Nerve Entrapments in the Lower limb

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Improving People's Lives
through innovations in personalized health care

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Case Example

CC: Right ankle dorsiflexion weakness with minimal paresthesias

HPI: 87 year-old physician with chronic lumbar pain and h/o prostate cancer, had recent weight loss. He had no history of diabetes or of neuropathy. Prostate had been excised.

PE: Ankle dorsiflexion and eversion of affected right side was 2/5 with normal inversion and knee flexion, and no other significant weakness noted. Minimal sensory loss in the dorsal foot.

Case Example-Motor NCS

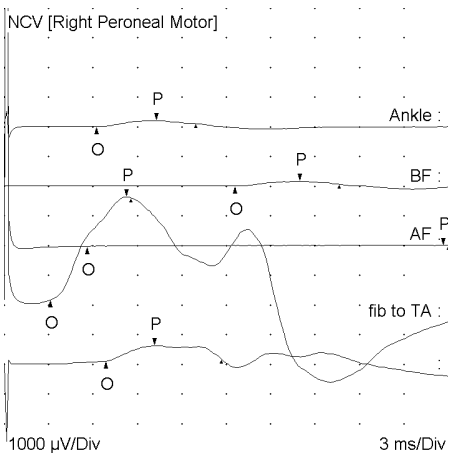
Nerves	Latency	Amplitude	Distance	Velocity
	Ms	mV	Cm	m/s
R Fibular (EDB)				
Ankle	**6.3**	**0.2**	**31.5**	
Fib Head	**15.6**	**0.2**	**13**	**34**
Knee	**No response**	**0**		
R Fibular	(Ant Tib)			
Fib Head	**3.1**	**3.5**		
Knee	**6.9**	**0.5**		**34**

First testing-6 weeks after onset

- Ankle stim-EDB
- Fibula-EDB
- Politeal-EDB (NR)

- Fib-Tibialis Ant
- Pop-Tibialis Ant

Strength ADF 2/5



Peroneal (Fibular) Motor Study

All three possible changes agree:

- Focal slowing of conduction
- Conduction block (neurapraxia)
- Change is shape of response (wider)
  - Temporal dispersion

=Nerve entrapment (As good as it gets!)

Case Example-Motor NCS 3 months later

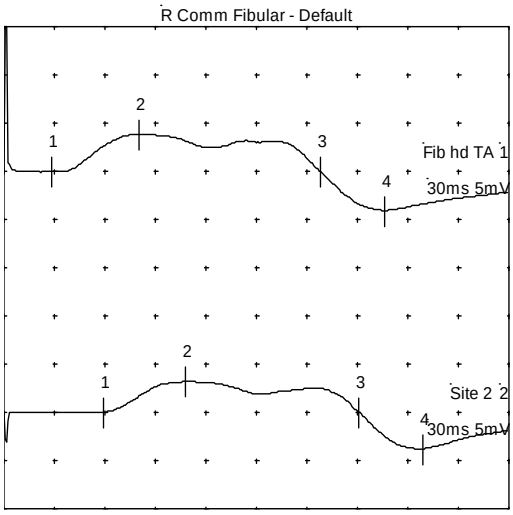
Nerves	Latency	Amplitude	Distance	Velocity
	Ms	mV	Cm	m/s
R Fibular (EDB)				
Ankle	**6.75**	**0.2**	**8**	
Fib Head	**22.65**	**0**	**32**	**20.1**
Knee				
R Fibular	(Ant Tib)			
Fib Head	**2.85**	**4**		
Knee	**6**	**3.1**	**10**	**31.7**

Follow-up testing- 3 months later

Strength ADF 4+/5

Fib-Tibialis Ant

Pop-Tibialis Ant



Improved amplitude with proximal stimulation = improved strength!

Fibular Nerve Compression at the Knee-Etiology Crossing Legs

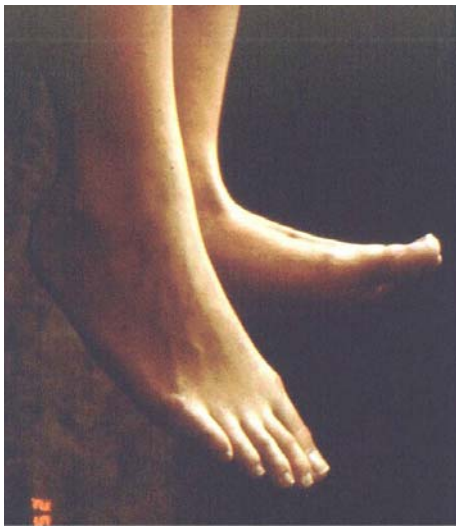
- 87 yo m
- Electrodiagnostician
- Acute fibular neuropathy
- Ernest W. Johnson, M.D.

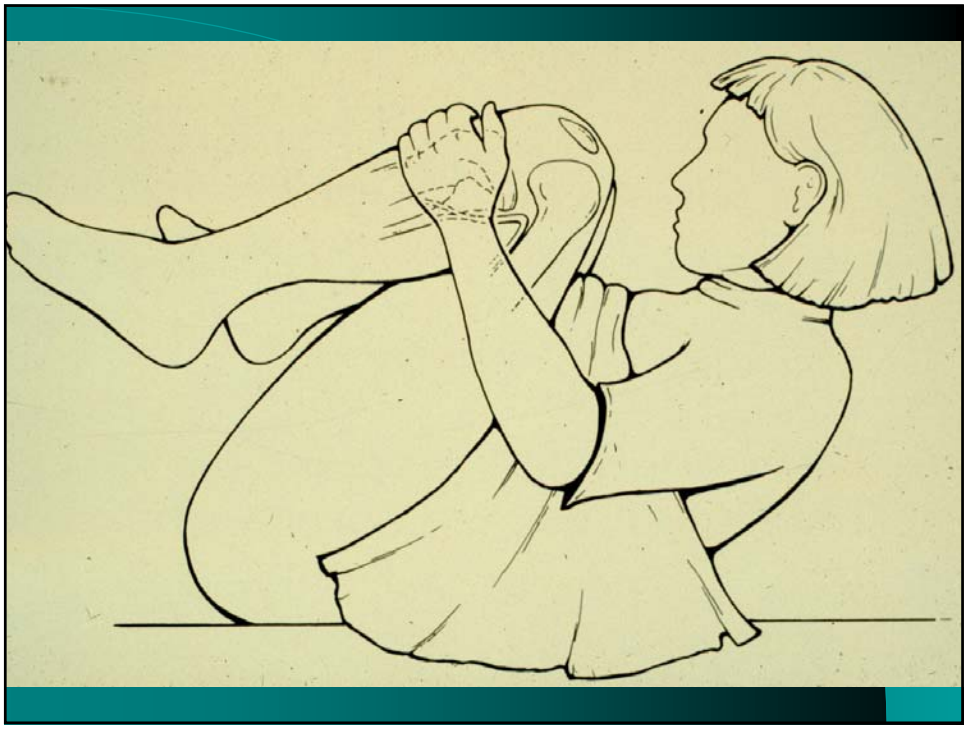
Fibular (Peroneal) Nerve Compression

- "Drop foot"
  - Weakness of dorsiflexion and eversion
  - Paresthesia/sensory loss dorsal foot
- Exclusions
  - Not CNS, reflexes WNL, Babinski -
  - Not cauda equina-opposite side normal
  - No incontinence

Common Fibular Nerve

- 28 yo woman
- 1st pregnancy
- Rt dorsiflexion weakness
- Onset s/p delivery-vaginal
- Excessive knee flexion while pushing at end of labor



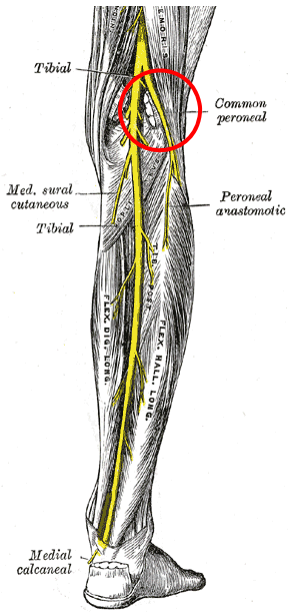


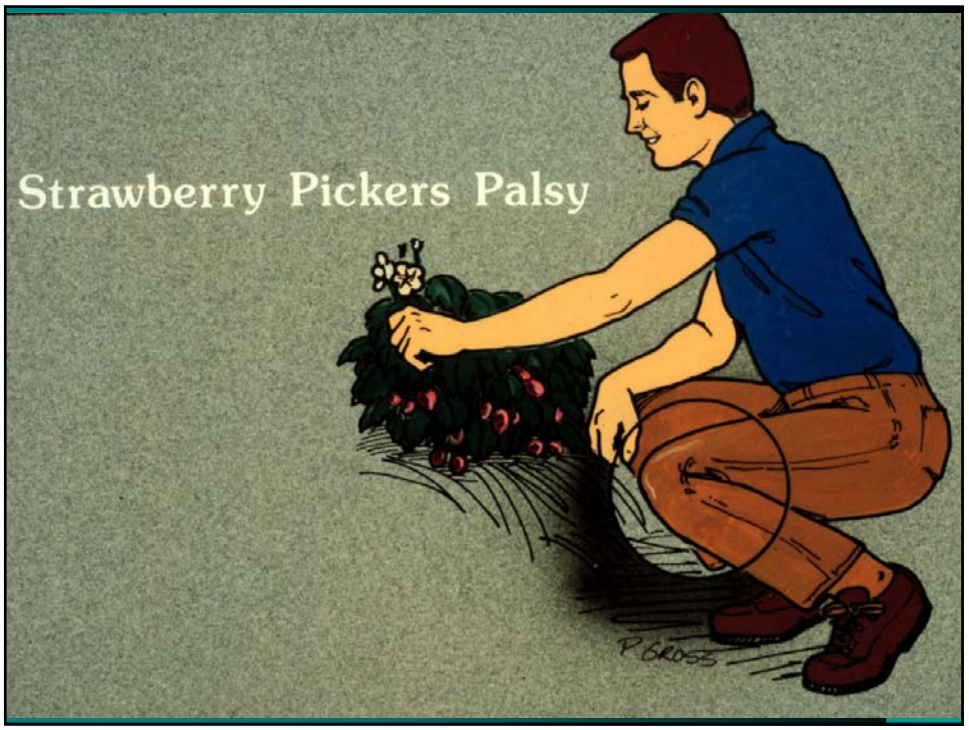
Fibular (Peroneal) Nerve Compression

- Entrapped between popliteal space and fibular head
  - Passes between tendons in area
- Contributing factors
  - Rapid weight loss
  - Crossing legs
  - Squatting-”strawberry picker’s palsy”
- Tx: Eliminate cause, heals well
- May need temporary orthosis

Fibular Nerve

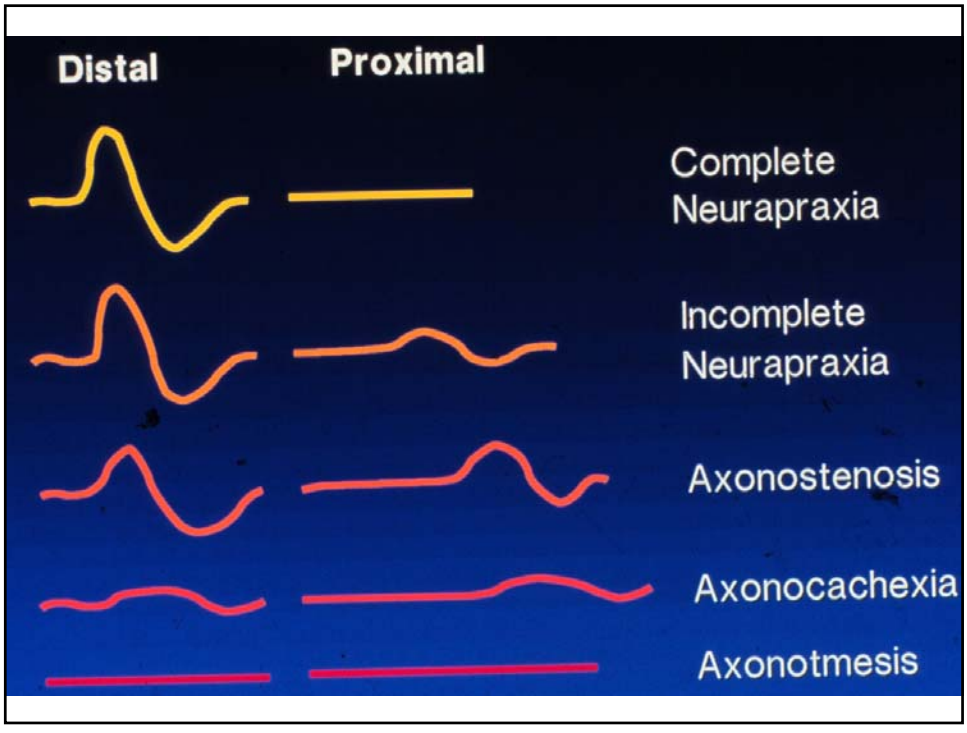
- Below knee
- Tendons
  - Biceps femoris
  - Popliteus
  - Lateral Gastrocnemius
- Common fibular
  - Both divisions affected typically





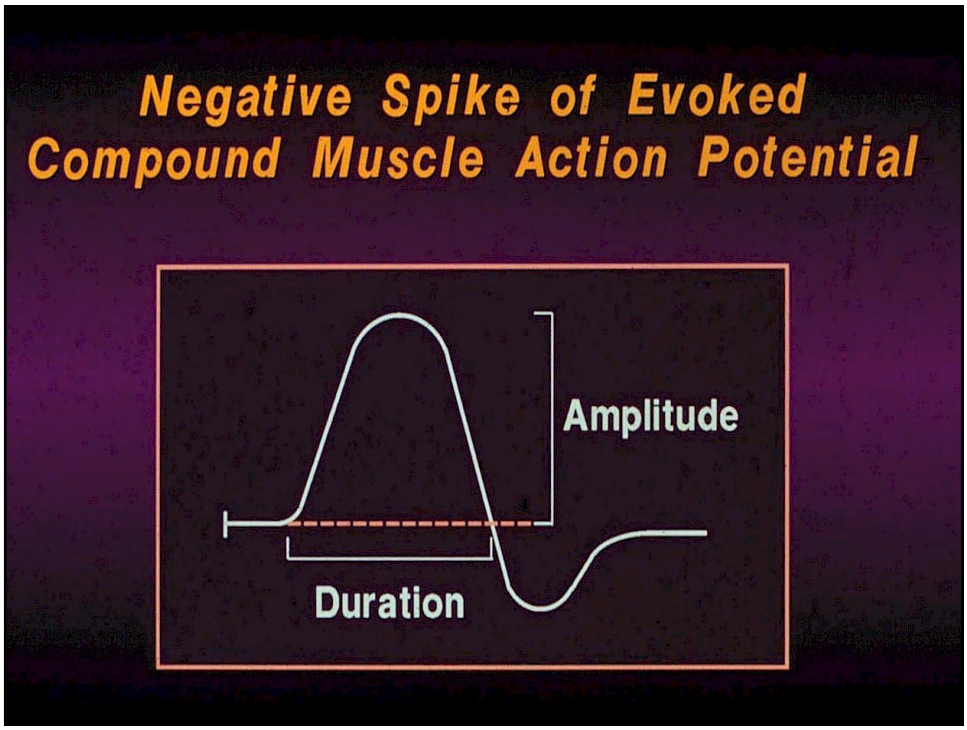
What is it you want to know?

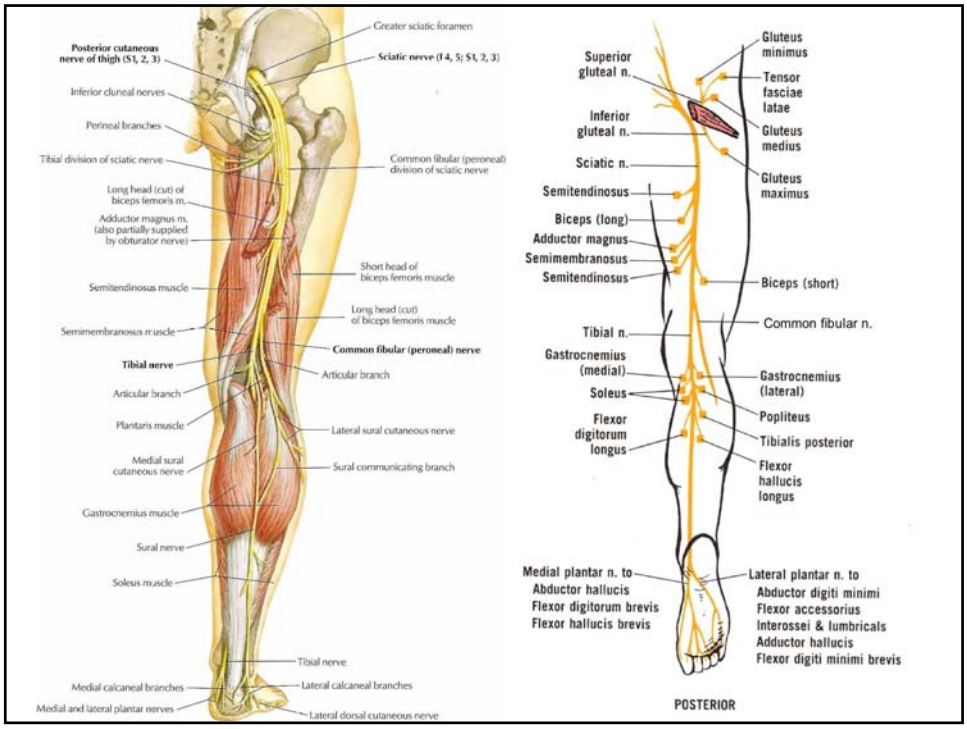
- Is this nerve working?
  - Amid pain, edema, restricted motion, paresthesia, weakness
- Is it a peripheral nerve problem?
- Where is the problem?
- Is anything else going on?
- How severe is the problem?
- What is the prognosis?

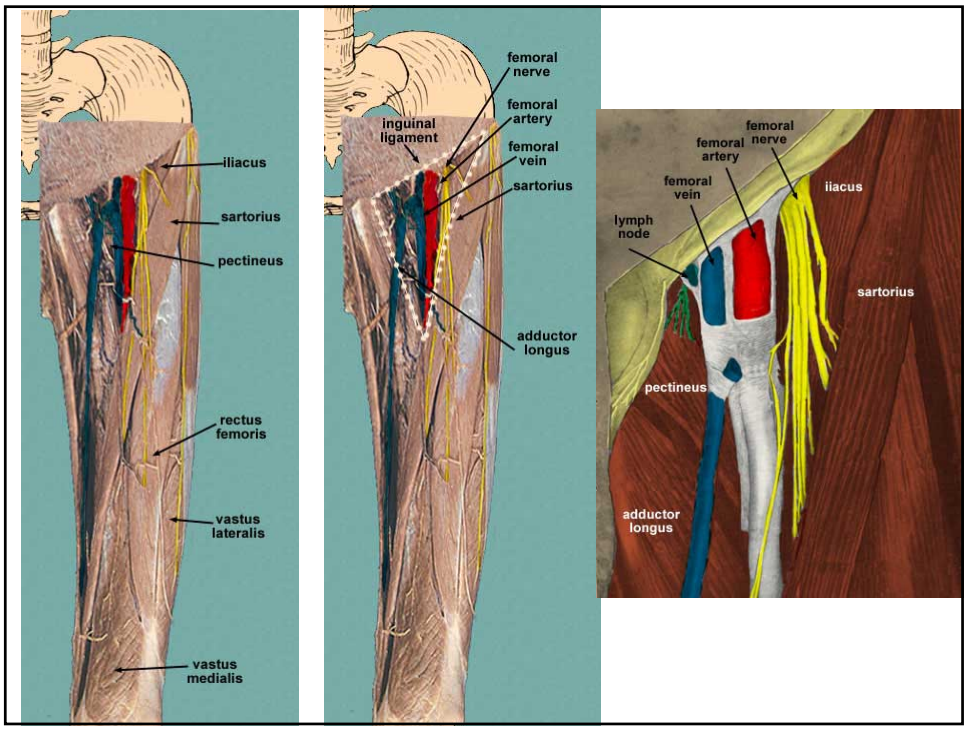


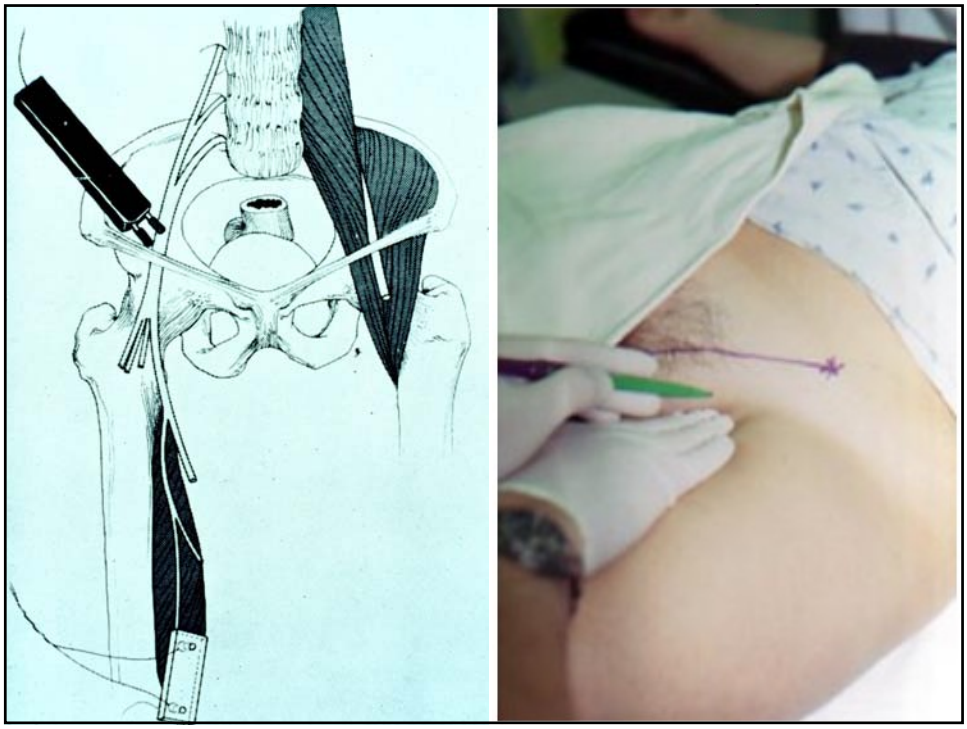
Nerve Entrapment

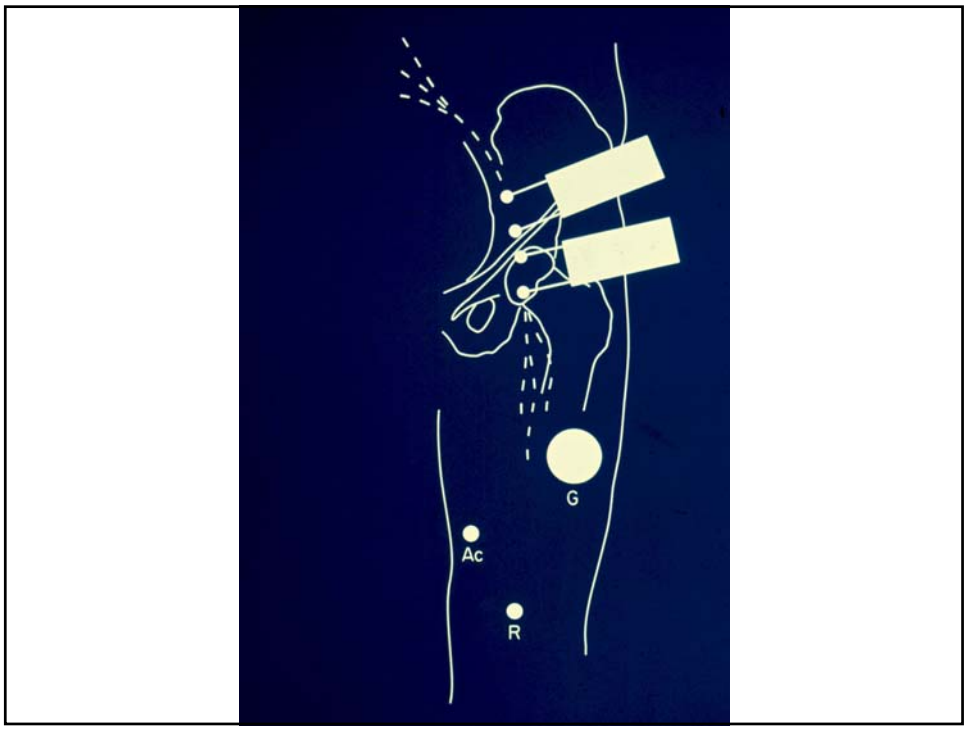
- **Always stimulate proximal and distal to the point of suspected entrapment**
- **Note amplitude, duration and latency**
- **Best measure of <u>prognosis</u> is most distal stimulation**
- **Best measure of <u>strength</u> is response to proximal stimulation**



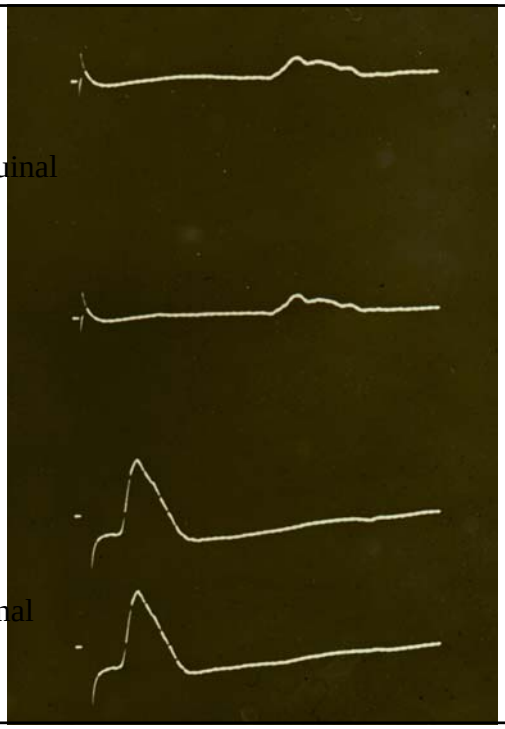

Posterior cutaneous nerve of thigh (S1, 2, 3)
Greater sciatic foramen
Sciatic nerve (L4, 5; S1, 2, 3)
Inferior cluneal nerves
Perineal branches
Tibial division of sciatic nerve
Common fibular (peroneal) division of sciatic nerve
Long head (cut) of biceps femoris m.
Adductor magnus m. (also partially supplied by obturator nerve)
Short head of biceps femoris muscle
Semitendinosus muscle
Long head (cut) of biceps femoris muscle
Semimembranosus muscle
Common fibular (peroneal) nerve
Tibial nerve
Articular branch
Articular branch
Plantaris muscle
Lateral sural cutaneous nerve
Medial sural cutaneous nerve
Sural communicating branch
Gastrocnemius muscle
Sural nerve
Soleus muscle
Tibial nerve
Medial calcaneal branches
Lateral calcaneal branches
Medial and lateral plantar nerves
Lateral dorsal cutaneous nerve
Superior gluteal n.
Gluteus minimus
Tensor fasciae latae
Inferior gluteal n.
Gluteus medius
Sciatic n.
Gluteus maximus
Semitendinosus
Biceps (long)
Adductor magnus
Semimembranosus
Semitendinosus
Biceps (short)
Tibial n.
Common fibular n.
Gastrocnemius (medial)
Gastrocnemius (lateral)
Soleus
Popliteus
Flexor digitorum longus
Tibialis posterior
Flexor hallucis longus
Medial plantar n. to
Abductor hallucis
Flexor digitorum brevis
Flexor hallucis brevis
Lateral plantar n. to
Abductor digiti minimi
Flexor accessorius
Interossei & lumbricals
Adductor hallucis
Flexor digiti minimi brevis
POSTERIOR


iliacus
sartorius
pectineus
rectus femoris
vastus lateralis
vastus medialis
femoral nerve
femoral artery
inguinal ligament
femoral vein
sartorius
adductor longus
femoral nerve
femoral artery
femoral vein
lymph node
iiacus
sartorius
pectineus
adductor longus

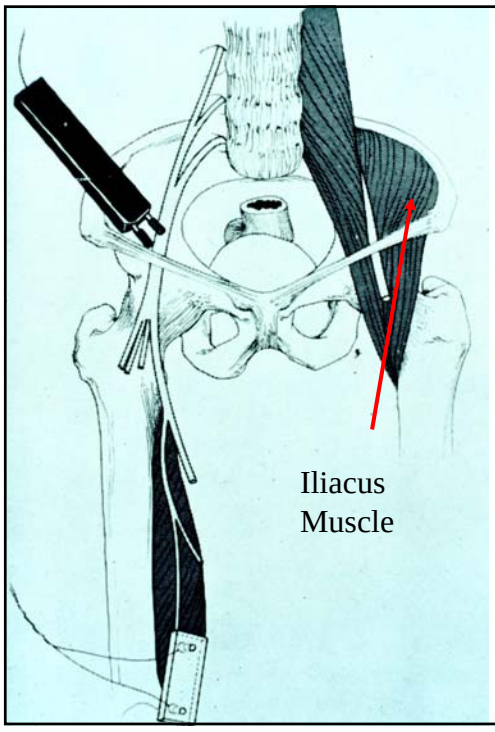



G
Ac
R

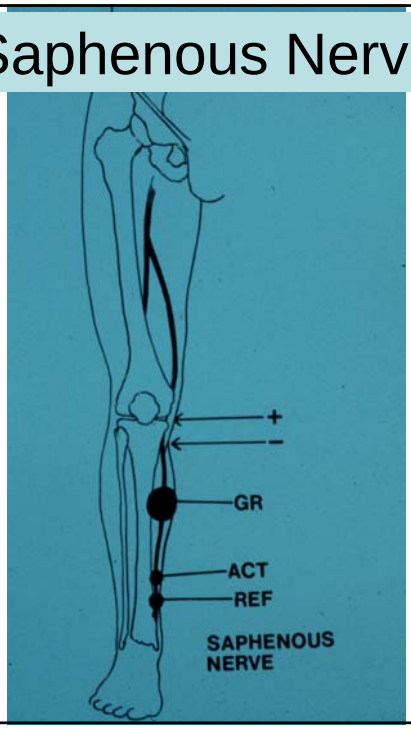
Stimulate
Femoral N
Above inguinal
ligament

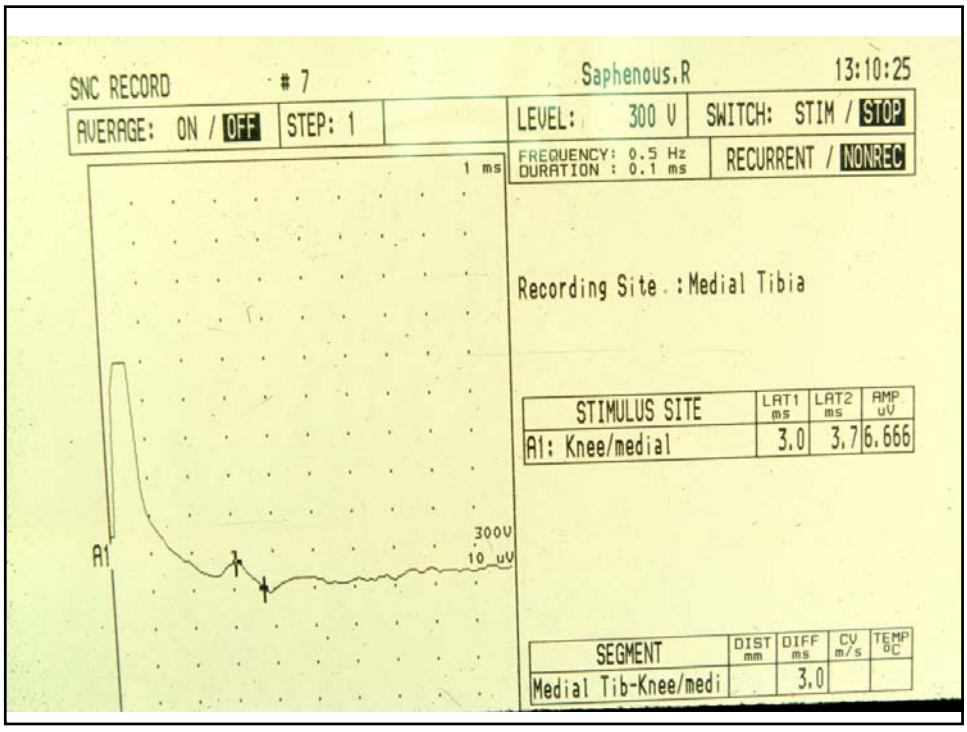


Stimulate
Femoral N
Below inguinal
ligament



Saphenous Nerve



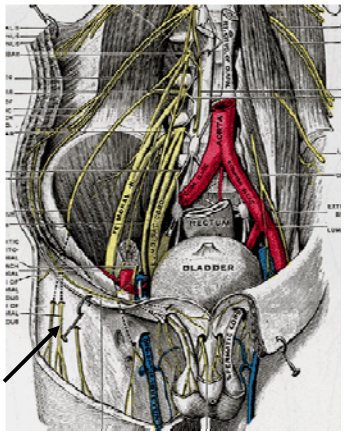


Meralgia Paresthetica
Lateral Cutaneous Nerve

- Burning pain in lateral thigh to just above the knee
- No weakness
- Risk factors
  - Weight gain
  - Diabetes Mellitus
  - Tight clothing/tool belt

Meralgia Paresthetica

- "Benign" sensory-only nerve palsy
- Rule outs are important
  - L4 root injury
  - Lumbar plexus
  - Femoral Nerve
- Tx: relieve pressure,
  - Symptomatic meds
  - Eg, gabapentin



Lateral Cutaneus Nv.

Lateral Cutaneous Nerve of the Thigh

- Stim
- 1 cm medial to ASIS
- Record
- 12 cm along line to lateral patella
- Onset Lat < 2.9 ms
  - At 14 cm
- Amplitude > 3 µV

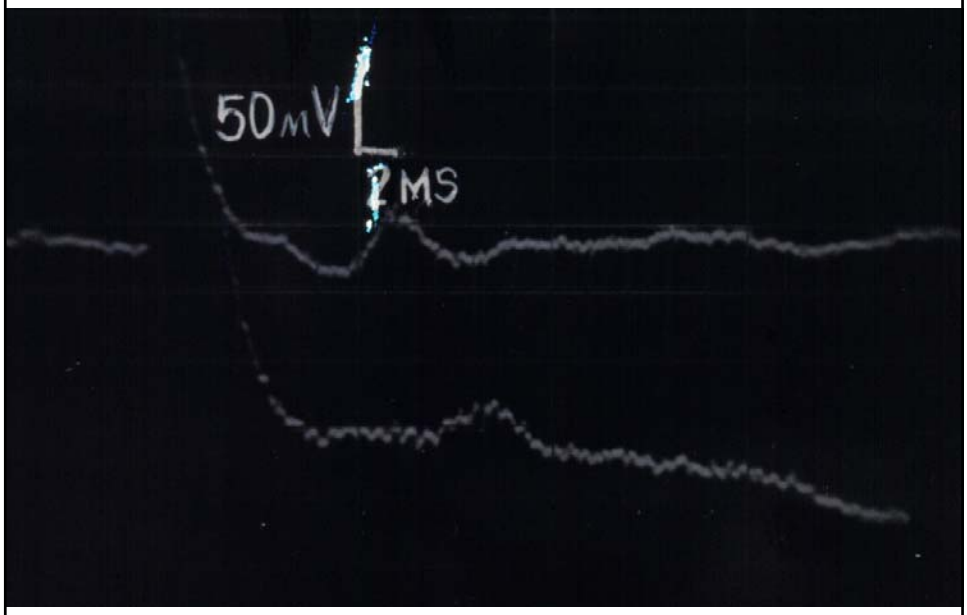
MERALGIA PARESTHETICA

FREQUENT IN DIABETICS; overweight persons with tight belts

Place recording electrodes 2/3 down on anterior-lateral thigh (use disposable sensory recording strips)

Stimulate with monopolar needle 1 cm medial to ASIS

Compare with contralateral



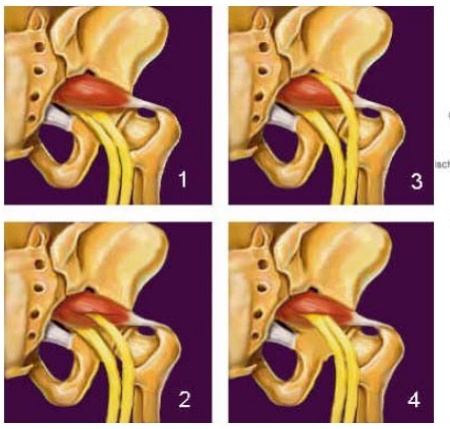
MERALGIA PARESTHETICA

- Differential Diagnosis
  - Radiculopathy L3 or L4
  - Lumbar plexopathy
  - Femoral Neuropathy
  - Polyneuropathy

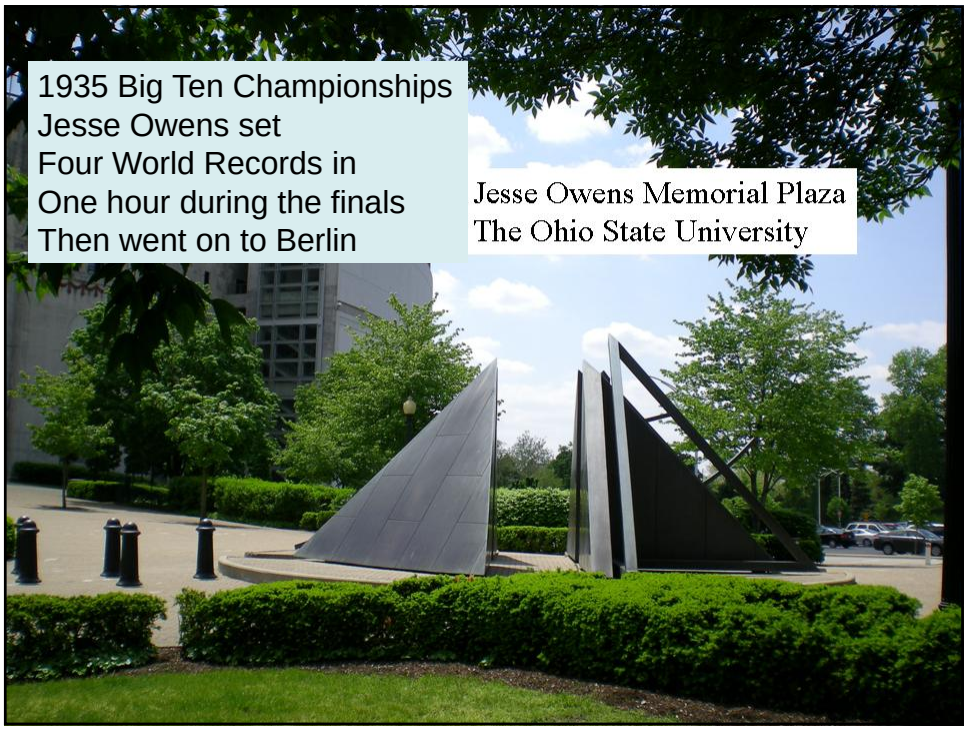
MERALGIA PARESTHETICA

- EMG Evaluation
  - Needle EMG to evaluate plexus and roots
  - Iliospsoas, quadriceps, adductors, tibialis anterior and gastrocnemius
  - Sural and tibial NCS with F wave
  - Lateral femoral nerve study

Piriformis Syndrome




Jesse Owens Memorial Plaza
The Ohio State University


1935 Big Ten Championships
Jesse Owens set
Four World Records in
One hour during the finals
Then went on to Berlin
Jesse Owens Memorial Plaza
The Ohio State University

Tarsal Tunnel Syndrome

- Tibial nerve compression at medial malleolus is relatively rare
- NOT analogous to CTS
- Anatomy of tendons and ligaments is very different
- Associated with altered anatomy of foot, usually following trauma

Tarsal Tunnel Syndrome

– EDX
  - Motor latency –
    – medial plantar n < 6 ms;
    – lateral plantar n - < 6.5 ms
  - If Medial Plantar comes within 0.5 ms of lateral plantar latency suspect medial plantar entrapment

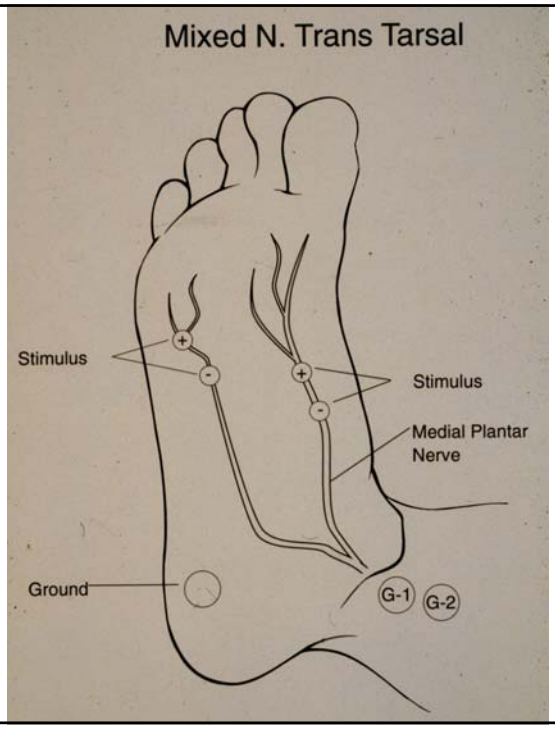
Lateral plantar nerve entrapment

- More frequently seen in diabetic peripheral neuropathy
- CNAP will be reduced or absent with stimulation at foot sole (Lat Pl N)
- Needle EMG abnormalities in abd dig V ped and lateral interosseus muscles

Tibial nerve Motor study

Abd Dig Min
Lateral Plantar

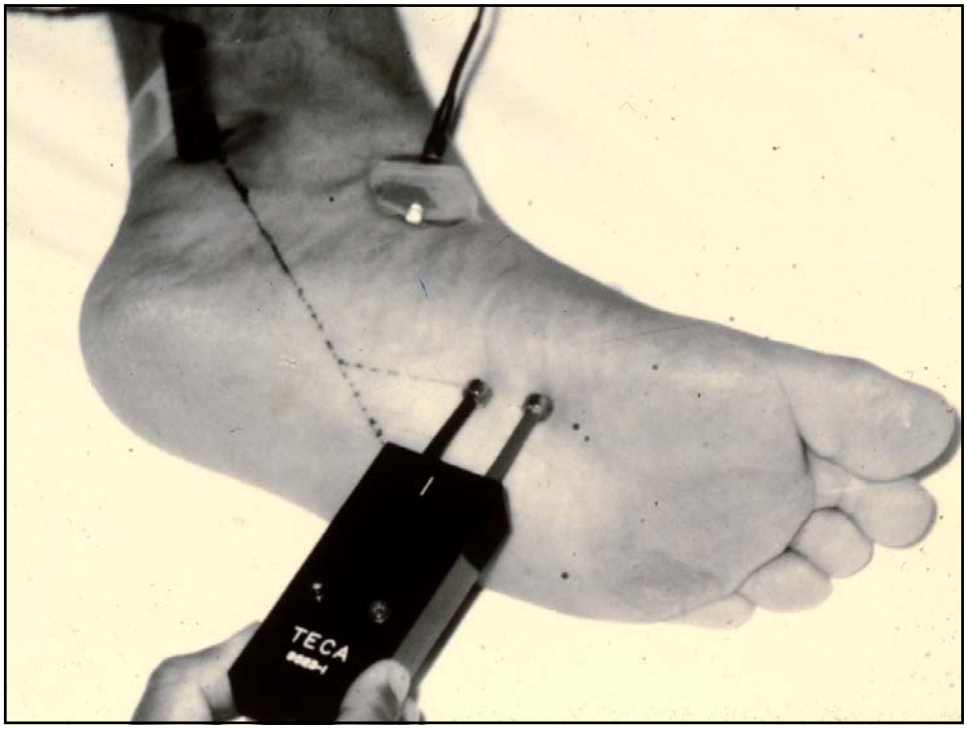
Abd Hall
Medial Plantar



Trans-Tarsal technique

- Medial plantar nerve
  - Amplitudes :10-30 uV
  - Latency: 3.2 msec
- Lateral plantar nerve
  - Amplitudes 8-20 uV
  - Latency: 3.2 msec

  – NB. This is a MIXED nerve action potential



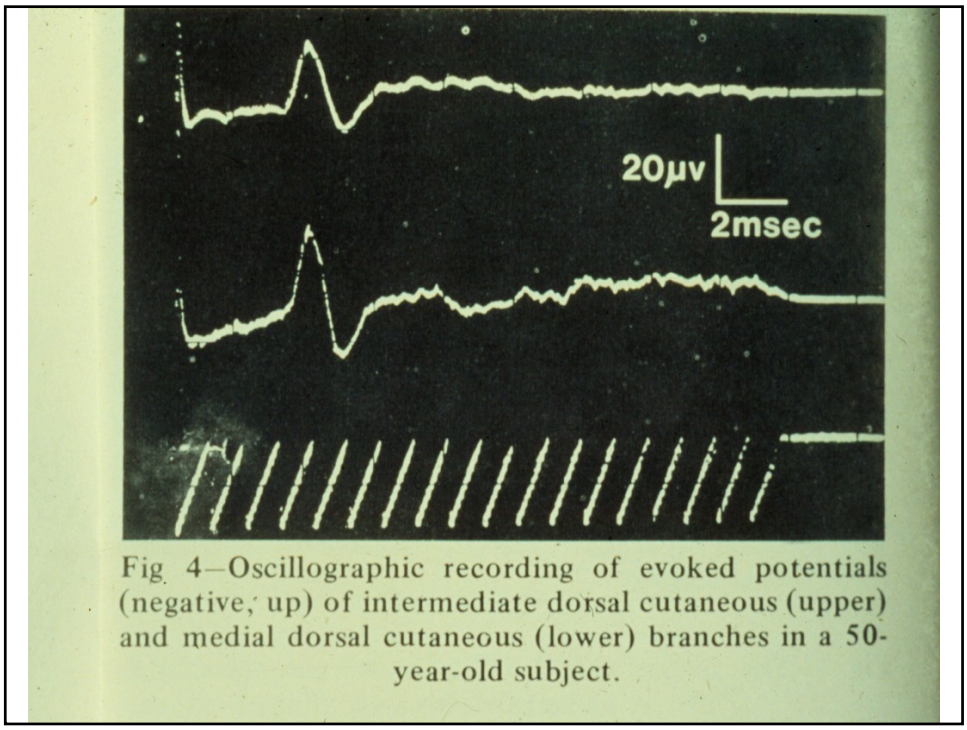


Fig 4—Oscillographic recording of evoked potentials (negative, up) of intermediate dorsal cutaneous (upper) and medial dorsal cutaneous (lower) branches in a 50-year-old subject.

Go Bucks!