

Saki Kamata

57.1 Introduction

57.1.1 What is the Posterior Tibial Nerve Block?

The tibial nerve is the nerve that is present inside the two large branches of the sciatic nerve. When exiting the popliteal fossa, the tibial nerve is still located in deep layers of the muscle [1]. Therefore, the occurrence of neuropathies is rare in this region.

57.2 Indications

Indications for the posterior tibial nerve block include anesthesia for surgery, pain caused by peripheral arterial disease, reflex sympathetic dystrophy, entrapment neuropathy (such as Morton's neuroma and tarsal tunnel syndrome), and knee joint pain caused by osteoarthritis of the knee joint.

57.3 Anatomy

The tibial nerve is a branch of the sciatic nerve, originating from the lumbar nerve roots of L4 to L5 and the sacral nerve roots of S1–S3. It splits from the common peroneal nerve at the distal 1/3 of the femur before traveling down. The tibial nerve is about two times larger in diameter than the common peroneal nerve. It descends with the posterior tibial artery along the posterior part of the knee joint through the deep layers and intersects with the popliteus muscle before existing between the two heads of the gastrocnemius muscle below the soleus muscle. The nerve then travels down underneath these muscles, along the medial border of the Achilles tendon, before reaching the flexor retinaculum where it splits

into the medial and lateral plantar nerves. The articular branches of the tibial nerve are distributed to the knee joint and talocrural joint. The muscular branches are distributed mainly to the gastrocnemius muscle, soleus muscle, plantar muscle, popliteal muscle, posterior tibial muscle, flexor digitorum longus muscle, and flexor hallucis longus muscle. The cutaneous branches of the tibial nerve include medial sural cutaneous nerve, medial calcaneal branches, medial plantar nerve, and lateral plantar nerve and provide sensory innervation to the skin below the lower leg.

57.4 Instruments and Drug Solutions

- High-frequency linear ultrasound probe
- A 27 G × 1.9 cm or 25 G × 2.5 cm disposable needle
- A 5 mL syringe (Carbocaine 0.5–1%)
- A water-soluble steroid

57.5 Procedures and Techniques (Fig. 57.1)

57.5.1 Approach from the Popliteal Fossa

The patient is placed in the prone position. A high-frequency linear ultrasound probe is usually used to obtain high-resolution images; however, since the target nerve is located slightly deeper than the superficial layers, a lower-frequency probe may be desired depending on the patient's physical size. The probe is placed perpendicular to the longitudinal axis of the knee joint. First, the popliteal artery and vein are identified on ultrasound images of the transverse creases of the popliteal fossa. If the images are unclear, the use of color Doppler is recommended. The tibial nerve can generally be identified at this location, in the superficial layers immediately lateral to the popliteal artery and vein. The tibial nerve is located about 1-cm deep to the surface and about 0.5–1.5 cm distal to the popliteal artery, which serves as a landmark. At this level, the shape of the tibial nerve appears to be

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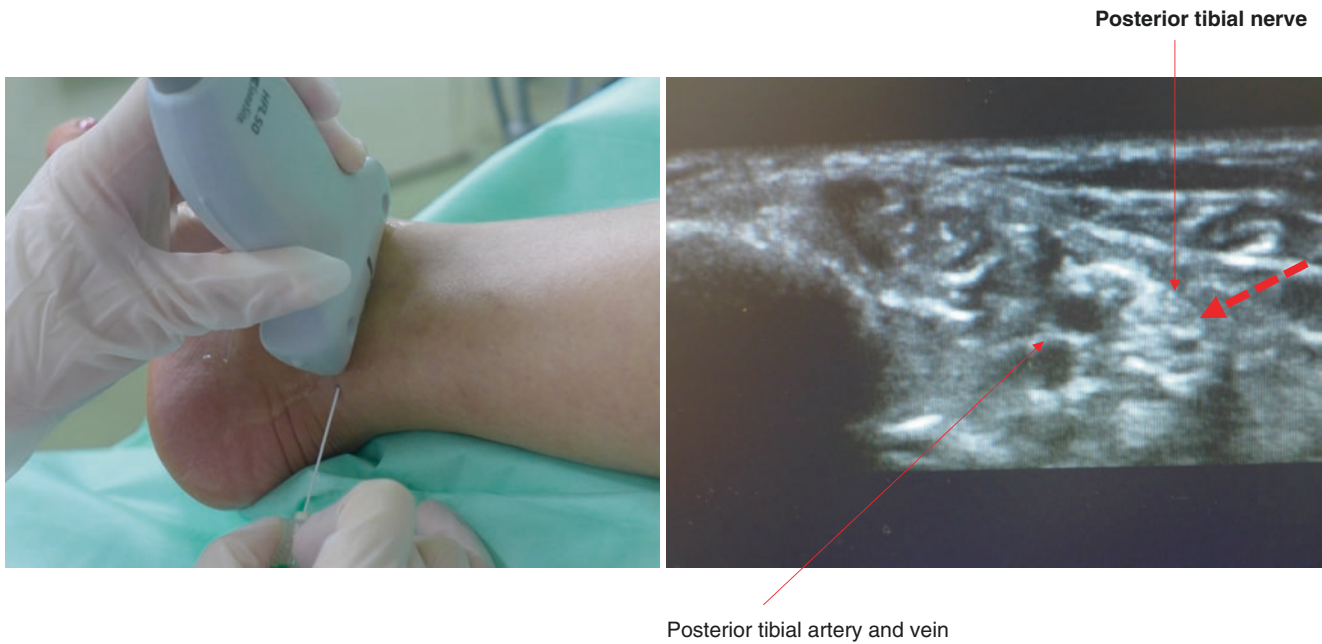


Fig. 57.1 Posterior tibial nerve block

circular or elliptical measuring 4–10 mm in diameter. On the lateral side of the tibial nerve, the common peroneal nerve may also be seen with similar shading. Local anesthesia is administered intradermally or subcutaneously as needed, and the needle is inserted from the mid-lateral side of the probe, in parallel to the probe. The needle tip is advanced as close to the target nerve as possible. The needle is then held in place, and 2–5 mL of a local anesthetic agent is injected while ensuring that there is no backflow of blood.

57.5.2 Approach from the Medial Malleolus

The patient is placed in the supine position. If necessary, a pillow or bolster is placed underneath the lower leg on the affected side to elevate the ankle to improve the ease of the procedure. Since the tibial nerve is located relatively superficial at the level of the medial malleolus, a high-frequency linear ultrasound probe is used to obtain high-resolution images. In an average-sized adult patient, the ultrasound image depth should be set at approximately 2 cm. The probe is placed dorsal to the medial malleolus and perpendicular to the longitudinal axis of the tibial bone. The pulsatile posterior tibial artery is identified near the tibial bone, which appears as a hyperechoic area with acoustic shadowing. The

tibial nerve is often located immediately posterolateral to the posterior tibial artery and seen as a circular or oval honeycomb structure. Local anesthesia is administered intradermally or subcutaneously as needed, and the needle is inserted from the anterior side of the probe, in parallel to the probe. The needle tip is advanced as close to the target nerve as possible. The needle is then held in place, and 2–5 mL of a local anesthetic agent is injected while ensuring there is no backflow of blood [2].

57.6 Complications

Infection, nerve damage, bleeding or hematoma formation resulting from vessel puncture, and paralysis of the muscles supplied by the nerve.

References

1. Tsui BCH. Ankle blocks. In: BCH T, editor. Atlas of ultrasound and nerve stimulation-guided regional anesthesia. New York: Springer-Verlag; 2007. p. 205–13. (in Japanese).
2. Saito Y, et al. Posterior tibial nerve block, Ultrasound-guided nerve block. Tokyo: Igakushoin; 2009. p. 312–3. (in Japanese).