ENDOVENOUS LASER ABLATION AND FOAM SCLEROTHERAPY: EXPERIENCE IN 450 CONSECUTIVE PATIENTS

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Purpose

Endovenous laser ablation (ELA) is a well-established alternative to surgery in the treatment of truncal and perforating vein insufficiency. After the refluxing truncal or perforating vein is ablated, the remaining varicosities are either removed with phlebectomy, or alternatively, treated with sclerotherapy **(1-3)**. Sclerotherapy is traditionally performed using liquid agents, but foam sclerotherapy is becoming more and more popular **(4)**. In the literature, there is little data on the concomitant use of foam sclerotherapy following ELA **(5,6)**. In this single center series, we present our experience in 450 patients in whom ELA and foam sclerotherapy were performed in the same session.

Materials/Methods

Between July 2005 and March 2010, concomitant foam sclerotherapy of the varicose veins were performed in 450 out of 510 patients who underwent endovenous laser ablation for truncal and/or perforating vein insufficiency. Demographic and clinical data of these patients are presented in table 1.

In all patients, ELA was performed with US guidance under local tumescent anesthesia. In 157 patients, a femoral or sciatic nerve block was also done to provide better analgesia. In patients with bilateral disease, ELA was performed in both extremities in the same session (n=279), or in a separate session (n=31). Depending on the diameter of the refluxing veins, 50-90 Joules/cm energy was given during the laser ablation. After all ELA procedures were completed (unilateral or bilateral), the remaining varicosities were treated with ultrasound-guided foam sclerotherapy (USGFS). For USGFS, first, multiple butterfly needles were placed into the varicosities under US guidance with the patient in the reverse Trendelenburg position. Then, a thick foam was prepared according to the Tessari method, using a mixture of 1%-3% polidocanol solution and air in a 1:4 ratio. The foam was then injected via the butterfly needles into the varicosities under US guidance with the patient in a slight Trendelenburg position (Figure 1).

Whenever possible, the foam was intentionally directed into the laser-ablated veins to create additional ablation of the refluxing veins with the foam. When all the varicosities were filled with echogenic foam, the injection was stopped. The patient then put on compression stockings and walked for 20-30 minutes.

Follow-up color Doppler US were performed at 1, 6 and 12 months.

Results

ELA was technically successful in all cases although another venous puncture was necessary in 23 legs with tortuous GSV's. Concomitant foam sclerotherapy was also technically successful in all cases. But during the follow-up, persistent reflux was seen in the varicose veins in 181 legs, although the refluxing trunkal/perforating veins were closed. In these legs, distal perforating vein reflux was present in 21 but in the remaining 160 legs, no source could be identified. These veins were treated with repeat USGFS 1-3 times. After the procedures, 198 patients devoleped dry coughing due to foam irritation, which resolved within 15 minutes. Other complications occurred in 148 legs and included hyperpigmentation, telengiectatic matting, skin necrosis, calf vein thrombosis and others (Table 2).

During the 1-49 months follow-up (Mean±SE: 10,81±0.58 months), 2 (0.26%) recanalizations were seen in the laser-ablated truncal and perforating veins (Figures 2a-c).

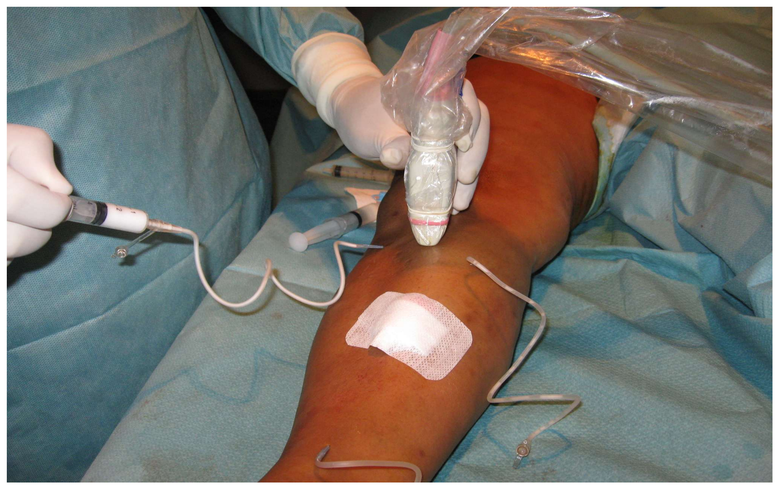

Figure 1. US-guided foam sclerotherapy.

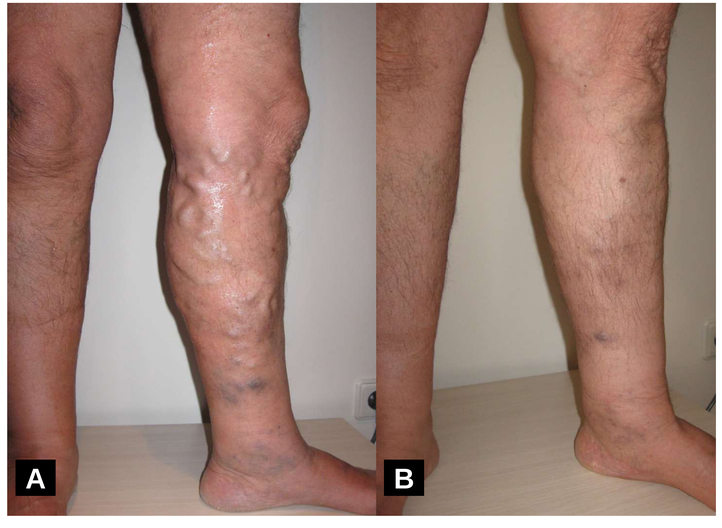

Figure 2. A 60 year-old man with the left GSV reflux and large varicose veins: A. Before the procedure. B. Eight months after ELA and foam sclerotherapy.

Table 1: Demographic and clinical aspects of 450 patients who underwent ELA and concomitant USGFS

Number of patients	450 (760 legs)
Sex	369 F / 81 M
Clinical classification (CEAP) in 760 legs	C1 (n=63) C2 (n=334) C3 (n=155) C4a (n=75) C4b (n=58) C5 (n=45) C6 (n=30)
Refluxing vein(s) in 760 legs	GSV (n=445) SSV (n=96) PV (n=39) Combined (n=180)

Table 2: Complications after ELA and foam sclerotherapy in 450 patients (760 legs)

Complications	Patients/legs	Outcome
Coughing	198 patients	Disappeared spontaneously
Nausea/vomiting	23 patients	Disappeared spontaneously in 20, antivomiting drug given in 3
Hyperpigmentation	92 legs	Disappeared in 85, persisted after 1 year in 7
Telengiectatic matting	36 legs	Disappeared in 30, persisted after 1 year in 6
Skin necrosis	5 legs	Healed completely within 4 months
Calf vein thrombosis	3 legs	Resolved within 1 month
Transient paresthesia	26 legs	Resolved within 4 months
Visual disturbances	3 patients	Resolved in 15 minutes

Conclusion

In truncal and perforating vein insufficiency, traditional method to treat remaining varicosities after ELA is ambulatory phlebectomy (AP) (3,7). Although excellent cosmetic results can be obtained in experienced hands, AP has some drawbacks. First, it is a time consuming procedure that requires special surgical instruments, which is not very suitable in the office setting. Second, although large varicose veins can be successfully removed, small reticular and spider veins remain after AP and these veins should be treated with sclerotherapy. And third, the idea of their veins "removed with hooks" is not welcome by many patients.

Another method to treat remaining varicosities after ELA is sclerotherapy. Sclerotherapy is traditionally performed by injecting sclerosing liquids into the varicosities. Liquid sclerotherapy has been an excellent treatment for spider and reticular veins but proved unsuccessful for the varicose veins (4). In the last decade, USGFS was also introduced and has become increasingly popular. USGFS has certain advantages over liquid sclerotherapy. First, the foam pushes the blood, rather than mixing with it, and may retain its concentration over a long distance in the vein lumen. As a result, its ablative effect is several times stronger than the liquid, and for this reason, it is suitable for the treatment of even large varicose veins. Second, because it is mixed with air, it contains less drug, but becomes more effective. As a result, the amount of sclerosant and the number of injections to obtain a certain ablative effect are reduced. And third, foam is readily visible on US, and because it is lighter than blood, it can be easily directed into the target vessels by manual massage and by putting the leg in certain positions (4).

Although successfully used in truncal and perforating vein ablation instead of endovenous laser or radiofrequency, USGFS is most commonly preferred in the treatment of pelvic-gonadal vein insufficiency and for the ablation of remaining varicosities after ELA of truncal and perforating veins (4). In the literature, we could find only 2 studies reporting the results of concomitant use of USGFS after ELA (5,6). In both, the combined treatment was associated with a high success rate (98-100% closure of the refluxing veins) and a low complication rate. Similarly, during the 1-48 months follow-up, we have seen only 2 patients with recanalization of the refluxing veins in our study. We believe that routine Doppler US follow-up of all patients including the asymptomatic ones, repeated USGFS of varicosities until no reflux was seen and intentional manipulation of the foam into the laser-ablated veins to create additional ablation after ELA may have decreased the recurrence rate in our series.

In our study, we saw some minor complications immediately after USGFS including coughing, nausea-vomiting and transient visual disturbances, which invariably resolved within 15-20 minutes after the procedure. Other minor complications included hyperpigmentation and telengiectatic matting (due to foam sclerotherapy) which mostly resolved within one year, and transient paresthesia (due to ELA) which resolved within 4 months. In our study, major complications occurred in 8 legs (1 %): Skin necrosis was seen in 5 legs and healed within 4 months, although systemic and topical antibiotics were necessary in 3 legs. Calf vein thrombosis was seen in one of the crural veins in 3 legs. All the patients presented with ankle swelling several days after the procedure, and successfully treated with low molecular weight heparin. In our study, we took some measures to reduce the risk of deep vein thrombosis: 1. Instead of injecting a large volume of foam via a single puncture, we injected small volumes via multiple punctures. 2. We avoided injection near to perforating veins. 3. When we saw filling of the deep veins with foam, we stopped the injection at that site and continued the injection via another puncture. 4. We performed USGFS only after all ELA were finished, and made the patient walk for 20 minutes immediately after the procedure. 5. We instructed the patient to be active (walking or performing foot exercises) for at least 4 hours after each USGFS session.

In our experience, concomitant use of USGFS with ELA provides some advantages: First, since the refluxing vein and the varicosities are treated in the same session, the total duration and cost of the treatment are reduced, and the period spent in compression stockings is shortened which is preferred by the patient. Second, if the varicose veins are left untreated following ELA, they may be thrombosed due to stagnation. This may complicate or interfere with the subsequent sclerotherapy (or phlebectomy) and may require anticoagulant treatment. USGFS performed shortly after ELA prevents this complication. And third, passage of the foam from the varicosities into the laser-ablated refluxing truncal or perforating veins creates an additional ablation, and this may result in a more durable occlusion.

In conclusion, endovenous laser ablation and concomitant USGFS is feasible and effective. The procedures are associated with a low complication rate and can be performed in both legs in the same session. Concomitant use of laser and foam may potentially decrease the recanalization rate of laser-ablated vessels.

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