tests*

- **US-guided nerve block**
  - Anesthetic or anesthetic + cortisone
  - Diagnostic and potentially therapeutic
General Principles – Treatment

- Activity modification
- Bracing
- Physical modalities (ice, heat, TENS)
- Desensitization
- Neural mobilization
- Address kinetic chain abnormalities
- Optimize technique and correcting training errors
- Meds (NSAIDs, neuropathic)
- US-guided corticosteroid injection or “hydrodissection”
- Surgery
Peroneal Nerve Branches

• L4-S2 → sciatic → CPN
• Short head BF
• LSCN
  • Proximal lateral leg
• DPN
  • Anterior compartment muscles
  • 1st webspace
• SPN
  • Lateral compartment muscles
  • Distal anterolateral leg

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Damarey Eur J Rad 2011
Common Peroneal Neuropathy

**Etiology**

- **Entrapment**: fibular neck/peroneal tunnel
- **Traction**
  - Repetitive ankle inversion/pronation (downhill)
  - Genu varum
- **Compression**
  - External (knee crossing, casts, braces)
  - Internal (tib-fib jt cyst, tumors, aneurysm, tib-fib dislocation, Baker cyst, fabella, prox fib fx, compartment syndrome, intraneural cyst)
CPN Intraneural Ganglion Cyst
Common Peroneal Neuropathy

Clinical Evaluation

- Anterolateral leg and dorsal foot pain, paresthesia, hypesthesia
- Weakness – dorsiflexion > eversion
  - Recurrent ankle sprains; foot slap
- Tinel’s fibular head – post-exercise sens
- Palpate masses, hernias
- Knee stability (PLC) and alignment (varus)
- Pulses

Peck Clin Sports Med 2010
Posterior femoral cutaneous n.

Common peroneal n. via lateral sural cutaneous

Lateral sural cutaneous n.

Saphenous n.

Medial sural cutaneous n.

Superficial peroneal n.

Sural n.

Medial calcaneal branches of the tibial n.

Deep peroneal n.

Peck Clin Sports Med 2010
Common Peroneal Neuropathy

Diagnostic Tests

- NCS/EMG
- X-rays
  - Knee alignment
  - Fracture
- US/MRI
  - Nerve morphology
  - Compressive lesions
  - Muscle atrophy
- Nerve block
CPN Block
Common Peroneal Neuropathy

Treatment

• Conservative measures initially
  • AFO for foot drop

• US-guided procedures
  • Corticosteroid injection/hydrodissection
  • Cyst aspiration

• Surgery
  • Address knee instability or malalignment
  • Weakness with progressive axonal loss on Edx
  • Resection of compressive lesions
Biceps Femoris Ganglion Cyst
Biceps Femoris Ganglion Cyst
Deep Peroneal Neuropathy

**Etiology**

- Commonly at inferior extensor retinaculum (anterior tarsal tunnel syndrome)
  - Tight footwear
  - Trauma (kicking)
  - Ankle osteophytes

- Traction
  - Repetitive hyperplantarflexion

- Anterior compartment mass
  - Proximal tib-fib joint ganglion cyst
Deep Peroneal Neuropathy

Etiology
Deep Peroneal Neuropathy

**Clinical Evaluation**

- Deep anterior leg/ankle/dorsal foot pain
- First webspaces paresthesia, hypesthesia
- DF weakness if proximal lesion
- EDB atrophy
- Tinel’s anterior ankle
Deep Peroneal Neuropathy

**Diagnostic Tests**

- **X-rays**
  - Ankle osteophytes
- **NCS/EMG**
- **US/MRI**
  - Nerve morphology
  - Compressive lesions
  - Muscle atrophy
- **Nerve block**
Deep Peroneal Neuropathy

**Treatment**

- Footwear changes to remove pressure
- US-guided procedures
  - Corticosteroid injection
  - Cyst aspiration
- Surgery
  - Cyst/osteophyte excision
  - Partial retinacular sectioning

Peck Clin Sports Med 2010
Prox Tib-Fib Joint Ganglion Cyst
Prox Tib-Fib Joint Ganglion Cyst
Prox Tib-Fib Joint Ganglion Cyst
Superficial Peroneal Neuropathy

**Etiology**

- Lateral compartment fascia exit – most common
  - Fascial bands
  - Muscle hernia
- Trauma
- Fibula fracture
- Lateral compartment mass
- Traction – lateral ankle sprains
- Tight footwear
- CECS/fasciotomy

*Peck Clin Sports Med 2010
Meadows Curr Sports Med Rep 2014*
Superficial Peroneal Neuropathy

Canella AJR 2009
Superficial Peroneal Neuropathy

**Clinical Evaluation**

- Lateral leg/dorsal foot pain/paresthesias/hypesthesia
- Tinel’s sign
- Muscle herniation at distal anterolateral leg
  - Resisted dorsiflexion/eversion
  - Passive plantarflexion/inversion

Peck Clin Sports Med 2010
Superficial Peroneal Neuropathy

**Diagnostic Tests**

- NCS/EMG – post-exercise ↑sensitivity
- US/MRI
  - Nerve morphology
  - Compressive lesions
  - Muscle herniations (post-exercise)
- Nerve block
- Compartment pressure testing
Anterior/Lateral Compartments (Trans)
Post-Exertion US

Lateral Compartment (Trans)
Post-Exertion US

Lateral Compartment (Long)
Muscle Hernia
Muscle Hernia
Superficial Peroneal Neuropathy

Treatment

- Ankle stability rehab
- Optimize footwear
- US-guided procedures
  - Corticosteroid injection
  - Cyst aspiration
- Surgery
  - Cyst/mass excision
  - Limited fasciotomy (muscle hernia)

Peck Clin Sports Med 2010
Superficial Peroneal Nerve Block
Saphenous Neuropathy

 Damarey Eur J Rad 2011
Saphenous Neuropathy

**Etiology**

- Medial knee emergence from Hunter’s (adductor) canal – most vulnerable
- Traction (cyclists, rowers)
- Mass
  - Pes anserine bursitis
  - Parameniscal cyst
- Trauma
- Patellar dislocation
- Surgery/injection iatrogenic injury
Saphenous Neuropathy

Clinical Evaluation

• Medial knee/leg pain/paresthesias/hypesthesia
• Tinel’s sign adductor canal/medial knee/leg
• Passive knee ROM
• Valgus stress/ext rotation/ankle eversion
Saphenous Neuropathy

**Diagnostic Tests**

- X-rays
  - Tibial stress fx
- US/MRI
  - Nerve morphology
  - Compressive lesions
- Nerve block
Knee US (medial/coronal)
Saphenous Neuroma – Sartorialial Branch

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Saphenous Neuropathy

Treatment

• Ankle stability rehab
• Optimize footwear
• Neuropathic pain meds
• US-guided procedures
  • Corticosteroid injection
  • Cyst aspiration
• Surgery
  • Cyst/mass excision
Saphenous Nerve Block
Sural Nerve

Beltran Sem MSK Rad 2010
Sural Neuropathy

Etiology

• Rare in athletes
• Recurrent ankle sprains
• Mass
  • Baker cyst
• Trauma
• Tight footwear
• Surgery/injection iatrogenic injury
Sural Neuropathy

Clinical Evaluation

- Posterolateral ankle/foot +/- leg pain/paresthesias/hypesthesia
- Tinel’s sign
- Passive ankle dorsiflexion/inversion

Peck Clin Sports Med 2010
Sural Neuropathy

 Diagnostic Tests

• X-rays
  • R/o ankle OA

• US > MRI
  • Nerve morphology
  • Compressive lesions
  • R/o peroneal tendinopathy

• Nerve block

• NCS?
Sural Schwannoma (MRI and US)

GL

Damarey Eur J Rad 2011
Sural Neuropathy

Treatment

• Ankle stability rehab
• Optimize footwear
• Neuropathic pain meds
• US-guided procedures
  • Corticosteroid injection
  • Cyst aspiration
• Surgery
  • Cyst/mass excision
  • Neurectomy
Tibial Nerve
Tibial Nerve Branches

Tibial division of sciatic n.

- Semitendinosus
- Semimembranosus
- Long head biceps femoris
- Branch to adductor magnus

Popliteal fossa

- Branch to sural n.

- Gastrocnemius
- Soleus
- Tibial posterior
- Flexor digitorum longus
- Flexor hallucis longus

Tarsal tunnel

Calcaneal branch
- Sensory to heel

Medial plantar n.

- Abd. hallucis
- Flexor digitorum brevis
- Flexor hallucis brevis
- Sensory medial sole, first to third toes

Lateral plantar n.

- Abd. digitii quinti
- Flexor digiti quinti
- Add hallucis
- Interossei
- Sensory lateral sole, fourth to fifth toes
Proximal Tibial Neuropathy

**Etiology**

- Rare cause of leg pain (well protected proximally)
- Mass
  - Baker cyst
  - Tumors
- Soleus fibromuscular arch entrapment
- Popliteus rupture → hematoma
- Deep posterior compartment syndrome
- Knee dislocation

*Boon in Akuthota & Herring (eds) Nerve & Vasc Injuries Sports Med 2009*
Proximal Tibial Neuropathy

Clinical Evaluation

- Plantar foot pain/paresthesias/hypesthesia
  - +/- posterolateral calf/ankle/foot (sural)
- Weakness – plantarflexors/invertors
  - Single leg calf raises
- Achilles hyporeflexic
- Popliteal space mass or Tinel’s sign

Proximal Tibial Neuropathy

**Diagnostic Tests**

- X-rays
  - R/o tibial fx
- US/MRI
  - Nerve morphology
  - Compressive lesions
  - Muscle denervation changes
- NCS/EMG

_Craig PM&R 2013_
Tibial Nerve Ganglion Cyst (MRI)

Damarey Eur J Rad 2011
Proximal Tibial Neuropathy

Treatment

• Traction injury
  • Observation
  • Protection (ankle brace)
  • Maintain ankle flexibility
  • Progress ankle stability rehab

• Significant weakness → AFO

• Compressive lesions
  • US-guided aspiration/injection
  • Surgery

Summary

• Neurogenic leg pain in athletes can be Dx challenging → understanding peripheral nerve anatomy is paramount

• Percussion (Tinel’s) works in the leg, too

• Electrodiagnostics can help localize the lesion and assess severity

• US allows correlation of structural abnormalities with clinical exam and can help target Dx/Tx interventions