A REVIEW OF TWO CASE REPORTS OF SAPHENOUS NERVE NEURALGIA IN HOSPITAL KUALA LUMPUR, MALAYSIA

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Abstract

Saphenous nerve neuralgia is often underdiagnosed as medial-sided knee pain, resulting in a delay in treatment and increased risk of developing chronic neuropathic pain. The development of saphenous nerve neuralgia can be attributed to direct trauma to the medial side or entrapment of the nerve post-operative knee surgeries. Due to delay in diagnosis, the treatment options are limited, and outcomes vary. We presented two complicated cases of saphenous nerve neuralgia in our sports medicine clinic, Hospital Kuala Lumpur, Malaysia, and outlined the management options available for such cases from sports physician perspectives.

Keywords: Saphenous Nerve, Neuralgia, Neuropathic Pain, Radiofrequency Ablation, Chronic Knee Pain

Introduction

Saphenous nerve (SN) neuralgia can be challenging to diagnose during early presentation and often results in a delay in treatment. The common diagnoses for medial-sided knee pain, mimicking saphenous nerve neuralgia are lumbar radiculopathy, patellofemoral disorders, suprapatellar plica, tear of medial meniscus, tibial stress fracture, pes anserine tendinopathy or bursitis (1-3). SN neuralgia can be caused by trauma to the medial side of the knee, post-total knee replacement surgery, and post-arthroscopic medial meniscus repair (3-5). Diagnosis of SN neuralgia requires an experienced physician to detect early, with a thorough history and careful examination, as common investigations such as Magnetic Resonance Imaging (MRI), diagnostic arthroscopy, and nerve conduction study can be normal (4). To our knowledge, literature regarding the management of SN neuralgia is scarce. Our objective is to describe a series of complicated cases of SN neuralgia presented in our sports medicine clinic, Hospital Kuala Lumpur, Malaysia, and outline the management options available for such cases from pain intervention physician perspectives.

Case 1

A 35-year-old lady who had a motor vehicle accident in 2019 sustained severe pain, a large knee effusion, and limited range of motion (0-100 degrees) over her left knee. Initial clinical examinations in the orthopedic clinic revealed signs of medial meniscus tear and lateral collateral ligament tear, in view of persistent medial joint line tenderness and positive varus stress test (pain) at 30 degrees. Her treatment was delayed in view of the COVID-19 pandemic, and it failed to address the pain, joint swelling, and limited range of motion. She also developed allodynia at the medial side, hyperalgesia, vasomotor symptoms such as an increase in temperature, and sudomotor symptoms such as oedema after 1 year post-trauma. After 2 years post-trauma, she still has persistent severe pain (pain score 7-8), especially on the medial side, joint effusion, and limited range of motion. MRI of the knee was done after 2 years post-trauma, showing a chondral injury over the trochlear and patella facet. However, the MRI findings did not correlate with her current clinical examination. She was diagnosed with chronic regional pain syndrome in view of the chronicity of her pain and the presence of allodynia

and sudomotor symptoms. She was on multidisciplinary teams, including chronic pain clinic, physiotherapy, and orthopedic. She was on gabapentin 300 mg twice daily, with minimal response in terms of pain. She was then referred to the Sports Medicine clinic for further musculoskeletal evaluation. Our musculoskeletal ultrasound assessments revealed a hyperechoic lesion, likely scar tissue between the vastus medialis obliquus and sartorius, entrapping the SN, with poor nerve gliding.

We prescribed a desensitization therapy and performed aggressive management to reduce swelling, such as education on the correct application of ice therapy, reconditioning her muscle strength using a mixture of isometric and isotonic strengthening exercises, and prescribing flexibility exercises. However, she did not improve much in conservative management. After failed conservative management, she received a diagnostic and therapeutic SN injection, with hydro dissection of the SN, at the adductor canal under ultrasound guidance. The technique to perform SN injection is described in Figures 1 and 2.

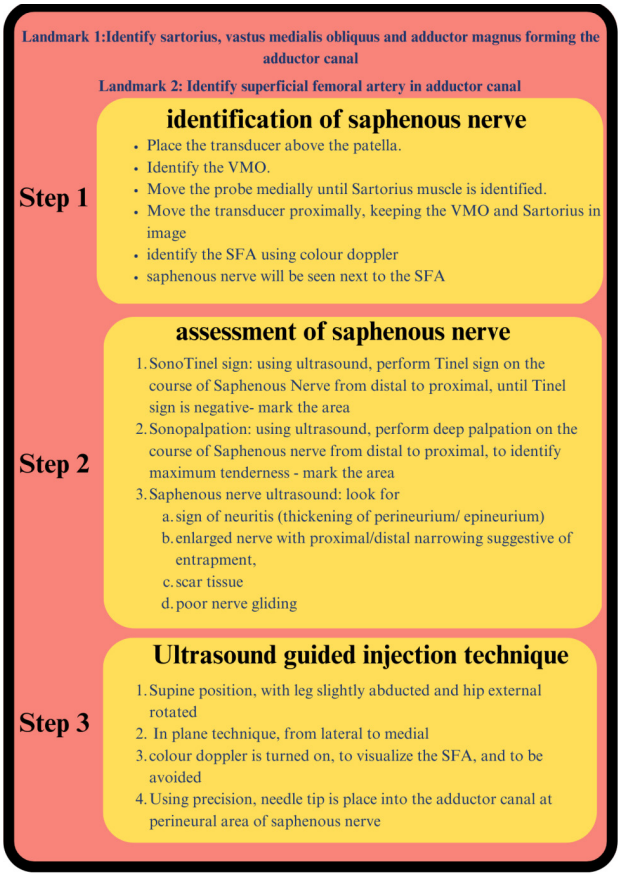

Figure 1: The steps used **(1)** to identify saphenous nerve using ultrasound guided; **(2)** assessments of saphenous nerve; **(3)** ultrasound guided injection technique for saphenous nerve injection.

VMO: Vastus Medialis Obliquus
SFA: superficial femoral artery

We opted for the hydro dissection technique to release the entrapped SN between the sartorius and vastus medialis obliquus. The ultrasound image is outline in Figure 3. Our cocktail was a mixture of lignocaine 2% (80 mg), 40 mg triamcinolone acetate and 5 mls of water. She had a good response of more than 50% pain improvement; however, it only lasted for a few days. We believe a successful nerve block is a good inclusion criterion for a successful radiofrequency ablation (RFA). She received thermal RFA of SN at the adductor canal after 1-month post nerve block, at 70 degrees Celsius for 120 seconds. After 3 months post-RFA, she demonstrated a good recovery. She has returned to function, with normal gait, full range of motion, and no knee effusion. She does have mild hypersensitivity around medial-sided knee, but zero pain.

Case 2

A 37-year-old gentleman, a police officer, who had a motorbike accident, sustained severe pain, large joint effusion, and limited range of motion (10-40 degrees). He was sent to the emergency department and was diagnosed with soft tissue injury, and was discharged. He was on general orthopedic follow-up, but the treatment of knee swelling, severe pain, and limited range of motion was not properly addressed as he still had persistent knee swelling for one year, associated with severe medial-sided knee pain, and range of motion did not return to normal (0- 120 degrees). He was referred to the sports medicine team for further musculoskeletal evaluation. Clinical examinations revealed a sharp shooting pain at the medial gutter and an electric-like sensation with a positive Tinel test. We suspected the presence of SN neuralgia. MRI reported a grade I medial collateral ligament sprain and posterior horn medial meniscus tear. Contrary to MRI findings, the diagnostic scope revealed a normal medial collateral ligament sprain and posterior horn medial meniscus. We performed diagnostic and therapeutic SN injection at the distal adductor canal using a mixture of 40 mg of lignocaine and 40 mg triamcinolone acetate guided by ultrasound, as per Figure 4. A few months' review post-injection revealed improvement in pain, no more allodynia, no recurrent knee effusion, and a normal range of motion.

Discussion

The diagnosis of SN neuralgia is not straightforward. These two cases demonstrate an underappreciated and delayed diagnosis of SN neuralgia. Entrapment at the knee commonly occurs at the first major branch of SN, the infrapatellar branch of the saphenous nerve (IPS). A specific pattern of IPS was described by Romanoff and colleagues in 1989: (i) pain at SN distribution, (ii) normal motor function, (iii) sharp pain at adductor canal region (midpoint between adductor tubercle and medial femoral condyle) (6). Injury to IPS may result in non-localized anteromedial knee pain, which is characterized as burning, stabbing, and/or allodynia and hyperalgesia (4). It may mimic chronic

Figure 2: The steps to identify the saphenous nerve

Red asterisk: patella
Pink asterisk: sartorius
Yellow asterisk: vastus medialis obliquus
Yellow arrow: adductor canal
Red arrow: saphenous nerve
Image was taken from courtesy of Dr. Arshad Puji and Dr. Azwan Aziz

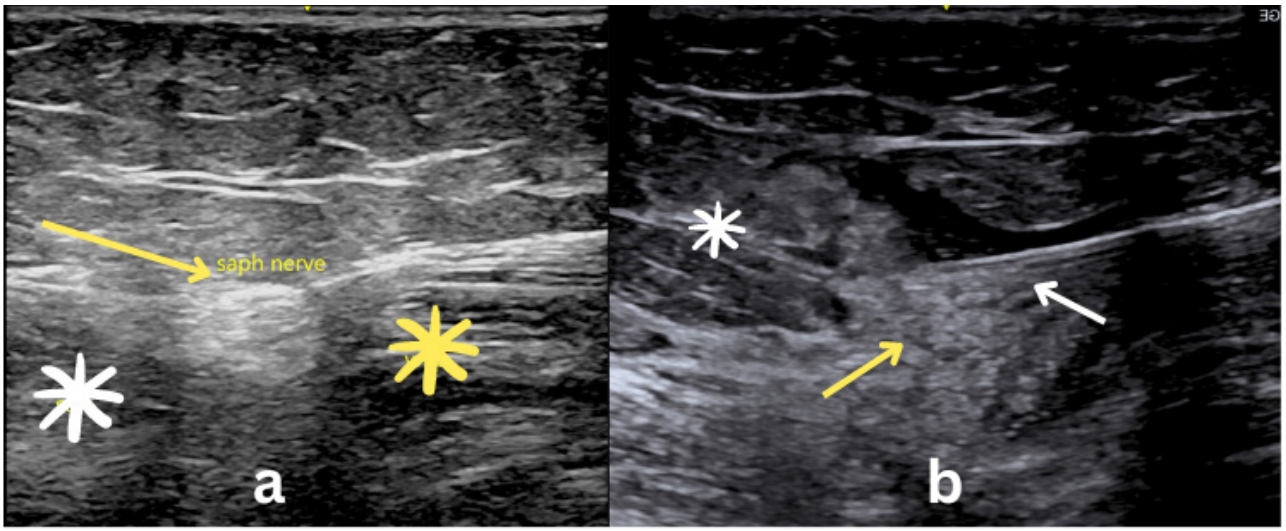

Figure 3: **(a)** An enlarged saphenous nerve at distal adductor canal with poor nerve gliding on dynamic ultrasound; **(b)** the hydro-dissection of saphenous nerve. The needle entered from lateral to medial, passing through the vastus medialis obliquus

Yellow arrow: Saphenous nerve
White Arrow: needle placement at perineural area of saphenous nerve
White asterisk: sartorius
Yellow asterisk: vastus medialis obliquus

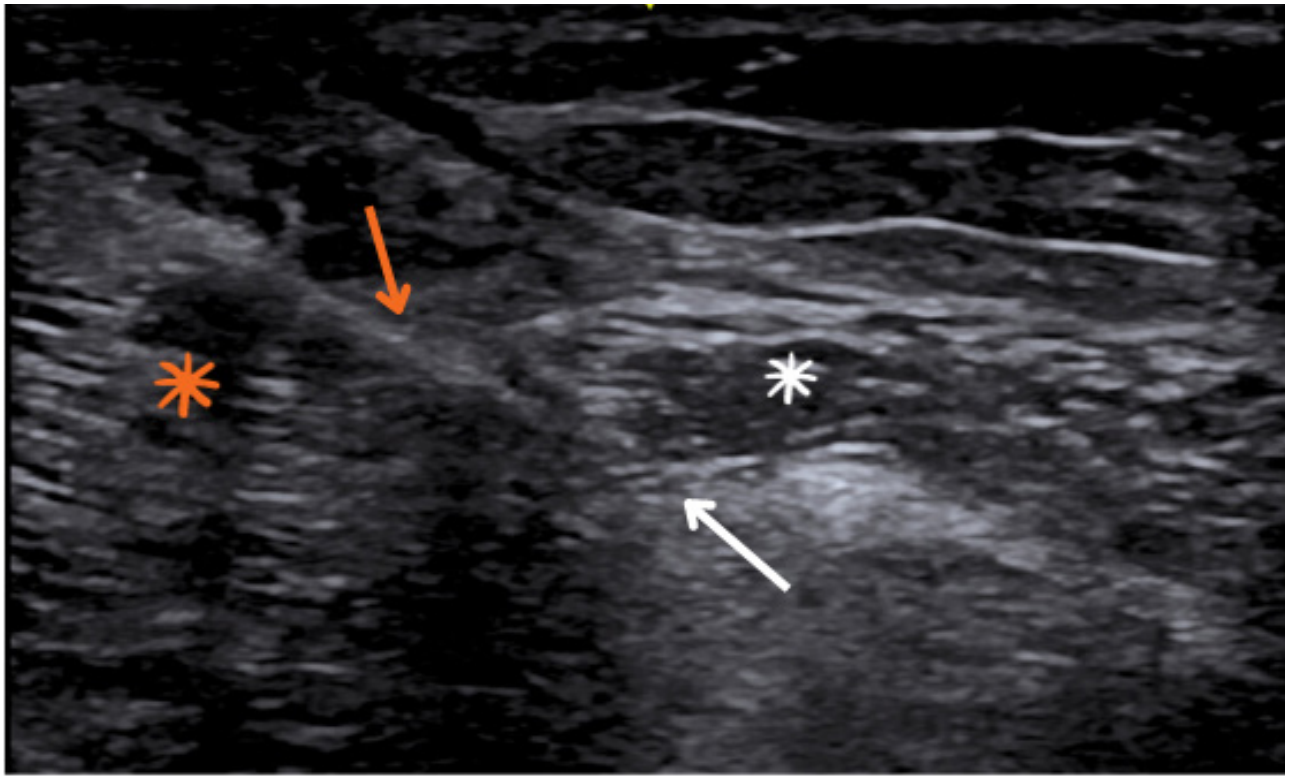

Figure 4: This is the technique used for the distal adductor canal block. We approached from lateral to medial (orange arrow is the needle), piercing through vastus medialis obliquus (orange asterisk). The needle tip should be in the adductor canal, around the perineural area of the saphenous nerve (white arrow). The key in interventional pain medicine is the precision, best done under ultrasound guidance.

White asterisk: sartorius

regional pain syndrome, as in Case 1. Peripheral oedema is a significant risk factor for developing SN neuralgia, as seen in our settings. In Cases 1 and 2, persistent knee swelling and reduced range of motion lead to local irritation of SN. Poorly addressed pain control could lead to peripheral sensitization and increased ion channels at the injured nerve. This will subsequently lead to allodynia and hyperalgesia (7).

Anatomy

Branching off the femoral nerve below the inguinal ligament, SN courses into the adductor canal up to the distal thigh, pierces off the vastoadductor membrane, and gives off the major branch, IPS. Branching off the femoral nerve below the inguinal ligament, SN courses into the adductor canal up to the distal thigh, pierces the vastoadductor membrane, and gives off the major branch, IPS. IPS has a variable course to supply sensory information to the anterior knee joint. Ackmann et al. (8) dissected 30 knees and found 4 patterns of IPS. In the first type, the IPS comes out of the front edge of the sartorius. In the second type, it comes out of the back edge of the sartorius. In the third type, the IPS goes through the sartorius. Finally, in the fourth type, it goes through the pes anserine muscle.

Diagnosis

Diagnosis of SN neuralgia is often challenging as symptoms are vague and poorly localized. Patients with a normal MRI or normal diagnostic scope should raise a high suspicion of SN neuralgia, as in Cases 1 and 2. A complete neurological examination can demonstrate a loss of sensation at SN distribution, with normal motor function. Through our clinical experiences, we have found that using ultrasound to carefully palpate the path of the saphenous nerve from the adductor canal to the medial joint can help identify SN neuralgia. This technique, known as sono-palpation, often causes sharp or stabbing pain and reproduces the symptoms, making it highly likely that SN neuralgia is the correct diagnosis. Nerve conduction studies often provide less diagnostic value as they are challenging to perform in body mass index > 25 kg/m^2 (9). We believe the diagnostic block over the SN has a greater clinical value in diagnosing SN neuralgia. There are 2 areas that can be blocked: (i) SN at the distal adductor canal or (ii) proximal IPS. We often choose the distal adductor canal as IPS has a variable course. We use ultrasound-guided injection to obtain a good precision of our nerve block. The sartorius and superficial femoral artery at the adductor canal are our anatomical landmarks, and SN is identified between

the sartorius and vastus medialis obliquus, at the distal adductor canal.

Management

Management of SN neuralgia often starts with aggressive management of joint effusion and range of motion to reduce the local irritation of the SN. We observed a significant improvement in pain following aggressive swelling management in Cases 1 and 2. SN gliding exercises, from knee extension to knee flexion, as in lunges, can be taught to patients to improve the mobility of SN (10).

In patients who have failed conservative treatment or have a severe presentation of SN neuralgia, there are many other modalities available. Steroid injection over the entrapped SN helps to soften the scar and reduce the activation of nociceptive receptors and ectopic firing (11-13). Local anesthetic such as sodium blockers help block the excessive ion channel at the injured nerve (14, 15). Hydro-dissection of the SN helps to decompress the adhesion around the nerve, improve blood flow into vasa nervosum, and improve nerve gliding (16). Nerve ablation, neuromodulation, surgical decompression, neurolysis, or neurectomy can be performed if a patient does not respond well to injection treatment (17, 18). In our center, a diagnostic block often serves as a guide to deciding on thermal radiofrequency ablation. Patients who respond well to diagnostic block with temporary pain relief > 50% often have successful thermal RFA outcomes. Clendenen et al. (2015) provided an algorithm for the management of SN neuralgia in post-knee arthroplasty (19). Our center has created a guide on the management of SN neuralgia around the knee joint, as illustrated in Figure 5.

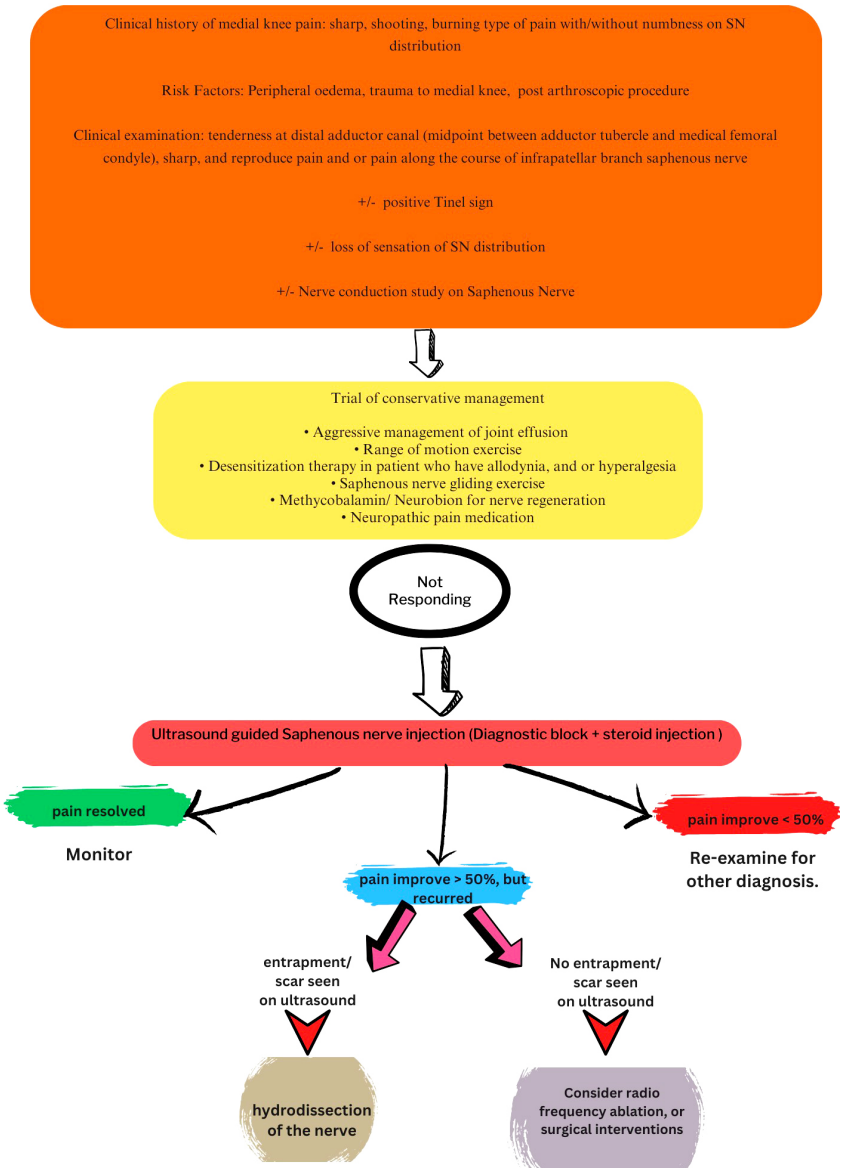

Figure 5: The algorithm used in Sports Medicine Clinic, Hospital Kuala Lumpur in the management of saphenous nerve neuralgia

Conclusion

SN neuralgia is often underappreciated, leading to delays in diagnosis and treatment, which in turn result in the development of chronic knee pain. This often results in the development of peripheral and central sensitization, increasing difficulty in managing such patients. Managing pain, swelling, and range of motion helps reduce the entrapment at the beginning of the insults. Diagnosis can often be made based on pain characteristics at the medial side of the knee, with or without clinical signs of positive Tinel sign. Diagnostic block is superior to other clinical testing. Managing such a patient using nerve gliding exercises requires aggressive physiotherapy to reduce swelling, improve range of motion, and improve pain as early as possible. Patients who respond well to diagnostic block can be offered other invasive management such as ablation of the nerve or surgical intervention.

Competing interests

The authors declare that they have no competing interests.

Informed Consent

Informed consent has been taken from the patients prior to the study.

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