

Infrapatellar Branch of Saphenous Neurectomy for Painful Neuroma: A Case Report

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ABSTRACT

We present the case of an 18-year-old woman who was healthy other than a history of multiple arthroscopic right knee surgeries culminating in subtotal lateral meniscectomy in a valgus knee. The patient was referred to our office for evaluation for realignment osteotomy and meniscal transplantation. Her diagnosed case of neuroma of the infrapatellar branch of the saphenous nerve was managed with neurectomy, which produced prompt and complete resolution of pain.

The saphenous nerve is the largest cutaneous branch of the femoral nerve in the lower extremity.¹ It is a purely sensory nerve, with input to L3 and L4 nerve root dermatomal sensory distributions.^{1,2} In proximity to the pes anserinus of the medial knee at the posterior aspect of the sartorius musculo-

tendinous junction, the saphenous nerve receives coalescing branches from the descending branch (coursing distally along the medial leg to just anterior to the medial malleolus and branching farther to variably supply sensation to the medial hindfoot, midfoot, and forefoot) and the infrapatellar branch of the saphenous nerve, or IBSN (coursing anteriorly, laterally, and distally).³ Numerous investigators (Tables I, II) have described the surgical anatomy of the IBSN.¹⁻⁹

includes a spectrum ranging from anesthesia, hypoesthesia, hyperesthesia, hyperalgesia, and allodynia to reflex sympathetic dystrophy, all stemming from varying degrees of Wallerian degeneration commencing at site and time of injury.^{11,12}

Although saphenous nerve and IBSN damage are of the less common causes of medial knee pain, when unrecognized it may lead to chronic, severe, painful saphenous neuritis,² reflex sympathetic dystrophy,¹³ and painful saphenous

“Although saphenous nerve and IBSN damage are of the less common causes of medial knee pain, when unrecognized it may lead to chronic, severe, painful saphenous neuritis, reflex sympathetic dystrophy, and painful saphenous neuromata.”

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The IBSN may be injured by traumatic contusion, inflammation, compression, or iatrogenic causes, such as needles or surgical incisions.^{2,9,10} Unintentional surgical damage to the IBSN has been reported after anterior cruciate ligament (ACL) reconstruction using hamstring autograft,^{3,5-8} after standard anteromedial knee arthroscopy portal placement,^{3,5,10} and after total knee arthroplasty (TKA).^{2,9} Other causes of iatrogenic IBSN surgical injury are vascular surgery techniques—varicose vein surgery, femoropopliteal bypass, femoral artery thrombectomy, and femoral artery embolectomy.² The pathophysiologic mechanism of pain generation

neuromata.^{2,9} Management of painful saphenous neuromata first requires diagnosing the cause of the neuroma(ta), as the diagnosis commonly goes unrecognized early in presentation. Nonsurgical treatment then includes use of nonsteroidal anti-inflammatory drugs (NSAIDs), oral gamma-aminobutyric acid analogue medications, capsaicin cream, physical therapy modalities, transcutaneous electrical nerve stimulation, oral antidepressant medications, and therapeutic local anesthetic and corticosteroid injections. Surgical management may consist of saphenous or IBSN neurectomy, saphenous or IBSN decompression, and saphenous or IBSN neurec-

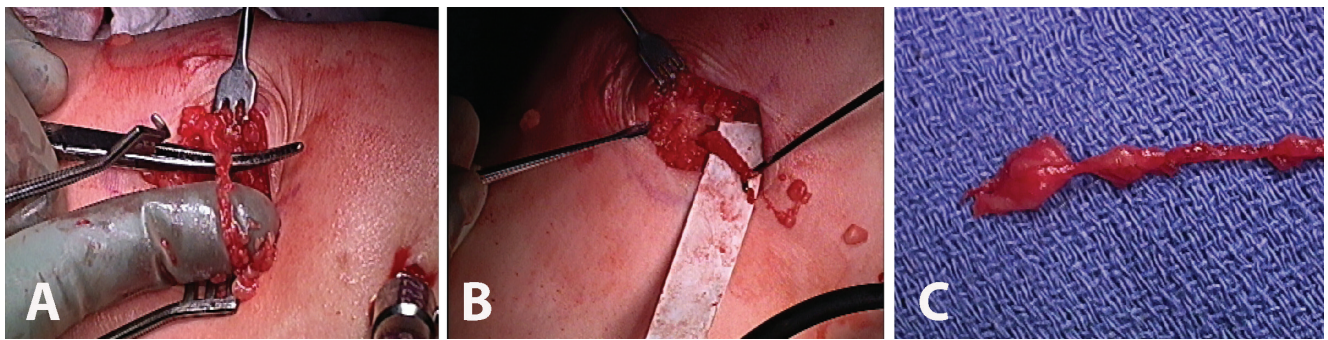


Figure. Intraoperative photographs (A, B) of medial-sided neuroma (infrapatellar branch of saphenous nerve). (C) Surgical neuroma specimen (sent to pathology).

tomy. Saphenous and IBSN neurectomy relieves symptoms by 80% to 100% in patients who undergo primary neurectomy or neurectomy after failed decompression or neurolysis.¹⁴⁻¹⁶

In this article, we present the case of an 18-year-old woman who was healthy other than a history of multiple arthroscopic right knee surgeries culminating in subtotal lateral meniscectomy in a valgus knee. The patient was referred to our office for evaluation for realignment osteotomy and meniscal transplantation. Despite lateral pathology, however, the patient's pain was medial. Her diagnosed case of neuroma of the IBSN was managed with neurectomy, which produced prompt and complete resolution of pain. The patient provided written informed consent for print and electronic publication of this case report.

CASE REPORT

An 18-year-old female college student was referred to our clinic for continued right knee pain after multiple knee arthroscopies. Three years earlier, the right knee sustained a twisting-type injury. On presentation to another institution, a lateral meniscus tear was diagnosed, and an inside-out lateral meniscus repair was performed uneventfully. One year after surgery, the patient sustained another injury and felt a pop in the knee. The meniscal repair had failed, and a partial lateral meniscectomy was performed. The patient continued to have pain in the operative knee. She described the pain then as severe, sharp, and starting medially and radiating laterally. One year before coming to our clinic, she underwent another partial lateral meniscectomy, after which 30% of the lateral meniscus

remained. Continued severe knee pain prompted referral to our clinic for possible meniscal transplant and realignment osteotomy. The patient already had been treated with courses of physical therapy, a cortisone injection, viscosupplementation, NSAIDs, and a lateral compartment unloader brace. All these treatments provided minimal or no relief. Further, because of the severe pain, the patient had stopped all physical activity for more than 2 years, and her narcotic use was chronic. On a daily basis, she had pain with any ambulation and activities of daily living and even at rest. A pain management consultation workup also had been pursued.

At our clinic, the patient reported 9/10 constant knee pain. The pain was mostly medial in the area of one of the previous anteromedial knee arthroscopy portals. It was sharp and

Table I. Cadaveric Studies of Anatomy of Infrapatellar Branch of Saphenous Nerve (Variety of Nerve Course Is Based on Study)

Study	Specimen Source (No. of specimens)	Anatomical Nerve Description
Ebraheim & Mekhail ⁴	Cadaver (28)	-8 mm posterior to AT at level of junction of inferior pole of patella and medial PT (knee extended) -At joint line, nerve anterior to AT (53% of specimens), posterior to AT (43%), at AT (4%) -Nerve crossed to lateral border PT in 36% of specimens
Tifford et al ³	Cadaver (20)	-2.4 cm from inferior pole of patella (knee extended) -2.5 cm from inferior pole of patella (knee flexed 90°) -Nerve 5.1 mm (knee extended) and 4.8 mm (knee flexed) from landmark 2 cm medial to medial border PT at joint line
Mochida & Kikuchi ⁵	Cadaver & in vivo (68)	-Nerve traverses anterior knee medial to lateral and proximal to distal -Blind puncture safe within 3-cm area from medial margin patella at level of midpatella -Blind puncture safe within 1-cm area from medial margin PT at level of inferior pole of patella -22% incidence of sensory disturbance in IBSN distribution

Abbreviations: AT, adductor tubercle; IBSN, infrapatellar branch of saphenous nerve; PT, patellar tendon.

Table II. In Vivo Clinical Studies of Incidence of Saphenous Nerve and Infrapatellar Branch of Saphenous Nerve Damage After Arthroscopic Procedures

Study	Specimen Source (No. of specimens)	Anatomical Nerve Description and Incidence of Damage
Figueroa et al ⁶	In vivo (22)	-77% incidence of hypoesthesia in IBSN distribution with area of 36 cm ² -68% incidence of electrophysiologic evidence of IBSN injury
Papastergiou et al ⁷	In vivo (230)	-9% incidence of injury to saphenous nerve proper -39.7% incidence of disturbed sensitivity in IBSN distribution with vertical incision for hamstring graft harvest -14.9% incidence of disturbed sensitivity in IBSN distribution with horizontal incision for hamstring graft harvest
Portland et al ⁸	In vivo (76)	-59% incidence of IBSN damage with vertical incision for BTB graft harvest -43% incidence of IBSN damage with horizontal incision for BTB graft harvest
Mochida & Kikuchi ⁵	In vivo (68) & cadaver	-Blind puncture safe within 3-cm area from medial margin patella at level of midpatella -Blind puncture safe within 1-cm area from medial margin patellar tendon at level of inferior pole of patella -22% incidence of sensory disturbance in IBSN distribution

Abbreviations: BTB, bone–patellar tendon–bone; IBSN, infrapatellar branch of saphenous nerve.

accompanied by episodes of tingling around the portal, and it worsened with activity, long periods of standing, and pressure. The patient reported some mechanical symptoms. She reported no recurrent effusions and constitutional symptoms.

On examination, the patient was mildly overweight, there was no calf or quadriceps atrophy, and she walked with an antalgic, stiff-legged gait. All surgical incisions were well-healed, and there were no signs of infection. No effusion was evident, active knee range of motion was 0° to 135°, and the ligamentous examination was stable. Tenderness was exquisite medially with hyperflexion and hyperextension but without lateral tenderness. The Tinel sign was present. Pain occurred with the McMurray maneuver medially. Weight-bearing knee radiographs showed no significant decline in joint space and a valgus shift of the knee. Magnetic resonance imaging (MRI) performed 3 months earlier showed no medial compartment pathology.

Saphenous neuroma was suspected along with possible new medial meniscal pathology, not identified on the earlier MRI. A superficial, extra-articular local anesthetic injection of lidocaine 1% and bupivacaine 0.25% was given in the area of maximal tenderness around the medial arthroscopy portal. The patient experienced approximately

30% immediate relief of symptoms.

Two weeks later, she returned to our clinic with continued medial-sided symptoms. Repeat MRI was not performed secondary to insurance issues. A diagnostic arthroscopy with exploration of the medial arthroscopy portal for a possible neuroma was performed. The medial compartment and cruciate ligaments were intact. The patellofemoral joint had Outerbridge grade II chondral damage, which was debrided. The lateral femoral condyle and tibial plateau had grade II focal changes, which were debrided along with minimal lateral meniscal fraying.

A 2-cm longitudinal skin incision was then made over an area that had been marked before surgery as the area of maximal tenderness. Blunt dissection in the subcutaneous tissue revealed that a branch of the saphenous nerve (IBSN) was scarred and adhering to the joint capsule. A portion of the nerve branch was bulbous, consistent with a neuroma (Figure, A & B). A 3-cm segment of nerve was sharply dissected from the branch, and the proximal and distal ends were allowed to retract. The specimen was sent to pathology (Figure, C). The incisions were closed, and the patient's immediate postoperative course was uneventful.

At 1-week follow-up, she had total resolution of the medial-sided knee

pain. She was completely off pain medications for the first time in more than 2 years. The surgical pathology report identified a nerve segment with focal changes consistent with a traumatic neuroma. At 2 months, the patient was continuing to do well, and there had been no recurrence of medial knee pain.

DISCUSSION

We have presented the case of an 18-year-old female college student with a history of multiple arthroscopic right knee surgeries culminating in subtotal lateral meniscectomy in a valgus knee. Despite lateral pathology, however, the patient's pain was medial. Her diagnosed case of neuroma of the IBSN was managed with neurectomy, which produced prompt and complete resolution of pain.

Iatrogenic damage to the saphenous nerve or one of its branches has been reported after both orthopedic and other general surgical procedures, including ACL reconstruction with both hamstring and bone–patellar tendon–bone autografts, medial collateral ligament surgery, TKA, high tibial osteotomy, and knee surgeries using a medial parapatellar arthrotomy.^{2,3,5} Cadaveric anatomy studies have demonstrated “safe zones” for blind puncture in knee arthroscopy portal placement to be within a 3-cm area from the medial margin of

the patella at the level of the midpatella and within a 1-cm area from the medial margin of the patellar tendon at the level of the inferior pole of the patella.⁵ As the IBSN and its superior and inferior branches traverse medial to lateral and somewhat proximal to distal (medial to the extensor mechanism), and as the nerve moves distally with knee flexion, horizontal anteromedial portal incisions (vs vertical incisions) may reduce the risk for IBSN damage, as Tifford and colleagues³ recommended. Once standard anteromedial and anterolateral knee arthroscopy portals are made with vertical incisions, the incidence of clinical and electrophysiologic IBSN sensory disturbance or damage ranges from less than 1% to 22%.^{5,10,17} These disturbances primarily consist of anesthesia or hypoesthesia and, less commonly, dysesthesia. Saphenous or IBSN neurectomy denervation has been performed successfully after multiple nonsurgical and surgical etiologies of saphenous neuritis or neuroma(ta).^{15,16,18} To our knowledge, however, the present report is the first to describe a painful IBSN neuroma that was caused by a standard anteromedial knee arthroscopy

portal and that, with IBSN neurectomy, was managed successfully (immediate and complete resolution of pain).

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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