Thermoablation using the hedgehog technique for complex recurrent venous reflux patterns

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Neovascularization after vein stripping is well recognized as a contributory cause of varicose vein recurrence. Treatment is challenging because of segment tortuosity and fibrous web formation. Surgical re-exploration is practiced, but foam sclerotherapy is becoming preferred. We suggest an alternative method using thermoablation with a technique originally intended for treatment of perforator vein reflux. This modification has not been described in the context of recurrent neovascularization before. By ultrasound-directed insertion of multiple intravenous cannulas into convoluted neovascularized segments, recurrences in the groin, popliteal fossa, and truncal vein strip tracks can be successfully ablated by endovenous laser ablation. (J Vasc Surg Cases 2016;2:181-3.)

Neovascularization in the strip track after conventional truncal vein stripping is well recognized and associated with high levels of recurrence. It occurs because of the formation of small channels that gradually coalesce to produce wider channels of variable length.[1] The groin is a particularly common area to be affected despite efforts to prevent it with the use of synthetic barriers sutured over the saphenofemoral junction.[2] Groin re-exploration surgery is time-consuming, challenging, and painful with the potential for morbidities due to neurovascular and lymphatic damage. Foam sclerotherapy has been advocated as the method of first choice for the treatment of neovascularized segments,[3] but high-quality compression is required to produce optimum results, and this can be difficult to achieve high up in the groin where effective bandaging becomes impossible. The National Institute for Health and Care Excellence guidelines of 2013[4] suggest that thermoablative methods, such as endovenous laser ablation (EVLA) and radiofrequency ablation (RFA), are preferred to ultrasound-guided foam sclerotherapy (UGFS), with conventional vein stripping suggested as a third alternative in the list of options for primary reflux. Whereas these recommendations cannot necessarily be extrapolated to recurrent refluxing segments, logical argument could be made for a similar approach. Neovascularization appears to occur as frequently after RFA or EVLA as after surgery,[5] but this finding is at variance with our experience; provided adequate energy is imparted to the vein wall to produce panmural death, failure in the form of reopening of the vessel does not occur, unlike the case of UGFS, in which a recanalization of around 15% to 20% in different series at 1 year is described. This recurrence rate is similar to that for vein stripping,[6] in which the mechanism is different and results from a regenerative process in the strip track and appears to be associated with early hematoma in the space left by the avulsed truncal vein. Thermoablation appears to be a more robust technique for the treatment of truncal veins in terms of closure and lack of neovascularization,[7] and it is reasonable to assume the same is true of neovascular segments. We report a method of EVLA for multiple segments of neovascularized vein track using multiple entry sites.

METHODS

The technique is based on the method previously described for access and treatment of refluxing perforators described by our unit.[8] The various vein segments are identified by B-mode ultrasound in a parasagittal plane. Intradermal injection of the skin with 1% lignocaine at one of the poles of the ultrasound probe is performed, and a 14-gauge Abbocath cannula (Venisystems; Abbocath-T; Hospira, Sligo, Ireland) is inserted through the anesthetized area following the line of the ultrasound beam until the neovascularized segment is accessed (Fig 1). The needle stylet is withdrawn and a Luer-Lok cap placed over the cannula hub to prevent backbleeding. The next segment is similarly cannulated until all accessible segments have been accessed (Fig 2). A 4F jacketed 1470-nm laser fiber (AngioDynamics VenaCure EVLT NeverTouch Direct; AngioDynamics, Latham, NY) is passed individually down each Abbocath cannula in turn. The ultrasound view is maintained in the parasagittal plane over the laser fiber, and the area around the neovascularized segment targeted is thoroughly infiltrated with Klein solution (500 mL total solution made up of 475 mL 0.9% sodium chloride [Fresenius Kabi Ltd, Runcorn, Cheshire, UK], 20 mL 2% lidocaine with 1:200,000 epinephrine [Hameln Pharmaceuticals

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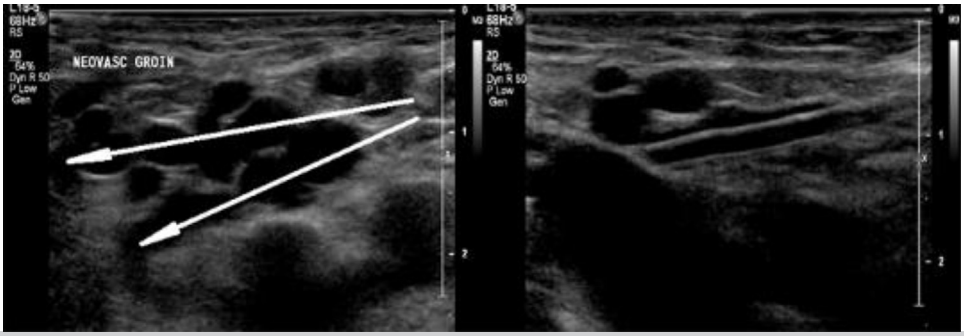

Fig 1. An extensively neovascularized groin is shown. The *arrows* on the *left* show the lines of insertion of cannulas, the first of which has been placed in the picture on the *right*.

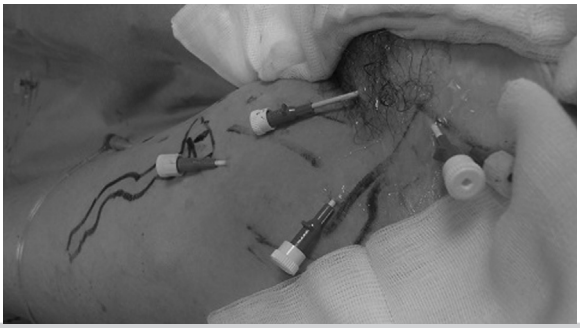

Fig 2. A total of five Abbocath cannulas have been inserted into neovascularized segments in the left groin. A separate Terumo cannula can be seen in a segment of truncal vein on the medial aspect of the thigh.

Ltd, Gloucester, UK], and 5 mL 8.4% sodium bicarbonate [Martindale Pharmaceuticals, Wooburn Green, Buckinghamshire, UK]). Ultimately, the whole field becomes infiltrated with tumescent fluid, emphasizing the importance of preliminary access of the segments to avoid obscuring areas that would benefit. Energy transfers of 70 to 80 J/cm are delivered under ultrasound surveillance to the segment lengths. Typical ultrasound appearances following the procedure are demonstrated in Fig 3; in this example, virtually all previous neovascular cavities are eliminated.

Full written informed consent was obtained from all patients whose clinical and ultrasound images are demonstrated in this paper.

DISCUSSION

Neovascularization will continue to present a problem in recurrent varicose veins for the foreseeable future. Despite the more widespread use of thermoablation and UGFS methods, it is estimated that conventional vein stripping remains the preferred method of treatment in more than a third of cases in the United Kingdom despite the apparent superiority of EVLA and RFA in terms of morbidity, longer recovery, and of course its association with neovascularization, which the more modern methods largely avoid. A recent meta-analysis[9] including 13 studies involving 3081 patients suggested that EVLA had lower neovascularization and technical failure rates compared with other modalities of treatment including UGFS and vein stripping.

Extensive neovascularization is still often tackled by re-exploration surgery or foam sclerotherapy. In a consensus debate at the Charing Cross International Symposium in 2014, a majority of delegates found in favor of open surgery in the groin for neovascular recurrence[10] despite well-recognized complications following such invasive treatment. Neovascular segments present a difficult challenge to the clinician, and it is easy to see why UGFS is appealing as a form of treatment. The segments are rarely suitable to the insertion of long introduction cannulas, such as the Terumo, because they are serpiginous with scarred walls and internal webs. However, with care, these challenging vessels can be accessed and some of the webs traversed to obtain longer lengths for treatment. They contract under exposure to heat energy delivered by either laser or radiofrequency, and it obviates the risk of their filling with sclerothrombus at the time of foam injection only for recanalization to occur later.

In our experience, it is important to access all possible segments before tumescence is introduced because infiltration with anesthetic fluid sequentially runs the risk of obscuring the next vessel to be cannulated. Numerous cannulas may be required if the segments are in proximity. Increasing familiarity with EVLA and RFA can only lead to improvement of technical skills that comes from practice and training. In 2015, there were 14 retrospective cases identified of a complexity to benefit from the described technique. Eleven have since presented for follow-up UGFS in accordance with our clinic's protocol. The opportunity to review the ultrasound appearances was taken and effective obliteration of the previous neovascular segments observed. The follow-up period was a median of 123 days (range, 20-266). Thus far, no significant complications, such as nerve injuries or venous thromboembolism, have been reported. Further study and follow-up are under way.

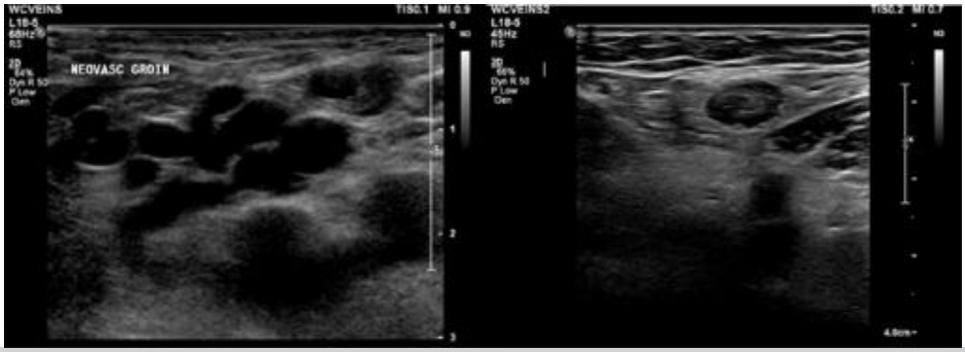

Fig 3. Ultrasound pictures showing effect of endovenous laser ablation (EVLA) treatment to groin neovascularization 5 months after the procedure.

CONCLUSIONS

The described method of multiple punctures or "hedgehog" technique for treating multiple short recurrent vein segments is presented and appears to provide a reliable obliterative alternative to UGFS, especially if the target vein diameter is 3 mm or more, when success with the latter technique is less likely. Moreover, thermoablation, unlike UGFS, is not reliant on compression after the procedure, particularly in areas such as the groin, where ideal effective pressure is impossible to maintain.

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