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Ultrasound-guided radio frequency ablation of lateral femoral cutaneous nerve in intractable meralgia paresthetica

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Abstract
Meralgia paresthetica characterised by pain, tingling and numbness in lateral aspect of thigh.
A 48 year-old male with 2 years history of left lateral thigh paresthesias and burning pain consistent with meralgia paresthetica was referred to our clinic after failing trials of physical therapy, nonsteroidal anti-inflammatories and neuropathic medications. We performed lateral femoral cutaneous nerve block with corticosteroid, after that patient had good relief for 2 months; however, block provided only temporary relief and patient again started feeling same pain. As this pain was limiting the patient's ability to perform his functions as truck driver, we planned to perform a pulsed radiofrequency treatment of the lateral femoral cutaneous nerve left side under ultrasound guidance. After locating the lateral femoral cutaneous nerve with ultrasound and reproducing the patient's dysesthesia with stimulation, pulsed radiofrequency treatment was performed at 42°C for 120 seconds. The needle was then rotated 180° and an additional cycle of pulsed radiofrequency treatment was performed followed by injection of 0.125 % bupivacaine with 20 mg triamcinolone. At 2 and 4 month follow-up visits, the patient reported excellent pain relief with activity and improved ability to perform his duties. We have also described various aetiologies for meralgia paresthetica and multiple modalities available for the treatment of meralgia paresthetica.

Keywords: Meralgia paresthetica, Lateral femoral cutaneous nerve, Pulse Radiofrequency Ablation, Ultrasound

Introduction
Meralgia paresthetica is characterized by pain or numbness in lateral side of thigh, and is caused by entrapment of nerve by fibrosis or other reasons. The Lateral femoral cutaneous nerve (LFCN) of thigh is a small pure sensory nerve that emerges from the lumbar plexus, runs along the iliacus and reaches the femoral region through the lateral 1/3rd inguinal ligament.
It is also known as *Bernhardt-Roth Syndrome, Bikini brief syndrome/ Skinny pent syndrome* because it is occurring due to wearing tight clothing's.
For diagnosis of meralgia paresthetica, LFCN block with local anaesthetic (LA) is performed.
Ultrasound can confirm the target nerve and surrounding structures so diagnosis is more accurate, additional damage is reduced during administration of medication and injection of steroids and local anaesthetic agent can be done at the exact location [1]. We report a successfully performed ultrasound-guided pulsed radio frequency ablation (RFA) of the LFCN in a patient with meralgia paresthetica.

Case Report
A 48-year-old male patient, truck driver by occupation came in OPD with complaints of pain, numbness and heaviness in lateral aspect of left thigh since 2 years, VAS score was 7/10, pain exaggerated during long sitting and driving and relieve with rest and standing for 5-10 minutes, he was on conservative treatment and was wearing elastic based loose garments since 1 year. There was no history of back pain. The patient had visited an orthopaedic hospital, they did lumbar x ray, no bony abnormality detected, intervertebral disc space was maintained in lumbar spine x ray, they managed with conservative treatment and physiotherapy, symptoms was relieved for 1 months but patient developed same symptoms again which was gradually increased in severity. There were no co-morbidities

like Diabetes Mellitus, Hypertension. In general examination patient weight was 84 kg, BMI was 33. Physical examination straight leg raising test was normal, neurological examination was normal. Symptomatic exaggeration of pain on palpation along the inguinal ligament was found. Based on history and examination meralgia paresthetica suspected. Diagnostic ultrasound guided LFCN Block with 5 mL of 0.25% Bupivacaine and 20 mg Triamcinolone was performed, patient had good pain relief for 2 months, then patient developed same symptoms again. So patient was planned for RFA of LFCN Lt side by using Ultrasounds (Linear Probe 7-11 MHz Logic P5 GE USA machine).

The block area was sterilized with 10% povidone solution and covered with surgical drape. Jelly was applied on the tip of linear probe (7-11 Hz). Probe was covered with transparent sterilised plastic drape. The end of the linear probe was positioned at the anterior superior iliac spine (ASIS), and in line with the inguinal ligament then it was moved down and confirmed the LFCN located above the Sartorius and below the Tensor Fasciae Lata (Fig. 1). A 22 gauge, 100 mm length, 5 mm active tip straight RFA needle was inserted from lateral to medial side of the patient and positioned near the LFCN by monitoring the current position using ultrasound. After locating the LFCN with ultrasound and reproducing the patient's dysesthesia with stimulation, pulsed RFA was performed at 42º C for 120 seconds then needle was rotated 180 º and an additional cycle of pulsed RFA was performed followed by injection of 0.125% preservative free bupivacaine 4ml with 20 mg triamcinolone. At 2 and 4 months follow up visits, patient reported excellent pain relief with activity and improved ability to performed his duties, VAS score was decreased to zero.

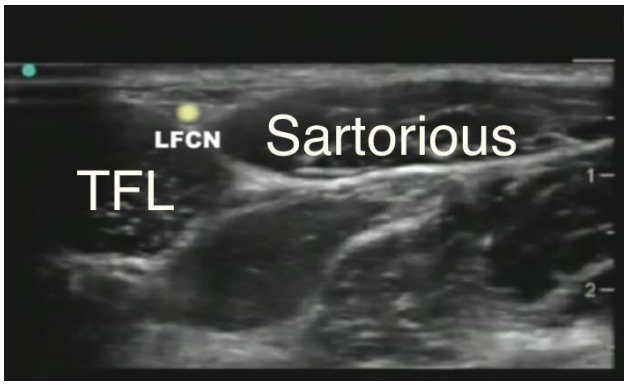

Fig 1: Ultrasound image of the lateral femoral cutaneous nerve in the short axis.
TFL: fascia Lata, LFCN: lateral femoral cutaneous nerve.

Discussion

Lateral femoral cutaneous nerve ((LFCN) block for meralgia paresthetica is a commonly known method of treatment. Hafer first presented meralgia paresthetica in 1885, reporting pressure on the lateral femoral cutaneous nerve as cause for the pain. Meralgia paresthetica is derived from the Greek words meros (thigh) and algos (pain), Roth named it "meralgia paresthetica" in 1895, which has been used up to the present time [1].

Meralgia paresthetica is characterized by pain and numbness along the LFCN and is caused by compression of the nerves from conditions that increase intra-abdominal pressure such as obesity, pregnancy, tight belts or pants, metabolic disorders (diabetes), alcohol and lead poisoning, or damage from surgeries near the inguinal region because of anatomical variability of the LFCN. Obesity and tight cloths are considered to be the reason in our case. The LFCN is a pure sensory nerve that originates from the 2, 3 lumbar nerves emerge from the side of the psoas major and passes the iliacus diagonally towards the ASIS. It then passes above, below or between the inguinal ligament, above the Sartorius and into the subcutaneous tissue of the femoral region. Then it is divided into anterior and posterior division: the front controls the frontal femoral region and up to the knee area, the rear controls the lateral femoral region up to the greater trochanter area.

The anatomical variability of the LFCN is about 30%, and according to reports of Bjurlin *et al*. [2], the distance from the ASIS to the LFCN can vary from 0.3-6.5 cm. For these reasons, there have been many methods suggested for LFCN block.

However, blind blocks have had a failure rate of more than 60% and there could be blockages of the femoral or obturator nerve or intra-abdominal insertion. Nerve stimulators can reportedly increase the success rate up to 85%, but their use doubles the time needed and results can vary depending on the patient's subjective complaints of paresthetica.

Ultrasound usage has increased dramatically in the area of pain medicine since it can confirm the target nerve and surrounding structures to allow accurate diagnosis, reduces additional damage when injecting medication, and allows injection in the exact location.

Ng et al. [3] investigated whether ultrasound was an accurate tool to find the location of the LFCN in 20 cadavers and 10 volunteers. Accuracy was confirmed by dissection of the cadavers, and location of the actual nerve was confirmed by using the transdermal nerve stimulators in the volunteers. Location accuracy using anatomical landmarks was 5.3% in cadavers and 0% in volunteers, while accuracy of the ultrasound was 84.2% in cadavers and 80% in volunteers. This study demonstrated how inaccurate blind block according to anatomical landmarks can be due to anatomical variance of the LFCN, while highlighting the accuracy of ultrasound-guided procedures.

Hurdle *et al*. [4] also reported a 100% success rate in ultrasound-guided blockage of the LFCN in 10 patients with small anaesthetic dosages of 1 ml to 8 ml. Reducing the amount of local anaesthetic agent used can reduce systemic toxicity as well as the risk of unintended blockage of the femoral or obturator nerves.

Diagnosis of Meralgia Paresthetica is based on clinical findings, Nerve conduction studies (NCV), testing by diagnostic block and Imaging modalities might be indicated [5]. Management of Meralgia Paresthetica involves systemic approach initial treatment with Anti Neuropathic medications, NSAIDs. Most of the patient respond to these medications whereas 10-15% remain refractory [6]. Those patients who do not respond to medical management are treated using Local Anaesthetic Injections (diagnostic blocks), Alcohol Neurolysis, Pulsed RF Ablation (pRF), surgical release/ decompression. As in our case report, patient was given medical management initially for first month and found to have no satisfactory reduction in VAS scores after 1 month. Then patient was offered Injection of Local Anaesthetic and steroid which confirmed the

diagnosis and gave a symptom free duration of 2 months followed by pulsed RF ablation of LFCN. Similar case report by Cyril N Philip *et al*. published in 2009 concluded pulse Radio frequency Ablation gave (VAS score = 0) at the end of 9 month interval. There patient was living symptom free, active life without medications [7]. A study conducted by Alaa Abd Elsayed *et al*. in 2020 reviewed 6 patients with meralgia paresthetica who didn't respond to medical management and were treated with Pulse RF with 120 sec at 42degree C. They found that all patients demonstrated immediate relief in self-reported pain scores, averaging a 75.5% reduction in pain. At the one-, two-, three-, and six-month follow-ups, patients averaged a reduction of 60.0%, 58.0%, 51.4%, and 40.5%, respectively. Both the postop and one-month follow-up pain scores were lower, statistically significantly so ($P < 0.05$). But the results of follow up at 6 month were not statistically different from pre treatment scores [8]. In an another case series of 5 cases by Babita G *et al*. published in 2018, five patients were given pulse RF ablation for extended duration of 8 min. There results showed Mean ± SD for the VAS score at baseline was 8 ± 0.70, and decreased remarkably after PRF and at follow up at 3, 6, 9, 12, 15, 18, and 24 months. But we didn't found any recommendations showing evidence for long duration of lesions using pulsed RF in Human subjects, even though the results were favourable and no complications were found in any of the patients [9]. Ahmed *et al*. in 2016 published a case series of 6 patients suffering from Meralgia Paresthetica diagnosed and confirmed using NCV. Author used 50% alcohol injection for neurolysis which was injected under Ultrasound guidance. There patient got 50% relief and maintained upto 12 weeks [10]. Potential complications arising from chemical neurolysis of the peripheral nerve include necrosis of the skin and other non-target tissue, neuritis, anesthesia dolorosa and prolonged paralysis. Both the American Society of Anesthesiologists' task force on chronic pain management and the American Society of Regional Anesthesia and Pain Medicine recommended in 2010 that chemical denervation should not be used in the routine care of non-cancer patients with chronic pain [11]. Son BC *et al*., did neurolysis (surgical) for intractable meralgia paresthetica. Nerve entrapment was confirmed preoperatively by electrophysiological studies or a positive response to local anesthetic injection. Decompression of the LFCN was performed at the level of the iliac fascia, inguinal ligament, and fascia of the thigh distally twelve decompression procedures were performed in 11 patients over a 7-year period. The average duration of symptoms was 8.5 months (range, 4-15 months). The average follow-up period was 33 months (range, 12-60 months). Complete and partial symptom improvement were noted in nine (81.8%) and two (18.2%) cases, respectively [12]. Pulsed RF ablation for MP provide a minimally invasive, day care, cost effective treatment option of intractable pain of MP.

Chronic pain continues to be one of the most challenging diseases to treat. Because of its multifactorial nature, treatment is consequently multimodal, including medical, physical, and interventional therapies. Radiofrequency ablation showed a clear reduction in average pain scores in a subset of patients who had failed standard medical therapy with a reduction in pain at one-month follow-up with relief of symptoms sometimes lasting longer than 6 months.

We retrospectively reviewed the clinical data of 11 patients with medically intractable MP who underwent PRF neuromodulation of the LFCN. These patients with MP underwent a diagnostic LFCN block using 2.0% lidocaine. Temporary pain relief > 50% was considered to be a positive response to the diagnostic nerve block. Following a positive response to the diagnostic nerve block, patients underwent PRF neuromodulation at 420 for 2 minutes. Patient pain was evaluated using a 10-cm visual analog scale (VAS). In MP patients who received PRF, we statistically evaluated VAS scores and the presence of any complications for 6 or more months after the procedure. Results: The mean initial patient VAS score was 6.4 ± 0.97 cm. This score was decreased to 0.91 ± 0.70 cm, 0.82 ± 0.75 cm, and 0.63 ± 0.90 cm at the one-, 3-, and 6- month followups, respectively ($P < 0.001$). Sixty-three point six percent of patients achieved complete pain relief (pain-free) in the last follow-up, whereas 27.3% of patients achieved successful pain relief (≥ 50% reduction in pain as determined by the VAS score). Furthermore, we did not observe any complications after the procedure.

A 33-year-old morbidly obese female with a history of lower back pain and previous spinal fusion presented with sensory dysesthesias and paresthesias in the right anterolateral thigh, consistent with meralgia paresthetica. Temporary relief occurred with multiple lateral femoral cutaneous nerve and fascia lata blocks at 2 different institutions. The patient expressed dissatisfaction with her previous treatments and requested "any" therapeutic intervention that might lead to long-lasting pain relief. At this time, we located the anterior superior iliac spine and reproduced concordant dysesthesia. Pulsed radiofrequency was then undertaken at 42 °C for 120 seconds followed by dexamethasone and bupivacaine. The patient reported exceptional and prolonged pain relief at 6-month follow-up. Limitations: Since this case report is not a prospective, randomized, controlled or blinded study, no conclusions may be drawn from the results attained on behalf of this single individual.

Additional, larger group analyses studying this technique while eliminating bias from patient variables would be essential prior to assuming any validity to using pulsed radiofrequency techniques of neuromodulation for managing peripheral neuropathic pain processes. Conclusion: The patient had experienced long-standing pain that was recalcitrant to conservative/pharmacologic therapy and multiple nerve blocks with local steroid instillations. A single treatment with pulsed radiofrequency resulted in complete and sustained cessation of pain. No side effects were evident. Pulsed radiofrequency of the LFCN may offer an effective, low risk treatment in patients with meralgia paresthetica who are refractory to conservative medical management or are unwilling or unfit to undergo surgery. Merlagia Paresthetica (MP) was first diagnosed by Hager in 1885. Later Roth named it Meralgia paresthetica from the Greek words Meros=thigh algos = pain. MP is sensory mononeuropathy which involves Lateral Femoral Cutaneous Nerve (LFCN). The distribution of pain or sensory impairment is along the distribution of LFCN. It presents mimicking of symptoms of Lumbar Neve compression.

The LFCN originates from L2 L3 nerve root from the side of psoas major and passes iliacus diagonally towards ASIS. It then passes below inguinal ligament above the Sartorius muscle and subcutaneous tissue of the femoral region. The anatomical variability of LFCN is about 30%.

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