Fibular (Peroneal) Neuropathy
Electrodiagnostic Features and Clinical Correlates

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INTRODUCTION

Fibular or peroneal neuropathy is the most frequent mononeuropathy encountered in the lower limb and the third most common focal neuropathy encountered overall, after median and ulnar neuropathies.1,2 Following revised anatomic terminology published in 1998, the peroneal nerve is also now known as the fibular nerve, to prevent confusion of this nerve with those regions with similar names.3 Perone is another term for the fibula and, thus, this revised terminology for this nerve, its branches, and related musculature is based on language describing the location.3 While both fibular and peroneal are considered acceptable terms, “fibular” and it related terminology is preferred and therefore will be used throughout this article.

Weakness of ankle dorsiflexion and the resultant foot drop are common presentations of fibular neuropathy, but may also be seen in a wide variety of other clinical conditions, including sciatic mononeuropathy, lumbosacral plexopathy, or a lumbar (L) 5

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• Fibular • Peroneal • Neuropathy • Electrodiagnostic

KEY POINTS
• Fibular (peroneal) neuropathy is the most common mononeuropathy encountered in the lower limbs.
• Clinically, sciatic mononeuropathies, radiculopathies of the 5th lumbar root, and lumbosacral plexopathies may present with similar findings of ankle dorsiflexor weakness, thus evaluation is needed to distinguish these disorders.
• The most common site of injury to the fibular nerve is at the fibular head.
• The deep fibular branch is more frequently abnormal than the superficial branch.
• Electrodiagnostic studies are useful to determine the level and type (axonal, demyelinating) of injury.
• The presence of any compound muscle action potential response on motor nerve conduction studies, recorded from either the tibialis anterior or extensor digitorum brevis, is associated with good long-term outcome.
radiculopathy. Additionally, ankle dorsiflexion weakness may be the initial presentation of generalized disorders, such as amyotrophic lateral sclerosis, or a hereditary neuropathy. In a retrospective series of 217 patients presenting with paresis or paralysis of foot dorsiflexors, of whom 68% had peripheral nerve abnormalities as the cause of their weakness, 31% had weakness related to a common fibular nerve lesion, 30% an L5 radiculopathy, and 18% due to a polyneuropathy. Fibular neuropathies may also present with predominantly sensory symptoms limited to the distribution of the deep or superficial fibular nerve or its branches. In addition to documenting fibular nerve abnormalities and the level of the injury, electrodiagnostic techniques have also been used to assess the potential for recovery of nerve function.

ANATOMY

Common Fibular (Peroneal) Nerve

The common fibular (peroneal) nerve is derived from the lateral division of the sciatic nerve. Fibers from the dorsal fourth and fifth lumbar, as well as the first and second sacral nerve roots, join with tibial axons to form the sciatic nerve. Though bound in the nerve sheath with the tibial nerve in the thigh, the fibular and tibial axons are separate even within the sciatic nerve at this level. In the thigh, a branch arises from the fibular division of the sciatic nerve to innervate the short head of the biceps femoris. Following bifurcation of the sciatic nerve in the distal thigh at the superior popliteal fossa, the common fibular nerve travels along the lateral side of the fossa at the border of the biceps femoris muscle to the lateral knee. At this level, the nerve gives off a branch, the lateral cutaneous nerve of the calf, which supplies sensation to the upper third of the anterolateral leg. The sural communicating branch of the lateral sural cutaneous nerve joins with the medial sural cutaneous nerve to form the sural nerve. The common fibular nerve then travels superficially at the lateral fibula and is located about 1 to 2 cm distal to the fibular head before entering the anterior compartment of the leg where it divides into deep and superficial branches at the fibular head.

Deep Fibular (Peroneal) Nerve

The deep fibular (peroneal) nerve supplies motor innervation to all anterior compartment muscles (the tibialis anterior, the extensor digitorum longus, and extensor hallucis longus) and the fibularis tertius, also known as the peroneus tertius. The anterior tibialis is the strongest foot dorsiflexor, although the extensor digitorum longus and the fibularis tertius assist with this movement. The deep fibular nerve travels distally in the calf and at the level of the ankle joint, fascia overlying the talus and the navicular bind the deep fibular nerve dorsally. Ventrally, the extensor hallucis longus muscle fibers and tendon and the inferior extensor retinaculum overlay the nerve. The inferior extensor retinaculum is a Y-shaped band anterior to the ankle; the anterior tarsal tunnel is considered the space located between the inferior extensor retinaculum and the fascia overlying the talus and navicular. Just rostral or under the inferior extensor retinaculum, the deep fibular nerve branches into medial and lateral branches. The lateral branch of the deep fibular nerve travels under the extensor retinaculum, as well as the extensor digitorum and hallucis brevis muscles to innervate these muscles and nearby joints. The medial branch travels under the extensor hallucis brevis tendon to supply sensation to the skin between the first and second toes.

Superficial Fibular (Peroneal) Nerve

The superficial fibular (or peroneal) nerve arises from the common fibular nerve in the proximal leg and travels distally in the leg through the lateral compartment. After
Fig. 1. Sciatic nerve: anatomy. Netter illustration from www.netterimages.com. © Elsevier Inc. All rights reserved.
Fig. 2. Common peroneal nerve and branches: anatomy. Netter illustration from www.netterimages.com. © Elsevier Inc. All rights reserved.
providing muscular innervation to the fibularis (peroneus) longus and brevis muscles in the lateral compartment of the leg, the terminal sensory branch supplies sensation to the lower two-thirds of the anterolateral leg and the dorsum of the foot, except for the first web space. It becomes superficial within the muscular compartment about 5 cm above the ankle joint where it pierces the fascia to become subcutaneous. It divides into its two terminal sensory branches, the intermediate and medial dorsal cutaneous nerves. The intermediate dorsal cutaneous nerve travels to the third metatarsal space and then divides into the dorsal digital branches to supply sensation to the lateral two digits. The medial dorsal cutaneous branch passes over the anterior aspect of the ankle overlying the common extensor tendons, runs parallel to the extensor hallucis longus tendon, and divides distal to the inferior retinaculum into three dorsal digital branches.

**Accessory Fibular (Peroneal) Nerve**

A common anatomic variant, the accessory fibular (peroneal) nerve, may be identified in the performance of studies to the extensor digitorum brevis.\(^9\) It generally arises from the superficial fibular nerve as it courses under the fibularis brevis muscle, traveling distally to the foot posterior to the lateral malleolus.\(^10\) It subsequently branches to innervate ligaments, joints, and the extensor digitorum brevis muscle. Prevalence as a normal anatomic variant has been reported to be 17% to 28% in anatomic studies and 12% and 22% electrophysiologically.\(^9,11–13\)

**CAUSES**

Fibular neuropathies are most often traumatic in origin; stretch or compression is a common feature in the history (Box 1).\(^14,15\) Recurring external pressure at the fibular head may result in this complication, such as that seen in patients at bed rest or in individuals who habitually cross their legs.\(^16\) Intrinsic compression of the superficial and/or deep fibular nerves has also been described, such as that occurring from fascial bands or intraneural ganglia.\(^17\)

Acute fibular neuropathies located at the fibular head may be found in the setting of recent weight loss, frequently in conjunction with a history of leg crossing.\(^1,18–20\) Fibular nerve palsies were reported in prisoners of war during World War II who lost from 5 to 11 kg.\(^21\) In another case series, it was noted that 20% of 150 cases of fibular mononeuropathy were associated with dieting and weight loss.\(^1\) The mean weight decrease in these patients was 10.9 kg, with most patients having moderate to severe weakness of foot dorsiflexion and eversion.\(^1\) It has been theorized that loss of subcutaneous fat leads to increased susceptibility of the nerve to compression at this level.\(^2\) Fibular neuropathy associated with weight loss most often demonstrates conduction block on electrodiagnostic testing, with the severity correlating with clinical weakness.\(^1\) More recently fibular neuropathy has been described following bariatric surgery.\(^22\)

Significant trauma around the knee or ankle may result in fibular nerve injuries due to the nerve’s proximate and superficial locations at the level of these joints. Lacerations from saws, boat propellers, or lawn mowers have all been described.\(^23\) Not surprisingly, those with nerve in continuity have better recovery of function. Knee dislocations, particularly open, rotatory, or posterolateral corner injuries can result in proximal fibular nerve involvement.\(^24\) Deep fibular nerve abnormalities may be localized following spiral fibular fractures.\(^25\) Fractures requiring external fixation of the ankle may result in more distal injury.\(^26\) However, in the case of fractures, it has been noted that fibular neuropathy may be localized to the fibular head electrodagnostically, though the fracture is an alternative location.
<table>
<thead>
<tr>
<th>Fibular (Peroneal) neuropathy: reported causes</th>
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</thead>
<tbody>
<tr>
<td><strong>Knee or fibular head</strong></td>
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<tr>
<td>• Anaphylactoid purpura</td>
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<tr>
<td>• Arthroplasty (knee)</td>
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<td>• Arthroscopy (Knee)</td>
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<td>• Baker cyst</td>
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<td>• Bed rest</td>
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<td>• Birth trauma</td>
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<td>• Boney exostoses</td>
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<td>• Casts</td>
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<tr>
<td>• Crossed-leg sitting</td>
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<tr>
<td>• Cryotherapy</td>
</tr>
<tr>
<td>• Fractures (femur, tibia, fibular)</td>
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<tr>
<td>• Fibrous arch</td>
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<tr>
<td>• Foot boards</td>
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<tr>
<td>• Ganglion</td>
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<tr>
<td>• Gun shot wounds</td>
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<tr>
<td>• Heterotopic ossification</td>
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<tr>
<td>• Hematoma</td>
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<tr>
<td>• Hemangiomas</td>
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<tr>
<td>• Intravenous infiltration or injections</td>
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<tr>
<td>• Knee dislocation</td>
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<tr>
<td>• Knee stabilization by helicopter pilots</td>
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<tr>
<td>• Kneepads</td>
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<tr>
<td>• Kneeling</td>
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<tr>
<td>• Lacerations</td>
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<tr>
<td>• Lipoma</td>
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<tr>
<td>• Knee surgery</td>
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<tr>
<td>• Schwannoma</td>
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<td>• Sequential compression devices</td>
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<tr>
<td>• Sesamoid bone of the lateral head of gastrocnemius</td>
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<tr>
<td>• Severe valgus or varus deformity at the knee</td>
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<td>• Splints</td>
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<td>• Squatting (childbirth, strawberry picking, farm workers)</td>
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<td>• Synovial cysts</td>
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<td>• Traction</td>
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<tr>
<td>• Varicose vein surgery</td>
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<tr>
<td>• Venous thrombosis</td>
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<tr>
<td>• Water ski kneeboards</td>
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</table>
Although the most common site of injury following surgical procedures is at the fibular head, focal fibular neuropathies have also been reported at the level of the calf, ankle, and foot. Following total knee replacements, fibular nerve abnormalities may present with sensory symptoms or decreased range of motion. Following high tibial osteotomies, done in association with fibular osteotomies, fibular nerve abnormalities have been noted in 2% to 27% of cases. The abnormalities of ankle and toe extension and the sensory loss described following these procedures are thought to result from hardware placement, tourniquet effects, or the fibular osteotomy. Nerve abnormalities as the result of surgeries may be subclinical. In 11 cases studied prospectively with electrophysiologic testing, pre- and post-osteotomy surgery, abnormalities were present postoperatively in 27%, though only one patient was clinically symptomatic.

Fibular neuropathy is the most common lower limb mononeuropathy encountered in athletes. Common or proximal deep fibular nerve injuries at or near the level of the fibular head are most often found, particularly in football or soccer players, and may be seen in isolation or in association with severe ligamentous knee injuries or fractures. Some athletes reporting pain and weakness in a fibular nerve distribution have been found to have constriction of the nerve by the fibularis longus muscle. Acute or chronic exertional compartment syndrome may also result in foot drop and should be considered, particularly in athletes with intermittent complaints. Superficial fibular nerve injuries at the ankle have been described in soccer players. Due to excursion of superficial nerve with inversion, injury may be seen in association with ankle inversion sprains. Nerve abnormalities may also occur at the fibular head in the setting of ankle sprains due to traction of the nerve at the posterolateral knee because the patient’s foot is forced into plantar flexion and inversion.

Fibular neuropathies, though more frequently reported in adults, can also be seen in childhood. In a case series of 17 children, findings were similar to those of adults in that the common fibular nerve was most often injured (59%), as opposed to the

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- Weight loss
- Ankle or distal leg
- Ankle sprain
- Arthroscopy
- Boots
- Burn scar
- Edema
- Exertional compartment syndrome
- External fixator
- Fasciotomy for compartment syndrome
- Fascia
- Fracture
- Ganglion cyst
- Inferior extensor retinaculum
- Kneeling in prayer position
- Tightly fitting shoes

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deep (12%), superficial (5%), or a nonlocalizable level of injury (24%). Compression, trauma, or entrapment were the most common causes encountered.

**CLINICAL FEATURES**

Patients with fibular neuropathy often present with complaints of “foot drop” or catching their toe with ambulation, which may develop acutely or subacutely depending on the precipitating cause. There may also be complaints of sensory loss over the foot dorsum.

Clinical motor examination demonstrates weakness in ankle dorsiflexion and great toe extension with deep fibular and eversion weakness with superficial fibular involvement. Superficial peroneal nerve abnormalities are rarely present in isolation. Toe flexion and ankle plantar flexion strength should be normal. In the setting of a deep fibular neuropathy in conjunction with an accessory deep fibular nerve supplying complete innervation of the extensor digitorum brevis muscle, foot drop with preserved toe extension can be seen.

Sensory loss may be found over the foot dorsum (superficial branch) and/or in the first web space (deep branch). However, sensory symptoms may also be absent. More proximally, neuropraxia of the posterolateral cutaneous nerve of the calf has been reported with sensory deficits in the posterolateral upper calf. When symptoms are limited to the superficial sensory branches, generally patients complain of tingling, numbness, and/or pain in the distribution of the involved sensory fibers. In patients with entrapment of the superficial fibular nerve in the calf, these symptoms extend proximally or distally from the anterolateral leg. The distribution depends on whether one or both terminal branches of the superficial fibular nerve are involved. Those patients with entrapment in the calf fascia may note aggravation of symptoms with exercise. In these cases, a soft tissue bulge with resisted dorsiflexion of the ankle, and a Tinel sign or tenderness at the bulge has been described. In the case of more distal nerve involvement at the ankle, findings may be limited to the involved branches and isolated sensory loss involving specific superficial fibular nerve branches to digits 2 to 5 has also been documented.

The term anterior tarsal tunnel syndrome refers to compression of the deep fibular nerve under the inferior extensor retinaculum. Although the fibular nerve is a mixed sensorimotor nerve at the ankle, patients with anterior tarsal tunnel syndrome have been reported to describe more sensory symptoms. Primary complaints include numbness and paresthesias in the first dorsal web space that may awaken the patient from sleep.

**ASSESSMENT**

**Electrodiagnostic Evaluation**

Electrodiagnostic studies should include an evaluation of motor and sensory axons of the fibular nerve and its branches using nerve conduction studies and electromyographic examination of relevant muscles (Table 1). Appropriate testing to rule out other disorders that may mimic fibular neuropathy (radiculopathy, plexopathy, or generalized disorders) should also be included.

**Motor conduction studies**

Motor conduction studies have been used for localization of the site of the nerve injury, assessing the severity of the injury and following the recovery process. Motor nerve conduction studies are most often performed to the extensor digitorum brevis. Stimulation sites should include the ankle, fibular neck, and popliteal fossa using an 8 to 10 cm
<table>
<thead>
<tr>
<th>Electrophysiologic Study</th>
<th>Nerve or Muscle</th>
<th>Recording Site</th>
<th>Stimulation Site</th>
<th>Findings in Fibular Neuropathy and the Fibular Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Nerve Conduction Study</td>
<td>Fibular (Peroneal)</td>
<td>Extensor digitorum brevis</td>
<td>Ankle Below fibular head Above fibular head</td>
<td>Low amplitude, or drop in amplitude across fibular head, or both. Slowed conduction velocity across fibular head</td>
</tr>
<tr>
<td></td>
<td>Fibular (Peroneal)</td>
<td>Anterior tibialis</td>
<td>Below fibular head Above fibular head</td>
<td>Low amplitude or drop in amplitude across the fibular head. Slowed conduction velocity.</td>
</tr>
<tr>
<td></td>
<td>Tibial</td>
<td>Abductor hallucis</td>
<td>Ankle Popliteal fossa</td>
<td>Normal</td>
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</table>

Sensory Nerve Conduction Study

<table>
<thead>
<tr>
<th>Electromyography</th>
<th>Anterior tibialis</th>
<th>NA</th>
<th>NA</th>
<th>Abnormal (may be normal if purely demyelinating lesion)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fibularis (peroneus) longus</td>
<td>NA</td>
<td>NA</td>
<td>Abnormal (may be normal if purely demyelinating lesion)</td>
</tr>
<tr>
<td></td>
<td>Biceps femoris, Short head</td>
<td>NA</td>
<td>NA</td>
<td>Normal</td>
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<tr>
<td></td>
<td>Tibial-innervated L5 (posterior tibialis, flexor digitorum longus)</td>
<td>NA</td>
<td>NA</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td>Gluteus medius or tensor fascia lata</td>
<td>NA</td>
<td>NA</td>
<td>Normal</td>
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<tr>
<td></td>
<td>Paraspinal muscles</td>
<td>NA</td>
<td>NA</td>
<td>Normal</td>
</tr>
</tbody>
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Abbreviation: NA, not applicable.
segment across the fibular head. In severe or chronic cases, no response may be recorded. Because the goal is to assess for conduction slowing, conduction block and axon loss, an absent response does not give information about the underlying pathophysiology. Thus, motor nerve conduction studies should be performed recording over the tibialis anterior muscle, with stimulation sites at the fibular neck and in the popliteal fossa, if there is no response on studies to the extensor digitorum brevis muscle. Focal conduction slowing or block may be evident on such studies. If motor or sensory fibular studies are abnormal, then further nerve conduction studies should be performed to exclude a more diffuse process.

In case series, muscles supplied by the deep compared with the superficial fibular nerve are most frequently reported as abnormal and more severely involved in fibular neuropathy at the fibular head. The intraneural topography of the common fibular nerve at this level may explain the particular pattern of involvement, in the same way it has been used to explain the differential involvement of fascicles within the ulnar nerve at the elbow. At the level of the fibular head, the fascicles of the deep fibular nerve are located anteriorly and, thus, are more sensitive to pressure or stretch. It is also possible that this branch is preferentially affected due to tethering in the fibular tunnel.

Electrophysiologically, the accessory fibular nerve may result in unexpected changes on motor nerve conduction studies recording at the extensor digitorum brevis muscle. In such cases, maximal stimulation of the deep fibular nerve at the ankle produces a smaller response with recording at the extensor digitorum brevis muscle, compared with responses with maximal stimulation at the knee. A response may be recorded from the extensor digitorum brevis if stimulation is applied posterior to the lateral malleolus.

Nerve conduction study parameters should be compared between the below fibular head and the across fibular head segment. The following suggest a focal lesion at the fibular head: a significant drop in conduction velocity between the ankle to the below fibular head segment compared with the across fibular segment and/or a significant decrease in the compound muscle action potential negative peak amplitude from the below fibular head stimulation site to the above fibular head site, which suggests conduction block or focal demyelination. A greater than 20% drop in fibular motor amplitude across the knee segment had a specificity of 99% in localizing fibular nerve lesions at the knee. Short segment stimulation of the fibular nerve across the knee segment has also been described. Though motor conduction is most often recorded proximally from the anterior tibialis, it may also be recorded over the fibularis brevis muscle. Comparison of side-to-side amplitudes distally can be used to assess relative amounts of axonal loss.

Katirji and Wilbourn reported electrophysiological findings in 116 nerves of 103 patients with fibular neuropathies. In this study, motor nerve conduction studies to the extensor digitorum brevis and tibialis anterior muscles were performed bilaterally. No response was recorded in 45 nerve lesions to the extensor digitorum brevis, but the fibular motor response to the tibialis anterior was unobtainable in only 13% (15 limbs). Axonal loss was uniformly present. In 52 of the 116 limbs, a conduction block was localized to the region of the fibular head. The motor nerve conduction study to the tibialis anterior muscle was helpful in localizing lesions to conduction block at the fibular head. In a study assessing the relative contributions of motor axonal loss versus focal conduction block, axonal degeneration was found to be greater in motor fibers to the extensor digitorum brevis, whereas, conversely, conduction block was more often found in anterolateral compartment recordings. Interestingly, it has been found that, despite extensive axonal loss, conduction velocity distal to the fibular head may not be...
slowed. This suggests that larger myelinated fibers are less involved. Major conduction abnormalities were most often found between the midfibular head and the popliteal fossa.\textsuperscript{14}

**Sensory Nerve Conduction Studies**

Antidromic evaluation of the two sensory branches of the superficial fibular nerve at the ankle can be done with surface stimulation applied 14 cm proximal to the recording electrodes at the anterior edge of the fibula, with the recording electrodes at the level of the malleoli, placed over the intermediate and medial dorsal cutaneous nerves (as located with palpation with the ankle inverted and plantarflexed)\textsuperscript{54} or 3 cm proximal to the bimalleolar line.\textsuperscript{54,55} Jabre\textsuperscript{56} reported a similar technique using the intermediate dorsal cutaneous branch, but stimulating 12 cm proximal to the recording site. The superficial fibular nerve conduction studies may be normal in a common fibular neuropathy despite severe abnormalities in the deep fibular distribution.\textsuperscript{57} There seems to be selective vulnerability of the deep fibular fibers to compression or stretch. Sural conduction studies may be normal in fibular neuropathies at the fibular head, despite contributions from the fibular nerve to the sural, and should be normal with more distal lesions.\textsuperscript{16,58} Sensory studies may be normal in some cases despite abnormalities documented in motor nerve conduction studies.\textsuperscript{59}

If focal involvement of a distal sensory branch is suspected, nerve conduction studies to each of the digital branches of the superficial fibular nerve may be performed.\textsuperscript{60} Patients with clinical findings limited to sensory distribution of the deep fibular sensory nerve (first web space of the foot) may be evaluated with nerve conduction studies to evaluate this specific branch.\textsuperscript{61} Finally, if focal sensory abnormalities are reported in the upper posterolateral calf, nerve conduction studies to evaluate the posterolateral cutaneous nerve of the calf can also be performed.\textsuperscript{62}

**Needle Electromyography**

Needle electromyographic examination should include the tibialis anterior muscle. This muscle is the most likely muscle to demonstrate abnormalities on the needle examination.\textsuperscript{16} The examination should also include at least one muscle innervated by the superficial fibular nerve, the short head of the biceps femoris, and at least one tibial innervated muscle distal to the knee. The short head of the biceps femoris, the only fibular-innervated muscle above the knee, is abnormal with a more proximal mononeuropathy involving the fibular division of the sciatic. Sciatic nerve lesions may mimic fibular neuropathies because of the fascicular arrangement of the nerve in the thigh.\textsuperscript{63,64} The fibular nerve fibers in the thigh seem to be more susceptible to injury compared with those of the tibia, and clinically only fibular nerve involvement may be suspected. This susceptibility is thought to arise from several factors, including the fibular nerve’s more lateral location, the larger funiculi, or its tethering and course around the fibular head. Electrophysiologically, a sciatic neuropathy can be distinguished by assessing tibial motor and sensory conduction, as well as evaluating for axonal loss in tibial nerve innervated muscles, including those in the thigh. If a distal tibial innervated muscle is abnormal or if the short head of the biceps femoris is abnormal, then the examination should be extended to include more proximal sciatic innervated muscles to exclude a sciatic neuropathy as well as an evaluation of gluteal muscles (abnormal in a lumbosacral plexopathy), and a lumbosacral paraspinous examination to exclude a radiculopathy or polyradiculopathy. Deep fibular abnormalities may be severe with common fibular neuropathy, with normal superficial sensory responses.
Evidence for the use of electrodiagnostic studies
An evidence-based review conducted by the American Association of Neuromuscular and Electrodiagnostic Medicine concluded that there was class III evidence supporting the use of nerve conduction studies for the diagnosis of fibular neuropathy, specifically motor nerve conductions of the fibular nerve recording from the tibialis anterior and extensor digitorum brevis muscles (including conduction through the leg and across the fibular head), and orthodromic and antidromic superficial fibular sensory nerve conduction studies. In addition, class III and IV evidence was found for its usefulness in providing information with regard to recovery of function, whereas evidence was limited to class IV for the role of needle electromyography.

Complementary Assessment Techniques
Ultrasonography has been used to assess the fibular nerve across the fibular head, as well as the superficial fibular nerve as it exits in the calf. The superficial fibular nerve became subcutaneous at about one-fourth of the fibular length. High-resolution ultrasonography may easily evaluate the nerve in its more superficial locations, such as around the fibular head. Body mass index has been found to be positively correlated with fibular nerve and fibular tunnel cross-sectional area and, thus, these parameters should be considered in evaluation with ultrasonography.

Magnetic resonance (MR) neurography is increasingly being used to define the site and extent of peripheral nerve disorders. High-field MR scanners allow high resolution and soft tissue contrast imaging of peripheral nerves. Secondary muscle denervation changes may also be seen. As with the results of MRI, it may be used to detect space-occupying lesions. Use of these imaging modalities is more important in nontraumatic fibular neuropathies because they may detect intraneural ganglia.

ASSESSMENT OF RECOVERY
Electrodiagnostics have been used to identify the potential for recovery of functional movement. Smith and Trojaborg followed a group of 14 subjects with fibular palsy at the head of the fibula, related either to compression at the time of surgery, crossed legs, or occurring spontaneously. At the time of follow-up, which spanned 5 months to 3 years, less than half of the subjects demonstrated complete recovery. All subjects with full clinical recovery had normal sensory conduction distal to the fibular head at the time of the initial study and only one had reduced amplitude SNAP. Similarly, all patients who recovered clinically had normal initial conduction velocities distal to the fibular head.

Derr and colleagues evaluated electrodiagnostic features associated with good recovery of function at follow-up in persons with fibular neuropathy diagnosed electrophysiologically. Good recovery in this study was defined by Medical Research Council Scale muscle strength grade 4 or 5 for ankle dorsiflexion. Any compound muscle action potential response recorded from the tibialis anterior or extensor digitorum brevis at baseline was associated with a good response (81% and 94%, respectively) compared with absent responses. However, it has been found that good outcome was still possible with an absent compound muscle action potential response. Recruitment in the tibialis anterior has also found to be predictive in cases of traumatic injury. Subjects with discrete or absent recruitment in the tibialis anterior tend to have a poorer outcome. Individuals with nontraumatic compression are more likely to have a good outcome.
Treatment Options

Treatment of fibular nerve injuries depends on the cause and the degree of weakness or sensory symptoms. In cases of compression, relief from external compressive sources should be in the initial intervention or in the case of intraneural ganglia, surgical referral. Open lacerations should undergo exploration and surgical repair as appropriate. If weakness is incomplete, strengthening exercises can be used to improve function. With complete loss of dorsiflexion, stretching to maintain ankle range of motion should be performed to prevent equinovarus deformity. Orthotic interventions include a lateral wedge shoe insert in the case of isolated superficial fibular neuropathies to decrease supination of the foot or an ankle foot orthosis with common or deep fibular neuropathy and significant ankle dorsiflexor weakness.

Options for intervention with persistent nerve injury include neurolysis, nerve repair, and nerve and tendon transfers. Electrophysiologic studies may identify reinnervation along with clinical examinations and the need for surgical intervention. Posterior tibialis tendon transfers have been used to restore ankle dorsiflexion with absent recovery.

Surgical outcomes for fibular neuropathy have been reported in large case series. Follow-up outcomes of 318 operatively-managed common fibular nerve lesions associated with a variety of mechanisms (stretch or contusions, lacerations, tumors, entrapments, stretch dislocations with fractures or dislocations, compression, iatrogenic injuries and gun shot wounds) found that of the 19 subjects who underwent end-to-end suture repair, 84% achieved good recovery by 24 months. In subjects requiring graft repair, graft length correlated with recovery; of those with grafts less than 6 cm long, 75% had good recovery of function. Longer grafts generally correlated with more severe injuries and poorer outcomes. Decompression surgery when symptoms were limited to sensory findings has associated with recovery of function at follow-up in other studies. Posterior tibial tendon transfers through the interosseous membrane followed by fixation to the anterior tibial and long fibular tendons have been reported to allow gait without an orthosis and improved quality of life in most patients.

SUMMARY

Fibular (peroneal) neuropathy is the most common mononeuropathy found in the lower limb and may be encountered as the result of acute traumatic injuries, surgical intervention, or with chronic stretch or compression. Clinically, sciatic mononeuropathies, L5 radiculopathies, and lumbosacral plexopathies may present with similar findings of ankle dorsiflexor weakness. More generalized disorders may also present with this symptom and, thus, evaluation is needed to distinguish these various disorders. The most common site of injury to the fibular nerve is at the fibular head. Electrodiagnostic studies have shown that the deep fibular branch is more frequently abnormal than the superficial branch; however, findings may be limited to specific motor or sensory branches, depending on the mechanism of injury. Electrodiagnostic studies are useful to determine the level and type (axonal, demyelinating) of injury. Studies should include motor nerve conduction studies to the extensor digitorum brevis and anterior tibialis muscles, superficial fibular sensory nerve conduction studies, and other motor nerve conduction studies outside the fibular distribution to distinguish a disorder localized to the fibular nerve from more extensive nerve abnormalities. The presence of any compound muscle action potential response on motor nerve conduction studies, recorded from either the tibialis anterior or extensor digitorum brevis, is associated with good long-term outcome. However, recovery is still possible despite an initial absent response.
REFERENCES


