Section: General and Laparoscopic Surgery

Original Research Article

ENDOVENOUS LASER ABLATION THERAPY OF VARICOSE VEINS: A COMPARISON BETWEEN FEMORAL NERVE BLOCK AND LOCAL TUMESCENT ANAESTHESIA

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Abstract

Background: The purpose of this research was to compare the effectiveness of local anesthetic in reducing patients' pain and discomfort during and after surgery versus femoral nerve block prior to endovenous laser ablation (EVLA) of varicose veins in patients with venous insufficiency. **Material and Methods:** Between January 2022 and January 2023, 35 patients with severe saphenous vein insufficiency received endovenous laser treatment for varicose veins. Two groups of patients were randomly assigned. Before the ablation operation, group A (10 patients) underwent local anesthesia, while group B (25 patients) underwent an ultrasound-guided femoral nerve block. Following endovenous laser ablation, patients were scheduled for a 2-day evaluation to gauge their level of comfort and pain. **Results:** According to the analysis, we observed that operative and post-operative comfort of the patients, who had been given femoral nerve block was more compared to the patients given local anesthesia. **Conclusion:** Usage of femoral nerve block is an effective method of anesthesia during endovenous laser ablation to reduce operative and postoperative discomfort for patients, as compared to that of administering local tumescent anesthesia alone.

INTRODUCTION

One popular treatment for great saphenous vein insufficiency is Endovenous Laser Ablation (EVLA). This procedure results in vessel blockage and direct heat damage to the endothelium.[1] In order to produce local analgesia, or local insensitivity to pain, a procedure known as local anesthesia is used to cause a particular area of the body to lose sensation. Other local senses may also be impacted. The majority of doctors administer tumescent anesthesia (TA) and local anesthetic during needle punctures in order to minimize pain and shield the surrounding tissues from heat transfer that could result from laser energy's effects on the venous wall.[2] Nevertheless, during TA, there may be a significant amount of pain from numerous needle punctures and, in particular, from injecting the local anesthetic (LA) solution along veins like the great saphenous vein (GSV). Both spinal and epidural anesthesia are used by some centers.[3] These procedures don't cause pain for the patient, but they are generally not advised because the danger of deep vein thrombosis may grow with delayed mobilization. Moreover, the operation is more expensive because it requires a hospital stay and specialized staff.[4] In order to reduce pain in a particular area of the body both during and after surgery, a nerve block is administered as a numbing agent (local anesthetic) close to particular nerves. When it comes to treatments in the great saphenous vein, sensory innervation sections of the femoral nerve that supply the muscles and skin of the anterior thigh prefer the use of ultrasound in their block.[5]

This study aims to demonstrate the effectiveness of local anesthetic versus ultrasound guided femoral nerve block in treating varicose veins using endovenous laser ablation.

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MATERIALS AND METHODS

Patients and Methods

The Aster MIMS hospital Kottakkal, general surgery department served as the study's site. For endovenous laser ablation of varicose veins of the great saphenous vein (GSV), perforating vein (PV), or a combination of them found in the anterior or medial portion of the leg, 35 prospectively enrolled patients of both sexes, ages 30 to 65, were included in this study. The need for general anesthesia or patients undergoing concurrent procedures at the time of EVLA were among the exclusion criteria. Preoperative testing was performed, including coagulation profile, complete blood count, chest X-ray, and ECG. During the preoperative session, patients received an explanation of the research protocol and anesthesia procedure in detail. Following that, patients were split into two groups at random:

Group A

Ten Patients had EVLA using local anesthesia. The surgeon started the procedure after the complete action of local anesthesia. The patients were observed postoperatively till the complete recovery from anesthesia. They were discharged on the same day with monitoring of pain and comfort.

Group B

Prior to tumescent anesthesia, a femoral nerve block was performed on twenty-five patients. Following the use of ultrasound guidance to find the artery, the femoral nerve can be recognized as an oval hyperechoic structure situated immediately lateral to the artery. A 45-degree angle was used to place the needle. Block was administered to the first 11 individuals using 5 to 8 cc of 0.5% bupivacaine. Eventually, after careful observation, the concentration was lowered to 0.25% in the subsequent cases. After an hour of observation, the patient was released the same day with close monitoring.

Table 1: Cases Done Using Local Anaesthesia

PATIENT NUMBER (Pt no)	AGE/SEX	PROCEDURE	DIAGNOSIS
1	46/M	Right EVLA	Bilateral varicose veins Right>Left
2	37/F	Left EVLA	Left varicose veins Right EVLA done 6 years back
3	47/F	Right EVLA + sclerotherapy	Bilateral varicose veins Right>Left
4	49/M	Right EVLA+ sclerotherapy	Right varicose vein with chronic venous ulcer
5	40/F	Right EVLA+ Subfascial ligation of below knee perforators+sclerotherapy	Right varicose vein
6	30/M	Bilateral EVLA+ Subfascial ligation to below knee perforators+ sclerotherapy	Bilateral varicose veins
7	49/F	Right EVLA+ Subfascial ligation of single below knee perforator+ sclerotherapy	Right varicose veins
8	53/F	Bilateral EVLA + Right below knee subfascial perforator ligation+ sclerotherapy	Bilateral varicose veins with lipodermatosclerosis+ stasis eczema on both legs
9	49/M	Left EVLA + MPL + sclerotherapy	Left varicose veins with healing ulcer
10	48/M	Right EVLA to GSV and SSV + Subfascial ligation to below knee perforator	Right varicose veins with venous ulcer on medial malleolar region

Table 2: Cases of Evla Done Using Femoral Nerve Block

Pt no	AGE/SEX	PROCEDURE	DIAGNOSIS
Patient was given 0.5% bupivacaine 5cc as femoral nerve block and 15ml lignocaine+ adrenaline for infiltration			
1	29/M	RIGHT EVLA	Right varicose veins
2	36/M	RIGHT EVLA + SCLEROTHERAPY	Right varicose veins
3	35/M	LEFT EVLA +SCLEROTHERAPY	Left varicose veins
4	47/M	BILATERAL EVLA	Bilateral varicose veins had prolonged numbness postoperatively
5	39/F	RIGHT EVLA + SCLEROTHERAPY	Right varicose veins with non-healing ulcer. Obese lady femoral nerve block not acting much
6	56/M	LEFT EVLA+ SCLEROTHERAPY	Left varicose veins with non-healing ulcer. Right lower venous ulcer on the lateral malleolus underwent surgery on right leg 12 years back. Has extensive lipodermatosclerosis
7	39/M	LEFT EVLA + SCLEROTHERAPY	Bilateral varicose veins left>right
8	36/F	LEFT EVLA	Left varicose veins with ulcer
9	61/M	LEFT EVLA	Left varicose veins with non-healing ulcer. Block acted after short while (obese patient)

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10	40/F	RIGHT EVLA	Right varicose veins had prolonged numbness on knee for one more day managed with steroids
Patient was given 0.5% Bupivacaine 5cc for Femoral nerve block and 10 ml lignocaine+ adrenaline for infiltration			
11	50/M	LEFT EVLA+SCLEROTHERAPY	Left varicose veins with bleeding had prolonged numbness on leg Diabetic patient
Patient was given 0.25% Bupivacaine 6cc for Femoral nerve block and 10ml lignocaine + adrenaline for infiltration			
12	46/F	Left EVLA+ sclerotherapy	Left varicose veins with bleeding. Post op patient doesn't complaints of any numbness
Patient was given 0.25% Bupivacaine 7cc for Femoral nerve block and !0 ml lignocaine+adrenaline for infiltration			
13	23/M	Left EVLA	Left varicose veins with non-healing ulcer
Patient was given 0.25% bupivacaine 7cc for femoral nerve block and 15ml lignocaine+adrenaline for infiltration			
14	52/M	Left EVLA + perforator ligation	Bilateral varicose veins Left > Right Sclerotherapy done 2 years back with healed ulcer
Patient was given 0.25% bupivacaine 5cc for femoral nerve block and 15ml lignocaine+adrenaline for infiltration			
15	44/M	Left EVLA + perforator ligation	Varicose veins Left>Right
Patient was given 0.25% bupivacaine 8cc for femoral nerve block and 10ml lignocaine+adrenaline for infiltration			
16	45/F	Right EVLA + sclerotherapy	Right varicose vein with bleeding and ulcer
Patient was given 0.25% bupivacaine 6cc for femoral nerve block and 15 ml tumescent infiltration given			
17	51/M	Left EVLA + sclerotherapy	Left varicose veins Varicose vein open surgery for right leg done 3 years back Block didn't act
Patient was given 0.25% bupivacaine 10cc for femoral nerve block and 10ml for tumescent infiltration given			
18	50/F	Right EVLA	Bilateral varicose veins. (Block acted)
Patient was given 0.25% bupivacaine 6cc for femoral nerve block and 10ml for tumescent infiltration given			
19	27/M	Right EVLA	Right varicose veins with non-healing ulcer (block acted)
Patient was given 0.25% bupivacaine 7cc for femoral nerve block and 10ml for tumescent infiltration given			
20	53/F	Right EVLA	Bilateral varicose veins Right>Left (block acted)
Patient was given 0.25% bupivacaine 8cc for femoral nerve block and 10 ml for tumescent infiltration given			
21	54/M	Right EVLA	Bilateral varicose veins Right>Left (block acted)
Patient was given 0.25% bupivacaine 7cc for femoral nerve block and 10 ml for tumescent infiltration given			
22	36/F	Left EVLA+ sclerotherapy	Left varicose veins (block acted)
Patient was given 0.25% bupivacaine 7cc for femoral nerve block and 10 ml for tumescent infiltration given			
23	55/M	Right EVLA + sclerotherapy	Right varicose vein with non-healing ulcer (block acted) History of left varicose vein surgery done 23 years back Sclerotherapy was done on both limbs 3 years back.
Patient was given 0.25% bupivacaine 9cc for femoral nerve block and 10 ml for tumescent infiltration given			
24	57/M	Right EVLA +sclerotherapy	Right varicose vein with itching (block acted)
Patient was given 0.25% bupivacaine 8cc for femoral nerve block and 10 ml for tumescent infiltration given			
25	42/M	Right EVLA + sclerotherapy	Right varicose with ulcer (block acted)

RESULTS

There were no significant differences between groups with respect to age and gender in most patients. But some female elderly patients showed comparatively more visual analogue score in both cases. All patients completed the entire study, and their data was included. In the initial phase, it took 5 to 6 minutes for the action of the block to be complete. Later procedure was slightly modified to give a small massage at the block site, and it improved the onset of action within 2 to 3 minutes in most of the patients which helped in reducing the operative period. Operative pain for EVLA done with local tumescent anesthesia was more compared to femoral block. The amount of anesthetic agent in tumescent solution administered was also reduced with the usage of femoral block. Initially block was tried with 0.5% bupivacaine, due to prolonged effect, the concentration was reduced to 0.25%. This reduced the post-operative numbness of patients with early recovery and reduced hospital stay. The concentration of tumescent infiltration was reduced from 20 ml [lignocaine (426mg) + adrenaline (1mg)] to 10 ml [lignocaine (210mg) + adrenaline (0.5 mg)] in 400ml ringer lactate by monitoring the patient's responsiveness to the block. Block wasn't delivered successfully for 2 patients due to anatomical difference such as obesity, difficult nerve localization. In 3 patients, numbness was found to continue till the next day due to inappropriate delivery of block. Further, with proper ultrasound guidance and change in concentration of the drug, the problem was settled.

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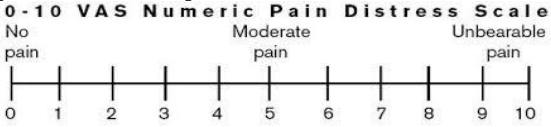
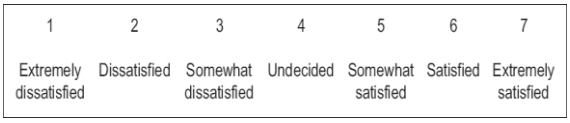
With keen observation, it was understood that the patient experienced minimal pain during the procedure and was comfortable throughout the procedure as compared to local anesthesia.



Likert scale



Despite the fact that Group B spent a little longer in the recovery area following the treatment than Group A did, group (B) had significantly higher patient satisfaction. In the same way, group (B) greatly outperformed group (A) in terms of doctors' satisfaction. Therefore, the volume of anesthetic agents used and the concentration of tumescent infiltration can both be decreased with the use of femoral blocks.

Table 3: Comparison of the study groups' scores for patient and surgeon satisfaction

	Group A (n=10)	Group B (n=25)
Visual Analogue Score (0,2,4)	6(Score 2) 4(Score 4)	22(Score 0) 3(Score 2)
Likert scale(patients) (5,4,6,7)	6(Score 5) 4(Score 4)	3(Score 6) 22(Score 7)
Likert scale (surgeon)	4(Score 5) 6(Score 6)	3(Score 6) 22(Score 7)

Table 4: Comparison of surgery-related data

Category 1- block acted	Category 2- block acted with prolonged numbness	Category 3- block didn't act
PATIENT NUMBER (Pt No.) 1 to 3 of Group B	Pt No. 4 (Patient with diabetes mellitus)	Pt No. 5 (obese patient)
Pt No. 6 to 9	Pt No. 10 (managed with steroids)	Pt No. 17(Patient with diabetes mellitus)
Pt No. 11 to 16		
Pt No. 18 to 25		

PATIENT NUMBER (Pt No.) mentioned in the table corresponds to GROUP B). Group A patients had only localized numbness**.**

DISCUSSION

In clinics, varicose veins are a type of common chronic illness. Usually resulting from valve insufficiency of the great saphenous vein (GSV), small saphenous vein, or connecting vein (varicose GSV being the most frequent), lower extremity varicosis is a prevalent clinical condition. A symptom of chronic venous insufficiency, lower extremity varicose veins are common and get worse with age; females are more likely to get them than males are (15%). No overt clinical signs exist in the early stages. On the other hand, as the illness advances, a variety of symptoms that impair quality of life may show; the most common ones are leg heaviness (70.4%), discomfort (54.0%), and edema (52.7%) eventually leading to skin ulcerations in advanced cases.[6] Regarding its management, the classic and widely used technique for treating the great saphenous vein is high ligation and stripping.[7] But there are also shortcomings with the standard treatment, chief among them being the high rate of postoperative sequelae (incision infection, superficial phlebitis, congestion, ecchymosis, etc.).[8]

The major branch of the lumbar plexus is the femoral nerve (L2-L4). At the inguinal ligament level, it splits in half. The sartorius and pectineus muscles receive motor innervation from the anterior branch, while the anterior and medial parts of the leg receive sensory innervation. The quadriceps muscle's motor innervation and the medial thigh's sensory innervation are supplied via the posterior branch. The anterior and medial parts of the entire leg, which are the source of varicose veins, go numb when these two femoral nerve branches are blocked.[9]

Four earlier publications that described the use of nerve blocks for laser ablation were found through a literature search. In one of them, Osturk T et al. found that analgesia following both unilateral spinal anaesthesia and femoral block was comparable.[9] Karim Youssef et al. conducted two prospective randomised control trials including femoral and obturator nerve blocks,[3] and Dzieciuchowicz et al. conducted a femoral nerve block research.[1] Both investigations separated their study population into two groups, with one group undergoing nerve block therapy. With nerve block, both investigations revealed noticeably reduced pain scores.[3,1] Salim Yilmaz et al.'s study, which used femoral and sciatic nerve blocks for laser ablation in conjunction with foam sclerotherapy or ambulatory phlebectomy, found that procedure discomfort was significantly reduced while maintaining motor function, allowing for faster mobilisation.[10]

Patients who got both tumescent anaesthesia (TA) and ultrasound-guided femoral nerve block (UGFN) reported less pain during the procedure than those who only received TA, according to a randomised controlled trial by Lomarat N et al. Furthermore, fewer fentanyl injections overall and in smaller amounts were needed for the patients who got UGFN

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and TA during the procedure. The number of painkillers taken during the postoperative phase and the pain score, however, did not differ substantially across the groups. Thus, the primary advantage of UGFN was less discomfort experienced throughout the procedure.[11] Bellam KP found that during laser ablation and foam sclerotherapy for varicose veins, US guided nerve blocks offered significant comforts and benefits. The pain associated with tumescent injection and foam sclerotherapy was eliminated or greatly reduced by them. They widened the saphenous vein to make catheter navigation and puncture easier. They also reduced the possibility of spasm, which is common in superficial veins, which cut down on procedure time.[12] It is also observed by Saha S that in order to lessen the amount of pain that patients experience during surgery, topical local anaesthesia is not beneficial for EVLA of varicose veins.[13]

The combination strategy of giving tumescent anesthesia prior to ablation and constantly during the EVLT operation may be an alternative method to lessen the patient's pain and discomfort during the surgery. EVLT is an effective and safe treatment for saphenous vein insufficiency.[14] It has been demonstrated that ultrasound-guided FNB is a secure and reliable way to reduce the need for additional analgesics and the discomfort experienced during surgery related to TA and endoluminal laser ablation of the great saphenous vein (GSV).[15]

Due to its comparatively small sample size, this study has certain limitations. Due to the fact that this is a pilot study, the computation was predicated on a 30% variation in pain scores. Although a smaller difference in pain scores might have been seen with a larger sample size, this difference might not be significant enough to support the regular use of topical anaesthetic.

CONCLUSION

Compared to local anesthesia, ultrasound guided femoral nerve blocks are a more successful way to provide anesthesia during endovenous laser ablation. When used for anaesthesia during minimally invasive procedures on varicose veins, US guided nerve blocks offer excellent procedural pain relief, facilitate active mobilisation following the procedure, and pose no additional risks. All of these benefits enhance patient and operator comfort without adding to costs or requiring additional equipment.

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