Original Research Article

Endovenous laser ablation of venous tributaries along with saphenous veins in chronic venous insufficiency

Manohar B Kachare[1*], Sanjay B Kulkarni[2]

[1]Professor and HOD, Department of Radiodiagnosis, Government Medical College, Miraj, Sangli, Maharashtra, INDIA.
[2]Consultant, Vishrambag Hospital, Sangli, Maharashtra, INDIA.
Email: manoharkachare@rediffmail.com

Abstract

Background and Aims: Endovenous laser ablation (EVLA) is a well-established treatment for chronic venous insufficiency. The venous tributaries are usually managed either by ultrasound-guided sclerotherapy (UGS) or by phlebectomy which may be synchronous or at an interval after EVLA. The venous tributaries can be treated by laser directly. We are presenting largest study about the treatment of tributaries along with saphenous veins in the single setting by EVLA as well. Only single relatively smaller patient study has been done for the simultaneous treatment of tributaries by the EVLA that is used for the saphenous veins. Aim of our prospective and largest study on this topic in the literature is to determine whether EVLA could be used to treat large lower extremity venous tributaries as well as saphenous veins in the single setting. **Methods and materials:** In this prospective study, 286 patients were consecutively enrolled and informed consent was obtained. The 1040 major venous tributaries along with saphenous veins of these patients were treated by EVLA under spinal anesthesia in single center by the team of radiologist and surgeon over the period of 36 months from April 2011 to March 2014. Only the major venous tributaries of the lower extremity which were visible on ultrasound and to naked eyes were included in the study and were treated by EVLA. 448 greater saphenous veins and 385 small saphenous veins were treated in 286 patients. **Results:** In 1040 major venous tributaries single puncture was sufficient in 860 (83%), while two punctures were required in 180 cases (17%).Treatment was successful in 876 venous segments (84.26%) in the first setting, while the residual veins were treated in second setting resulting in their 100% obliteration. After treatment, ultrasound surveillance within the next few days confirmed that the saphenous veins and tributaries were all occluded. Bruising was noted along the course of treated veins. Neuropraxia was noted in leg along the course of saphenous vein and sural nerve in all the cases for variable period of 2 weeks to 4 months. There were no late sequel such as persisting induration or fat atrophy. **Conclusion:** Most of the venous tributaries along with the saphenous veins in all the cases can be treated by EVLA in single setting without any significant complications. It is safe, cost effective with a comfortable recovery while maintaining minimally invasive treatment.

Key Word: Endovenous Laser, ultrasound, venous tributaries, saphenous veins.

[*]**Address for Correspondence:**
Dr. Manohar Kachare, Ultravision diagnostic Centre, Jaysingpur, Tal. Shirol, Dist Kolhapur, Maharashtra, 416101, INDIA.
Email: manoharkachare@rediffmail.com
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INTRODUCTION

Endovenous laser ablation (EVLA) is a well established treatment for chronic venous insufficiency[1]. The venous tributaries are usually managed either by ultrasound-guided sclerotherapy (UGS) or by phlebectomy which may be synchronous or at an interval after EVLA[2,3]. The venous tributaries can be treated by laser directly[4] .Only single relatively smaller patient study has been done for the simultaneous treatment of tributaries by the EVLA that is used for the saphenous veins. Aim of our prospective and largest study on this topic in the literature

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is to determine whether EVLA could be used to treat large lower extremity venous tributaries as well as saphenous veins in a single setting.

METHODS AND MATERIALS

In this prospective study, 286 patients were consecutively enrolled and informed consent was obtained. Approval of institutional ethics committee was taken. The 1040 major venous tributaries of these 286 patients were treated under spinal anesthesia along with saphenous veins in single center by the team of radiologist with 15 years of experience and surgeon with 20 years of experience over the period of 36 months from April 2011 to March 2014. All the major tributaries along with saphenous veins visible on ultrasound and to naked eyes were treated by EVLA. The definition of saphenous veins and tributaries followed that recommended by a Consensus group of the International union of phlebology[3]. The saphenous veins treated were the great saphenous(GSV), anterior accessory saphenous(AASV) and small saphenous (SSV) veins. Most of the venous tributaries were unnamed according to venous nomenclature so we described them based on location on the anteromedial, anterolateral or posterior aspect in the limb and whether they were above the knee, below the knee or both(Table 1). Out of 286 patients 162 patients underwent both lower limb and 124 underwent single limb EVLA. The reasons for treatment was varicosities (n= 52), leg edema (n= 16), varicosities and pain (n=75), varicosities and ulcer (n= 42), Klippel–Trénaunay syndrome (n= 1).448 greater saphenous veins and 385 small saphenous veins were treated in 286 patients. In 286 patients, 1040 major venous tributaries were treated by EVLA. All the major tributaries visible to naked eyes and on ultrasound were treated by attempted EVLA. All the patients were examined in standing position prior to surgery on Toshiba Nemio 30, Japan ultrasound system, the length and diameters of the veins were recorded[4] .EVLA was done by using Diomed 15 Plus Diode Laser 810 nm system, U.K. [Fig. 1]. Spinal anesthesia was given in all the patients. Ethroli ultrasound system was used for intraoperative scanning. Sterile Xylocaine jelly was used as coupling agent. The veins were punctured with 16 G Jelco (Smiths Medical International Ltd., Italy) under ultrasound guidance, the stellate was replaced with 600 micron Laser fibre directly [Fig.2a,b]. In few cases, a Terumo 0.035″ hydrophilic glide wire (Terumo Corporation Australian Branch, Sydney, Australia) was maneuvered through the tributary, long 5F sheath is passed over the glide wire, after withdrawing wire, 600 micron Laser fiber was passed through the sheath [Fig. 3].Under ultrasound guidance isotonic saline was infiltrated around the entire course of veins with 22G needle [Fig 4a,b]. The settings for EVLA used were 12W continuous power for above knee joint GSV, 10W for below knee GSV, SSV and tributaries at a withdrawal of 1 mm/second. 1240 veins treated were GSV and tributaries [Fig.5a, 5b], anterior accessory saphenous vein and tributaries 22 [Fig 6], small saphenous vein and tributaries 165, and tributaries only 61 [Fig 7]. All patients were admitted to the hospital for one day and scheduled for clinical and ultrasound review 2 weeks after treatment[5].

RESULTS

Out of 1040 major tributaries, single puncture was sufficient in 860 [83%], while two punctures were required in 180 venous tributaries [17%]. Glide wire was required in 120 tributaries, in remaining veins fibre was passed directly. The volume of isotonic saline required for GSV was 150-200ml, AASV was 20-50ml, SSV was 80-100ml, and was 20-150ml for venous tributaries. The lengths of greater saphenous veins treated were 30-90 (median = 60) cm, lesser saphenous veins treated were 15-40 cm (median = 30) and the lengths of tributaries treated were 5-45 cm (median 15). The diameters of treated greater saphenous veins was 8–22mm (median 14), lesser saphenous veins was 5-16mm (median 8),and the estimated mean diameters of treated tributaries was 4–15 mm (median 7) as measured prior to operation in standing position. Treatment was successful in 876 venous segments (84.26%) in first setting, while the remaining164[15.76%] residual veins were treated in second setting thereby resulting in 100% obliteration. After treatment ultrasound surveillance within the next few days confirmed that the saphenous veins and tributaries were all occluded. Bruising was noted along the course of treated veins in all patients which disappeared within 5-6 days after treatment while lower limb edema seen in 80% [228 out of 286] of the cases reduced in 7-10days. Both bruising and edema are selflimiting and does not require any treatment. Numbness noted over medial malleolus in 90 % [257 out of 286] cases disappeared in 6-8 months, except for permanent numbness in 30 % [86 out of 286]. These patients were treated with vitamin B1, B6 and B12 supplements. There were no late sequel such as persisting induration or fat atrophy.


Figure 1


Figure 2.A


Figure 2.B

Figure 1: Diomed 15 Plus Diode Laser system; **Figure2A:** Ultrasound guided puncture of greater saphenous veins done at the level of ankle joint; **Figure 2 B:** LASER fibre was inserted through the elco

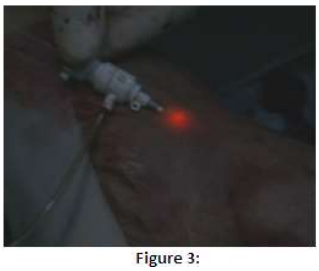
Figure 3:


Figure 4.A:


Figure 4.B:

Figure 3: LASER fibre passed through sheath after withdrawing the guide wire; **Figure 4A:** Ultrasound guided perivenous infiltration of isotonic saline; **Figure 4B:** Logitudinal ultrasound image shows fluid in perivenous space


Figure 5.A:


Figure 5.B:


Figure 6:


Figure 7:

Figure 5A: Tributory of GSV on dorsum of foot; **Figure 5B:** Tributory of GSV in the leg punctured with Jelco. LASER fibre is in the GSV; **Figure 6:** LASER Fibre in anterior accessory saphenous vein; **Figure 7:** LASER fibre in lesser saphenous vein. Tributory on the posteromedial aspect is punctured with Jelco

DISCUSSION

The saphenous veins located within their saphenous sheaths are usually straight even when diseased and dilated. However their major varicose tributaries outside the sheaths are usually tortuous to varying degrees. The degree of tortuosity was assessed by intraoperative ultrasound scanning. In most of the tributaries Laser fiber was passed directly, rarely glide wire is used. We used intraoperative ultrasound for guided puncture of the veins and for perivenous infiltration of isotonic saline. The perivenous saline acts as heat sink and reduces the thermal damage to perivenous tissues[6]. Endovenous laser ablation (EVLA) damages a blood-filled vessel by steam formation, leading to endothelial denudation, collagen contraction and vein wall fibrosis, with even complete lack of visualization of vein at the 6–12 month scans[7]. Treatment of tributaries along with saphenous veins in single setting prolongs treatment by few minutes than isolated treatment by ultrasound guided sclerotherapy or phlebectomy. There are many advantages of treating tributaries and saphenous veins in single setting. Basically EVLA is non-surgical procedure. The tributaries treated by EVLA along with the draining superficial varicosities become impalpable immediately after treatment and also the draining superficial varicosities. Most of the perforators located between deep veins tributaries also get obliterated following treatment. Besides, this has increased cosmetic value given the disappearance of most of the visible leg veins. Patient's symptoms of pain & leg fatigue reduce significantly. Ulcer healing improves with treatment of tributaries. Reduced recurrence rate as venous pressure is significantly reduced with aggressive treatment. The hospital visits and expenditures on treatment are reduced[7,10]. There is paucity of data regarding laser ablation of venous tributaries and its advantages except for 95 patient's series from Myers *et al*[10]. To best of our knowledge, this is the only study done in the Asia on this

topic. K A Myers *et al*[10] has described 173 major venous systems in 95 patients treated by EVLA over a 12-months. As compared with our study, there are few differences with K A Meyer *et al* study who used glide wire in all the cases while we were required to use glide wire in 120 venous segments [11%]. The success rate of 84% Vs 89%was comparable in both studies. Besides, the incidence of major and minor complications in both studies was similar. We are presenting our largest study in the literature of treatment of venous tributaries along with saphenous veins. Limitations of the study consisted of conduction of study at single center in a diagnostic hospital setting with highest referral for this procedure due to presence of experienced multidisciplinary team of radiologist and surgeon and similar scenario may not be present in other community hospital settings.

CONCLUSION

Most of the venous tributaries along with the saphenous veins in all the cases can be treated by endovenous laser ablation in single setting without any significant complications. It is a safe, cost effective with a comfortable recovery while maintaining minimally invasive treatment.

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