

Foot Drop: Knee Surgery vs Sciatic Nerve Block

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Abstract

58 years old patient was brought to Operating room for Left knee reconstruction. He has a history of diabetes mellitus controlled on oral medication. Sciatic nerve block was performed at knee level along with adductor canal block for post-operative pain.

After surgery patient developed foot drop. Besides surgical complication, it was thought can sciatic nerve block cause foot drop by injury to common peroneal nerve.

Introduction

Sciatic & Femoral nerve blocks are performed to control pain in patients with knee surgery. The techniques of these blocks have changed to maintain motor function for physical therapy and rapid recovery.

Every year, there are more than half a million knee replacements performed in USA. With aging population, this number is destined to increase in the coming years. Knee replacement is one of the most painful orthopedic surgeries, as reported by the patients.

Knee joint is supplied by branches of lumbo sacral plexus mainly from Sciatic, Femoral & small part from obturator nerve. To control pain several different modalities are used & have been modified. Besides pharmacological therapy, nerves blocks have gained the popularity to alleviate the side effects of pharmacological therapy especially to circumvent the side effects of the opioids. In the past Femoral nerve was blocked to control pain for knee surgery. But complete femoral nerve block would cause weakness of thigh muscles & hinder in physical therapy post surgically. Femoral nerve arises from lumbo sacral plexus by contributions from Lumber 2, 3 & four.

Sciatic nerve is the largest nerve in the body and supplies the muscles of the lower leg. Blocking sciatic nerve at the level of popliteal fossa provides same results at blocking this nerve at the thigh level.

Technique

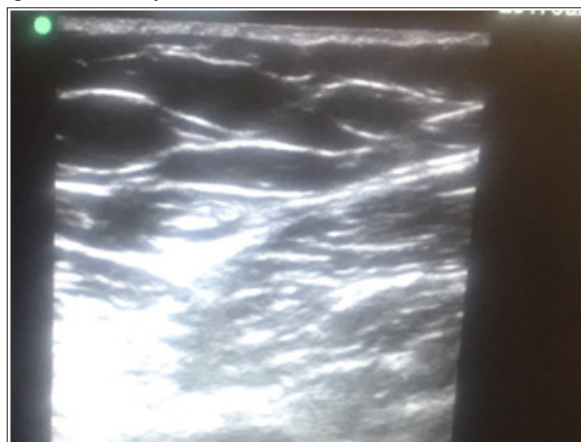
Sciatic nerve block is performed at the level of popliteal fossa known as popliteal block. There are two methods of performing this block. First is placing the patient in prone position & blocking at the apex of the popliteal fossa. Popliteal block can also be performed with pt. being in the supine position, elevating the leg & performing the

block from the lateral side. This is a more desired approach due to the ease of technique & comfort of the pt. femoral nerve was blocked at the inguinal level which would block both the motor & sensory portions of the nerve. Nerve could easily be identified with the help of ultrasound as hypoechoic structure just lateral to femoral artery.

Now only the sensory portion of the femoral nerve is blocked at the adductor canal to block the sensory portion which obtunds the pain sensation.

Description

Sciatic nerve block at the level of the popliteal nerve in a lateral position is a more desirable approach for Sciatic nerve block for knee & ankle surgeries. Adductor canal block at the level of mid-thigh blocks the sensory portion of femoral nerve. With this technique as there is no muscular weakness, pt. can perform physical therapy & has a quick recovery.

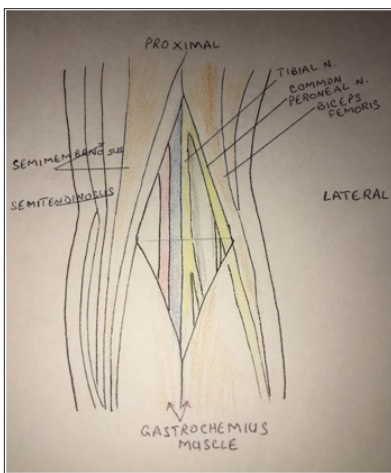


Femoral nerve can be blocked at the level of the groin just lateral to the femoral artery. Femoral artery is identified with the help of the ultra sound. The anatomical landmarks from lateral to medial side are Femoral nerve, Femoral artery, Femoral vein, empty space & lymphatic's. Femoral artery is pulsatile, thick walled and non-compressible, while femoral vein is no pulsatile, thin walled & compressible. If color is added to ultra sound machine the red or blue color does not specify the artery or the vein. The red color means that the flow is towards the probe while blue color means that the flow is away from the probe.



Femoral nerve can also be blocked at the level of the mid-thigh where femoral nerve is continued as the saphenous nerve which is a pure sensory continuation of femoral nerve. At mid-thigh saphenous nerve is close to the femoral artery. In a more distal part of leg the femoral nerve could be identified as a long horn view. At this level the saphenous nerve is at the head of the cow & the facial sheath below the vastus muscle which form the horns of the cow.

Ten cc. of local anesthetic either Bupivacaine 0.25% or Ropivacaine 0.2% is usually sufficient to block this nerve.



Femoral nerve gives motor supply to three vasti muscles, vastus lateralis, intermedius, medialis, and also to Sartorius & Pectineus. These Quadriceps muscles would become weak if femoral nerve is blocked & hinder in physical therapy. Saphenous nerve is a continuation of femoral nerve & provides sensation to the medial side of the knee & the leg.

Saphenous nerve can be blocked at mid-thigh and this block is called adductor canal block as the saphenous nerve lies between adductor muscles. The adductor canal is a triangular space bordered by Sartorius superiorly, Vastus longus & magnus posteriorly & laterally by vastus medialis.

The posterior branch of femoral nerve provides motor innervation to the quadriceps muscle (rectus femoris, vastus intermedius, vastus lateralis, and vastus medialis) and sensory innervation to the medial aspect of the lower leg via the saphenous nerve.

The sciatic nerve emerges from the lesser pelvis cavity via the infrapiriform foramen and runs on below the gluteus Maximus. Immediately after emerging, the sciatic nerve enters in between the ischial tuberosity and the greater trochanter and proceeds onto the quadratus lumborum surface and finally becomes evident within the thigh region, arising from under the lower border of the gluteus maximus. Within the thigh region, the nerve runs deep between the neighboring muscles.

Clinical applications

Chilling of the area related to the nerve results in neuritis of the sciatic nerve (sciatica). The state features painful sensation within the ischial area and the posterior portion of the thigh. The condition may even feature sensory and motor disorders. The nerve exits from the lesser pelvis cavity via the piriform foramen and runs below the gluteus Maximus.

On reaching the upper angle of the popliteal fossa, the nerve splits into the terminal branches: - the tibial nerve and - the common peroneal nerve. The tibial nerve arises directly from the sciatic nerve and runs vertically down to the popliteal fossa. Within the fossa, the nerve occupies the most superficial position with respect to neighboring popliteal artery and popliteal vein. From the popliteal fossa, the nerve proceeds to the cruropopliteal canal. On escaping from the canal, the nerve loops around the medial malleolus and gives some branches to the ankle joint.

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and a medial half of the fourth toe. The muscular branches of the nerve supply the flexor digitorum brevis, all muscles of great toe and two lumbricals (1 and 2). 5. Lateral plantar nerve -superficial branch -deep branch they supply the lateral aspect of foot, the fifth toe and a lateral half of the fourth toe. The deep branch supplies all interossei, two lumbricals, the adductor hallucis, and the lateral head of flexor hallucis brevis. All muscles of great toe and two lumbricals (1 and 2). 5. Lateral plantar nerve -superficial branch -deep branch they supply the lateral aspect of foot, the fifth toe and a lateral half of the fourth toe.

Clinical applications Injury to the tibial nerve results in paralysis of pertaining flexors. The foot thus becomes permanently extended and the toes may resemble the claws. The common peroneal nerve from its origin runs laterally to reach the head of fibula. At that point, the nerve enters between the heads of the Peroneus longus and splits into the superficial and the deep peroneal nerves. Yet within the popliteal fossa, the nerve gives the lateral sural cutaneous nerve that merges with the medial sural cutaneous nerve to form the sural nerve. Very often, the nerves merge at the lower third of shin or even run separately. Clinical applications Injury to the peroneal nerve leads to inability to extend and to pronate the foot. The foot in this case hangs down and laterally.

Results

Exposure of peripheral nerves to local anesthetics may result in axonal damage, particularly if the solution is injected intrafascicularly, if the concentration is high, and if duration of exposure is prolonged. Disruption of numerous cellular functions may contribute to neuronal damage by local anesthetics, but elevated intracellular calcium levels may play a central role. Needle penetration of a nerve results in minimal lasting damage unless this is combined with local anesthetic administration within the nerve fascicle. Direct compression by a pronged tourniquet application may damage axons particularly of large myelinated fibers. Ischemia may also contribute to neuronal injury in proportion to the duration of blood flow interruption [1-4].

Conclusion

EMG and neurologic exam concluded that the peroneal nerve injury was caused by knee surgery, which is a rare complication of this type of operation. Patient was advised to have physical therapy and wear special shoes to support the foot drop.

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