Advanced chronic venous insufficiency and the role of the incompetent perforator vein: A 100-year quest for the right strategy

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In their publication, Gloviczki et al[1] have noted the usefulness of the subfascial endoscopic division technique for the management of incompetent perforator veins. They pursued this technique in 11 legs (9 patients) with 9 of the 11 legs having active or recently healed venous ulcers with a mean duration of 5.6 years. The technique involves the application of a tourniquet to the proximal thigh, exsanguinating the leg and then inflating the tourniquet to a pressure of 300 mm Hg. Two 10-mm laparoscopic ports were placed just below the knee, avoiding the area of lipodermatosclerosis/ulcer(s). The subfascial space was then insufflated to a pressure of 30 mm Hg using carbon dioxide and the medial perforating veins from the ankle up to the access sites were clipped and divided (mean perforating veins per limb, 4.4[2-7]). Concomitant stripping of superficial veins was performed in 8 limbs. Over a mean follow-up of 9.7 months, the authors noted a complete resolution of symptoms with the healing of ulcers without recurrence in seven limbs, improvement of the ulcer in three limbs, and no change in one. The authors concluded that endoscopic subfascial division of perforating veins is a safe technique, with favorable early results that support further clinical trials to evaluate the technique. The limitations of this subfascial endoscopic perforator surgery (SEPS) include[1] the inability to adequately insufflate the subfascial space in the setting of severe lipodermatosclerosis,[2] that all subfascial perforators need to be ablated irrespective of the status of incompetence,[3] and that separate incision(s) need to be made to access perforators that are not within reach of the initial access/port.

Although ligation of the perforator veins has been propounded for more than a century,[2-4] a more systematic approach to the surgery was put forth by Robert Linton in his landmark 1938 publication.[4] However, this approach through the use of medial, anterolateral, and posterolateral longitudinal skin flaps resulted in a high rate of wound complications and extensive scarring, as well as prolonged hospitalization. These factors led to modified Linton approaches being put forth, including by Linton himself, where only a medial approach was used,[5] a posterior subfascial approach,[6] through an incision in the posteromedial aspect of the calf and extra fascial ligation of perforators,[7] a medial or lateral incision depending on the location of the ulcer,[8] a limited upper calf incision with blunt subfascial interruption of perforating veins using a phlebotome,[9] and an approach that used bipedicled flaps in the natural skin lines to permit ligation of offending perforating veins.[10] Most of these modifications had problems similar to those encountered in the original surgery. With the advent of endoscopic surgery, this technique became the first choice as opposed to the Linton-derived procedures. Although Heuer[11] initially published the use of a single port to perform subfascial division of perforators, others including Couto and Baptista,[12] Jugenheimer and Junginger,[13] O'Donnell,[14] Conrad,[15] and Gloviczki et al,[1] among others, further modified the technique enabling simultaneous endoscopic visualization besides other adaptations. An analysis of 146 patients from the North American SEPS Registry, including 122 with active or healed venous leg ulcers, demonstrated that the interruption of incompetent perforators with concomitant treatment of superficial disease (71%) was effective in decreasing the symptoms of chronic venous insufficiency and promoting ulcer healing.[16] Cumulative ulcer healing at 1 year was 88% (median time to healing, 54 days) with concomitant ablation of superficial reflux and lack of deep venous obstruction predicting ulcer healing ($P < .05$). Cumulative ulcer recurrence at 1 year was 16% and at 2 years was 28%. Post-thrombotic limbs had a higher 2-year cumulative recurrence rate (46%) than did those limbs with primary valvular incompetence (20%; $P < .05$).[16] A recent Cochrane review that evaluated the role of SEPS for treating venous leg ulcers analyzed four randomized control trials and noted that the role of SEPS for the treatment of venous leg ulcers remains uncertain with only low or very low certainty evidence available.[17] All four studies had problems owing to small

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sample sizes or poor reporting, and it was not possible to determine the potential benefits and harms of SEPS.[17]

Contemporary management of the incompetent perforator vein includes the use of ultrasound-guided foam sclerotherapy (UGFS), radiofrequency ablation (RFA), and endovenous laser ablation (EVLA). More recently, cyanoacrylate has been used to close incompetent perforator veins.[18] Overall, ulcer healing with UGFS has been between 52% and 100%, with RFA from 63% to 100% and with EVLA from 71% to 80%.[19] Ulcer recurrence when reported has been 23% for UGFS (1 study), 0% to 16% for RFA (4 studies), and none for EVLA (1 study).[19]

A recent meta-analysis[20] that evaluated 81 studies (7010 patients) to determine the role of the incompetent perforator vein in chronic venous insufficiency noted that the overall evidence quality was low to intermediate, with a moderate to high risk of bias in the comparative studies. Pooled estimates for short-term (1 year) wound healing were 99.9% for ultrasound-guided sclerotherapy, 72.2% for open ligation, and 96.0% for SEPS.[20] A systematic review network metanalysis and metaregression that evaluated the impact of perforator vein treatment on venous leg ulcers, as part of a bigger analysis that assessed the role of endovenous and surgical interventions for venous leg ulcers, failed to predict healing or recurrence of ulcers.[21]

The most recent multisocietal guidelines,[22] which are a decade old, recommend the use of percutaneous techniques including ultrasound-guided sclerotherapy or endovenous thermal ablation (radiofrequency or laser) over open venous perforator surgery for the treatment of pathological perforator veins to eliminate the need for incisions in areas of compromised skin. Pathological perforator veins were defined as incompetent perforator veins (diameter >3.5 mm with an outward flow of >500 ms duration) in the setting of a healed or active venous leg ulcer.[22] The role of cyanoacrylate in this regard remains to be clarified. Updates to these multisocietal guidelines are underway currently.

The role of perforator vein incompetence in the setting of advanced chronic venous insufficiency remains to be elucidated. Given that bidirectional flow in perforator veins is a normal phenomenon, the factors that lead to this normal efflux becoming pathological efflux have not been thoroughly evaluated. Even in the setting of a pathological perforator, is the perforator truly the cause of the problem, or is it just an innocent bystander? If it is the former, then it begs the question as to why do we not see better, more consistent results from perforator vein ablation? The answer likely lies in our relative lack of understanding of venous hemodynamics of the lower extremity. Until such an understanding is complete, although we may see positive results from our interventions, the consistency of such positive results is likely to elude us. Herein lies a significant knowledge gap that we need to strive to fill.

DISCLOSURES

None.

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