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Role of saphenous nerve block in knee osteoarthritis

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Abstract
A complex degenerative disorder of the joints, knee osteoarthritis (OA) is marked by profound articular cartilage modification, alterations in osteophyte production, subchondral bone, and synovial inflammation. Pain and impaired functioning will be brought on by this illness. The saphenous nerve, which finishes the femoral nerve, is mostly a sensory nerve. It nourishes the knee joint's medial Compartment as well as a portion of the anterior compartment. To relieve pain following procedures on the knee, this nerve may have partially or completely block close to the knee joint by infiltrating by surgeons and anesthetists. The fluid has a tendency to additionally block the medial branches of the anterior femoral cutaneous nerve as we block the saphenous in the mid-thigh's sartorial canal.
Since the majority of individuals with knee OA have medial and anterior knee discomfort, it is predicted that this may completely relieve their symptoms. Ultrasound is used to better find the nerve, assuring accuracy.

Keywords: knee osteoarthritis, nerve block: saphenous, ultrasonography

Introduction
A prevalent ailment, knee OA contributes significantly to the burden of physical incapacity and may be accompanied by excruciating pain severe enough to cause serious mental anguish [1]. Articular cartilage and the subchondral bone of the knee are both affected by the condition known as osteoarthritis (OA). Pain and functional impairment will be brought on by this illness [2]. The main symptom of symptomatic OA and a major contributor to persistent impairment, which is most often present in the medial knees, is pain [3]. Weight reduction, exercise, alterations to daily routines, physiotherapy, analgesics and nonsteroidal anti-inflammatory medications (NSAIDs) are among the non-surgical pain management options for knee osteoarthritis. However, several studies have advocated intra-articular injections of corticosteroids, hyaluronic acid, dextrose, and platelet-rich plasma [4]. Additionally, several less invasive therapy methods, like US-guided saphenous nerve blocking, have proven successful in relieving pain in knee osteoarthritis [5]. The femoral nerve's only sensory branch is the saphenous nerve. It provides the anteromedial aspect of the knee, lower foot, and leg with a substantial amount of cutaneous innervation [6].
Blocking the saphenous in the sartorial canal in the middle of the thigh also is prone to blocking the medial branch of the anterior femoral cutaneous nerve, according to local Anesthesia. This is said to provide total relief from medial and anterior knee discomfort. Using ultrasound makes it easier to find the nerve and guarantees accuracy [7].

Saphenous nerve's origin and course
The posterior branching of the femoral nerve gives birth to the saphenous nerve (L3, L4) in the proximal portion of the anterior thigh. Subsequently, it passes lateral to the femoral artery after descending via the femoral triangle. Once within the adductor canal, additionally recognized as Hunter's canal, the saphenous nerve passes the femoral artery anteriorly and lies medially to it [8].

The superficial femoral vein, artery, saphenous nerve, Vastus Medialis nerve, and the posterior obturator nerve terminating nerve endings are all located inside the canal. The saphenous nerve emerges from the adductor canal and splits into two branches: the Infrapatellar branch, which gives a sensory branch to the knee's peripatellar plexus, and the sartorial branch, which runs across the superficial fascia separates the Sartorius and gracilis muscles and emerges to rest in the subcutaneous tissue underneath the fold of the knee [8].

It subsequently descends across the lengthy saphenous vein across the medial tibial boundary, supplying several cutaneous branches to the medial portion of the ankle, leg, and forefoot. A combination cadaver Y magnetic resonance imaging investigation which revealed the saphenous nerve sits in-between the gracilis and sartorius muscles at the the knee joint level has provided a clear description of the anatomic connection between the saphenous nerve and the adjacent muscles and tendons [8]. The nerve connects to the superficial branch of the common fibular nerve's medial branch. The front aspect of the leg is then supplied with feeling by both of these neurons [8].

Branching and innervation

At various points along the lower limb, the saphenous nerve produces multiple branches, including:

- The nerve branches out to the Subsartorial plexus in the center of the thigh.
- The nerve releases its greatest branch, the infrapatellar nerve, as soon as it leaves the adductor canal, which is located at the level of the medial femoral condyle of the femur. The medial and anterior portions of the knee are innervated by this nerve, which is additionally supplied the peripatellar plexus.
- The medial crural cutaneous branches of the nerve, which transmit feeling to the anterior and medial surfaces of the leg, are located in the lower part of the leg. The cutaneous branches of the obturator and femoral nerve are connected to these nerves [8].

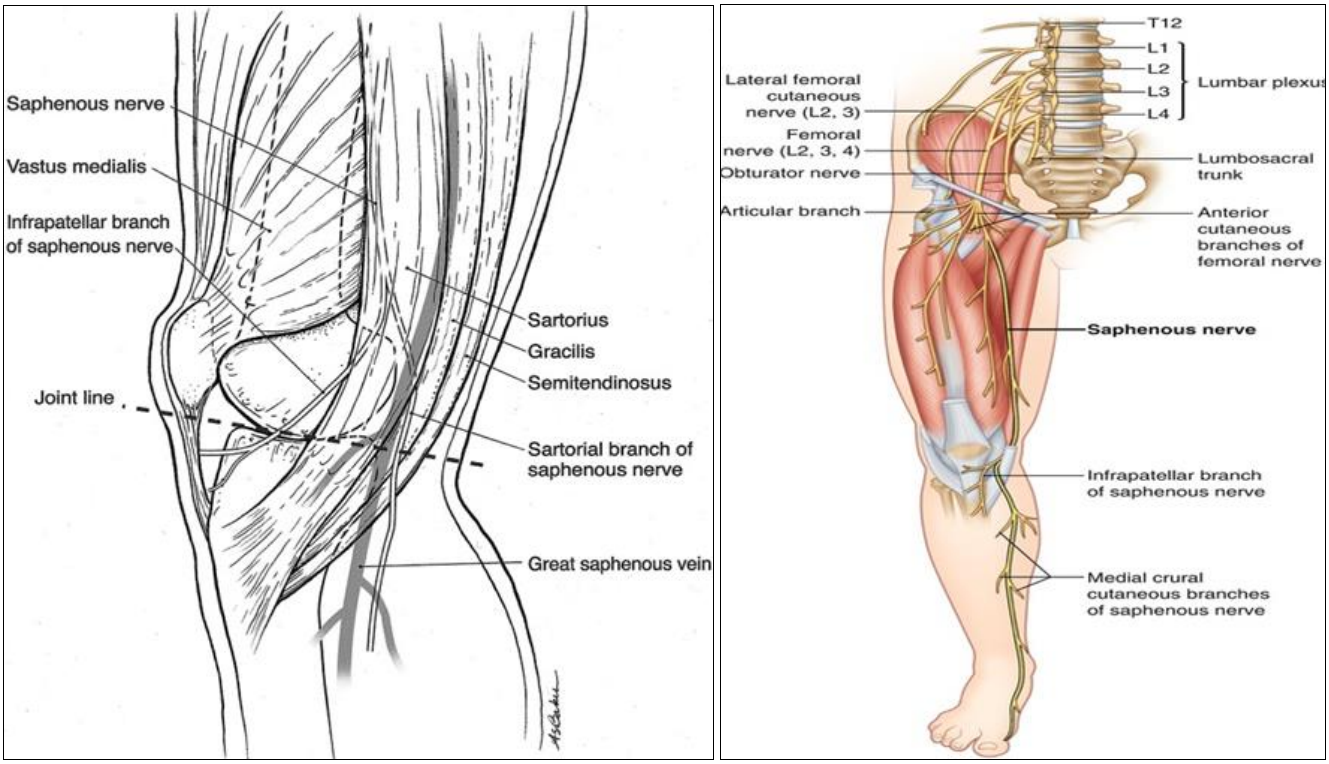

Fig 1: Anatomy of saphenous nerve [8].

Clinical relationships [9]

Saphenous vein cutdown

In order to reach the individual's venous system, a saphenous vein cutdown is performed. Harm to the saphenous nerve is a possible side effect of saphenous vein reduction. Sensation loss on the medial surface of the leg is one of the symptoms.

Saphenous nerve entrapment neuropathy

The adductor canal is a space that extends deep to the sartorius from the adductor hiatus to the apex of the femoral triangle. The adductor (Hunter's) canal is the passageway for the femoral vein and artery, as well as the saphenous nerve. The nerve may get trapped, leading to the symptoms listed below:

- Deep thigh pain
- Knee discomfort
- Sensation loss on the medially aspect of the leg

Blockage of the saphenous nerve

During a number of lower limb surgical operations, a saphenous nerve blockage is utilized as well as a sciatic nerve block.

Indications [10].

- Chronic knee OA discomfort.
- Arthroscopy of the knee.
- Reconstruction of the anterior cruciate ligament (ACL).
- Surgery on the low foot, ankle, and leg that affects skin that the saphenous nerve supplies.
- Complete and single component knee replacement.

- Along with other nerves that give feeling to the ankle area being blocked.

Contraindications [10].
- Refusal of the individual.
- Pain or discomfort at the injection site.
- Local anesthetic allergy.
- Disorders of bleeding or anticoagulation.
- Peripheral neuropathies that already exist.

Complications [10]:
- Failure of the block
- Bruising and bleeding.
- Illness.
- Toxicity from local anesthetics.
- Nerve damage.

Saphenous nerve block's mode of action

The saphenous nerve, which finishes the femoral nerve, is mostly a sensory nerve. It nourishes the knee joint's medial compartment as well as a portion of the anterior compartment. To relieve pain following knee surgery, this nerve has been partially or completely stopped close to the knee joint by infiltration by surgeons and anesthetists. The fluid has a tendency to additionally block the medial branch of the anterior femoral cutaneous nerve as we block the saphenous in the mid-thigh's sartorial canal. (11) Given that the majority of individuals with knee OA have pain in the medial and anterior knees, it is expected that treatment may completely relieve that discomfort.

Local anesthetics temporarily rob a region of its feeling by temporarily blocking nerve conduction close to the site of injection. Inhibition of sodium channels at the nerve terminals and along the axon prevents the conduction of nerve impulses.

This lowers the sodium permeability of nerve cell membranes, perhaps by combating calcium-binding locations that control permeability of sodium. This alteration in permeability causes a reduction in depolarization and a rise in excitability threshold, which eventually stops the formation of the nerve action potential. [12]. Musculoskeletal ultrasound is a non-invasive imaging technique a tool for assessing the musculoskeletal system.

It could provide therapeutically useful details on a range of pathologic conditions affecting the knee joint's tendons, ligaments, muscles, articular cartilage, synovial space, and neighboring soft tissues. Additionally, it enables the dynamic assessment of a few tendons and ligaments [13].

Ultrasonography benefits

Technology that is affordable, non-invasive, radiation-free, portable, and It is now possible to give a diagnostics assistance in the community or even on the field of a sports event thanks to real-time dynamic inspection.

It is the best instrument for the guided methods used in diagnosis and treatment since it can see needles and target structures in real time. (14)

Blocking the saphenous nerve under ultrasound guidance is used to treat knee osteoarthritis (15)

Contrary to anatomical guidance, US-guided intra-articular knee injections exhibit greater accuracy and enhance clinical results.

Position

Patients in frog-leg posture, with leg rotated externally and knee slightly flexed. as demonstrated in Fig (2).

Fig 2: Patient positioning during saphenous nerve block technique.

Technique

Betadine 10% Povidone-iodine was used to clean the region. I positioned the ultrasound equipment so that the screen was facing both the individual and I was standing to the side of the individual to be blocked. I then put a high-frequency ultrasonography probe on the patient's anterior thigh. midway between the medial condyle and the inguinal crease, Locating the femur (about 3-5 cm deep, although this is varied) and moving the probe to medial till the boat-shaped or trapezoid-shaped Sartorius' muscle is visible. Within the adductor canal, the femoral artery was located just underneath this muscle.

The goal of the procedure was to apply local anesthesia to the area surrounding the femoral artery. and beneath the sartorius (i.e., within the adductor canal), since the saphenous nerve is nearly invariably too tiny to be successfully visualized.

One 5cc syringe was filled with 5cc of mepecaine-L (mapivacaine HCL 2% and levonordefrin 1:2000). It was attached to one 23 number spinal needle. This was passed in the plane to reach the saphenous nerve and following a negative blood aspiration, the substance was administered. Fig (3).

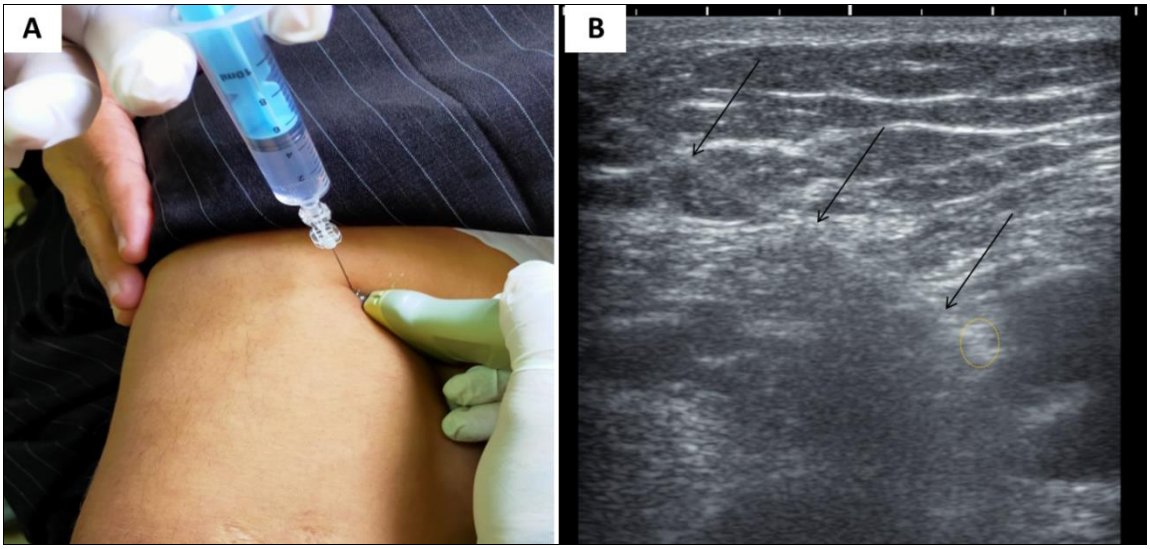

Fig 3: (A) Utilizing ultrasound-guidance, the needle was inserted from the lateral to medial sides of the body to target the saphenous nerve's short axis in a plane approaches. (B) In the adductor canal, the saphenous nerve was indicated by a dotted orange circle and black arrows.

Conclusion

Management of mild to moderate knee osteoarthritis was related with improved outcomes when saphenous nerve block was used. Improved nerve location, greater precision, and reduced risk of neurovascular damage are all benefits of ultrasound.

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