Axon degeneration proceeds centrally rather than peripherally
Principles and Practice

1) Hx & Px before EDx
2) Watch twitch, then measure
3) Distal vs Proximal Shocks
4) Linear or Nonlinear Changes
5) Short and Long of NCS
<table>
<thead>
<tr>
<th>Site of Stimulation</th>
<th>Amplitude (mV)</th>
<th>Latency to Recording Site (ms)</th>
<th>Difference Between Two Sides (ms)</th>
<th>Conduction Time Between Two Points (ms)</th>
<th>Conduction Velocity (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle</td>
<td>5.8 ± 1.9 (2.9)$^f$</td>
<td>3.96 ± 1.00 (6.0)$^f$</td>
<td>0.66 ± 0.57 (1.8)$^f$</td>
<td>8.09 ± 1.09 (10.3)$^f$</td>
<td>48.5 ± 3.6 (41)$^*$</td>
</tr>
<tr>
<td>Knee</td>
<td>5.1 ± 2.2 (2.5)</td>
<td>12.05 ± 1.53 (15.1)</td>
<td>0.79 ± 0.61 (2.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE OF STIMULATION</td>
<td>PERONEAL NERVE (ms)</td>
<td>TIBIAL NERVE (ms)</td>
<td>DIFFERENCE (ms)</td>
<td></td>
<td></td>
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<tr>
<td>Ankle</td>
<td>3.89 ± 0.87 (5.6)†</td>
<td>4.12 ± 1.06 (6.2)†</td>
<td>0.77 ± 0.65 (2.1)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee</td>
<td>12.46 ± 1.38 (15.2)</td>
<td>12.13 ± 1.48 (15.1)</td>
<td>0.88 ± 0.71 (2.3)</td>
<td></td>
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</tr>
</tbody>
</table>
Medial and lateral plantar nerve

Pitfalls

• Technically difficult. Stimulus artifact may obscure recording (calluses, thick skin, pedal edema, etc).
• Lateral plantar n. response more difficult to elicit than medial. Averaging may be required.
• In some normal subjects and in elderly, plantar responses may be absent. Before interpreting abnormality, side-to-side comparison is needed (≤50 % of unaffected side is abnormal).
• In obese pts with pes planus (flat feet), compression in sole rather than at tarsal tunnel may cause lateral or medial plantar neuropathy.
• Medial and lateral plantar nerve responses often absent in polyneuropathy.
Tarsal Tunnel Syndrome (TTS)

- **Etiology**
  - Compression of tibial nerve fibers in tarsal tunnel.
- **General comments**
  - A rare entrapment neuropathy.
  - Symptoms usually involve one foot (Dawson et. al., 1990).
  - Predisposing conditions: ankle trauma / deformity, peripheral neuropathy, rheumatoid arthritis.
  - Radiologic studies: degenerative ankle arthritis, old fractures, bony changes (DeLisa and Saeed, 1983).
Clinical Features-TTS

- Pain, often burning in quality, in the sole of foot.
- Numbness in medial or lateral plantar areas +/- whole surface of foot (Dawson et. al., 1990).
- Patients may awaken at night with symptoms (nocturnal paresthesias).
- Tinel’s sign over the tarsal tunnel is often present (Oh et. al., 1978).
- +/- weakness and atrophy of intrinsic foot muscles, may be difficult to detect clinically.

Electrodiagnostic Strategy-TTS

- Use NCS to confirm a focal lesion of tibial sensory or motor fibers in tarsal tunnel (Oh 1978; DeLisa and Saeed, 1983).
- Perform EMG in foot muscles supplied by both medial and lateral plantar nerves. In severe TTS, EMG shows neurogenic changes.
- If EMG is abnormal, study proximal tibial-innervated muscles to exclude proximal nerve lesion. Compare findings in other foot since TTS is often unilateral.
- Study S1, S2 muscles innervated by other nerves to exclude radiculopathy.
Tarsal Tunnel Inching Technique
NCS: Long and Short of It

1) Short distances magnify focal abnormality despite increased measurement error.

2) Long distances, though insensitive to focal lesions, yield better for diffuse process