

Evaluation of Neuropathies/Nerve Entrapment Around the Knee Joint

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52.1 The Infrapatellar Branch of the Saphenous Nerve Injury

52.1.1 Anatomy

The saphenous nerve is a clinically important nerve, which may differ in its anatomical course not only among individuals but also between the left and right limbs of a person. It is the longest cutaneous branch of the femoral nerve and further divides into the sartorial and infrapatellar branches. The first branch, the sartorial, runs along the great saphenous vein to the medial side

of the foot. The second one, the infrapatellar branch of the saphenous nerve (IPBSN), diverges from the main saphenous nerve at the level of the knee joint. It then courses around the posterior border of the sartorius muscle, and it pierces the fascia lata. It has three branches in the subcutaneous layer of the anteromedial part of the knee and supplies the skin over the medial and front sides of the knee, as well as the patellar ligament. There are many studies regarding the variants of the IPBSN. It may emerge anteriorly or posteriorly to the sartorius muscle or penetrate this muscle.

52.1.2 Causes

The potential for surgical trauma to the IPBSN has been known since 1945 [1]. It may often take a long time before a correct diagnosis of this syndrome is made, and it may be misdiagnosed or even overlooked by physicians. The infrapatellar pain syndrome may occur secondary to many factors, including post-traumatic and post-surgical ones. It may thus be caused by an everyday, direct fall on the knee, as well as plenty of surgical procedures including arthroscopy, total knee replacement, and bone-patellar tendon-bone or hamstring tendon harvesting for anterior cruciate ligament (ACL) procedures [1]. The injury mainly occurs during tendon harvesting (Figs. 52.1 and 52.2).

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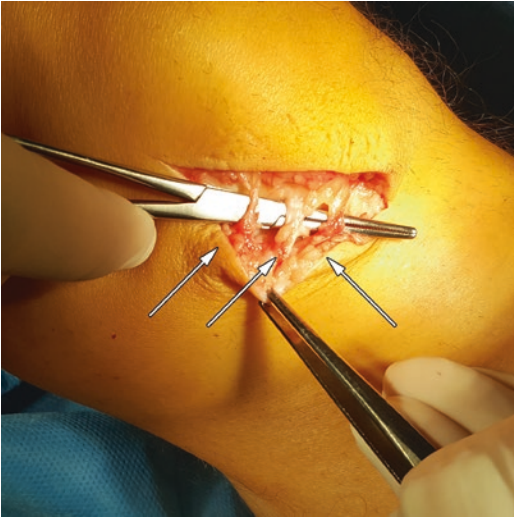


Fig. 52.1 Left knee of a 35-year-old male during revision surgery after ACL reconstruction. Infrapatellar nerve branches' entrapment in the scar tissue in the region of pes anserinus (arrow)



Fig. 52.2 Right knee of a 24-year-old male during revision surgery after ACL reconstruction. Histologically confirmed infrapatellar nerve neuroma formation in the area of the anteromedial portal

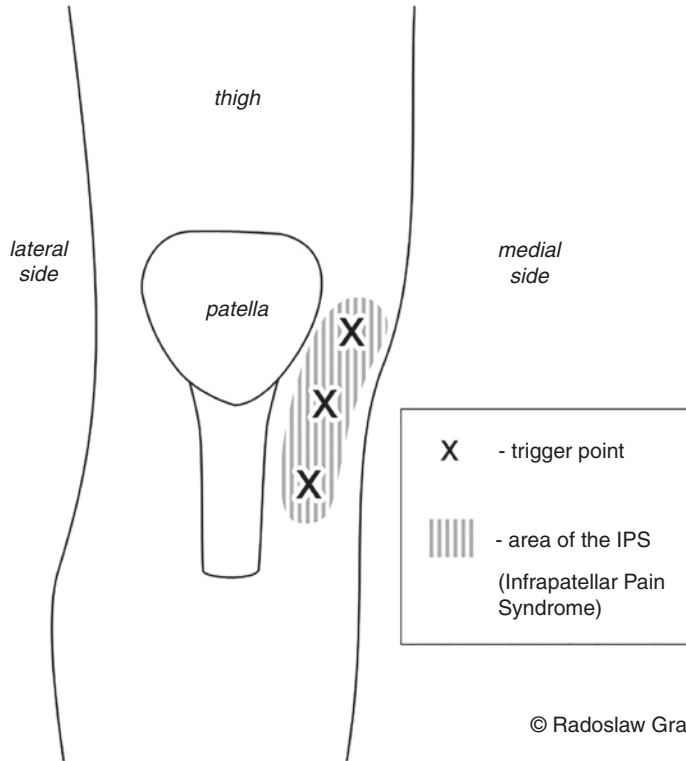
52.1.3 Examination

Figueroa et al. [2] described four types of disturbances including hypoesthesia, dysesthesia, painful neuroma, and reflex sympathetic dystrophy. The infrapatellar pain syndrome (IPS) has often been described as a pain similar to a toothache. This pain is present even at rest and increases during palpation of the skin at this

region. Three trigger points were found and are depicted in Fig. 52.3.

Thinking about a neuroma due to injury of the IPBSN, it is crucial to bear in mind the other nerves located in this region: the lateral cutaneous nerve of the thigh, the intermediate cutaneous nerve of the thigh, and the anterior division of the medial cutaneous nerve of the thigh.

Fig. 52.3 Schematic presentation of the IPS trigger points



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52.2 Peroneal Neuropathy

52.2.1 Anatomy

The common peroneal nerve (CPN) is a branch of the sciatic nerve that separates at the upper level of the popliteal space. In the distal thigh, it gives one motor branch to the short head of the biceps femoris muscle. This is the only motor branch proximal to the fibular head. The CPN travels superficially to the lateral head of the gastrocnemius and plantaris muscles as it provides the cutaneous innervation to the lateral aspect of the calf (by the lateral cutaneous nerve of the calf and a communicating branch that anastomoses with the sural nerve). At the fibular neck, the peroneal nerve passes through a fibro-osseous tunnel, the roof of which is formed by the origin of the peroneus longus and the intermuscular septum. It continues between the peroneus longus muscle and the fibula. At this point, it divides into two main branches: the deep peroneal and superficial peroneal nerves. The deep peroneal

nerve innervates the anterior muscles of the leg by traveling deep to the peroneus longus. This nerve supplies the tibialis anterior, extensor digitorum longus, peroneus tertius, and extensor hallucis longus. These muscles control foot dorsiflexion and toe extension. Additionally, it provides a sensory branch to the first interdigital space. The superficial peroneal nerve supplies the peroneus longus and brevis muscles and then penetrates the lateral fascia at the junction of the mid- and distal calf as the medial and lateral cutaneous branches to supply sensation to the antero-lateral aspect of the distal calf and dorsum of the foot.

52.2.2 Causes

Causes of peroneal nerve palsy can be divided into two large categories. At the level of the knee, the CPN can be compressed by normal or pathological structures. Anatomical structures can compress the CPN secondary to repetitive

activity or unusual position. The common peroneal nerve may be compressed by the tendinous origin of the peroneus longus as it winds around the fibular head and passes through the fibrosis tunnel [3]. Nerve entrapment at the level of the biceps femoris tendon in the popliteal fascia was also reported [4, 5]. Common peroneal nerve compression has been found secondary to kneeling, crossed-leg sitting, prolonged squatting, and lying on hard surfaces. Weight loss, malnutrition, and diabetes may predispose to this condition [4]. Peroneal neuropathy has also been reported after bariatric surgery [6]. The proposed mechanism is a loss of adipose tissue previously protecting the CPN. In addition, patients who require prolonged bed rest after surgery may be at risk for peroneal neuropathy due to the tendency of the lower limb to rest in external rotation of the hip. A preventative program should thus be instituted during hospitalization.

The second major cause of CPN neuropathy around the knee includes tumors. Intra-neural ganglion cysts are the most common mass lesion in peroneal neuropathy. Other tumors, in order of decreasing frequency, include schwannoma, neurofibroma, osteochondroma, neurogenic sarcoma, focal hypertrophic neuropathy, desmoid tumor, and glomus tumor [7].

52.2.3 Examination

Pain can be the earliest symptom in peroneal neuropathy, usually preceding sensory changes in a similar distribution. Tapping over the area where the CPN winds around the head of the fibula may reproduce dysesthesia in the lateral calf or foot. A careful sensory examination can assist with localizing the lesion. The patient's leg should be examined for ecchymosis, edema, or ulcers. Evidence of trauma or vascular compromise may help to determine the cause of the lesion. All muscles of the lower limb should be examined for weakness and compared to the contralateral side. Weakness of the ankle dorsiflexors, toe extensors, and ankle evertors, commonly referred to as foot drop, is suggestive of peroneal

neuropathy. Less frequently, lumbosacral plexopathy can result in weakness in a similar distribution. The tibialis posterior, innervated by the tibial nerve, contributes most to ankle inversion. If the ankle inversion is weak, the lesion involves more than the common peroneal nerve. In addition, weakness in peroneal neuropathy may lead to functional gait impairment.

The main manifestation of peroneal neuropathy is foot drop. Examining normal and pathologic reflexes can further narrow down the differential diagnosis. The presence of pathologic reflexes, such as a Babinski reflex, suggests foot drop of central origin.

Clinically, peroneal neuropathy appears most similarly to L5 radiculopathy. Concurrent low back pain or posterolateral thigh pain suggests spinal origin of symptoms. Absent or diminished patellar tendon (innervated by L2–L4) and Achilles tendon (innervated by S1) reflexes suggest a peripheral origin of foot drop. Sensation of the area between the first and second toes' plantar surface of the foot is disrupted in both cases.

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