Complications in subfascial endoscopic perforating vein surgery: A report of two cases

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Subfascial endoscopic perforating vein surgery is a safe method for the division of incompetent perforating veins. Nevertheless, we report two cases with unfortunate complications: the posterior tibial artery and tibial nerve were damaged during the procedures. In one patient this resulted in a reintervention, but in both patients it resulted in permanent discomfort. We then present a guideline that may prevent damage to these critical structures. (J Vasc Surg 2001;33:1108-10.)

Since the introduction of endoscopic subfascial surgery for the interruption of perforating veins, surgeons have become increasingly attracted to the use of this minimally invasive technique in the treatment of severe venous disease. The safety, feasibility, and efficacy of subfascial perforating vein surgery (SEPS) has been widely demonstrated.[1-5] The perforating vein division combined with ablation of superficial venous insufficiency is effective in decreasing the symptoms of chronic venous insufficiency and contributes to the healing of ulceration.[6] Although complications from this procedure such as hematoma, cellulitis, wound dehiscence or seroma, and skin nerve injury have been described earlier, we encountered two other complications from this procedure, which will be presented in the following two cases.

CASE REPORT

Patient 1. A 64-year-old man presented in our outpatient clinic with asymptomatic large varicose veins on the medial side of the left lower leg. He had hyperpigmentation of the skin in his lower leg. He was afraid of damaging these large veins with subsequent bleeding during his active involvement in sports.

One year before, he had had proximal ligation of the lesser saphenous vein with open division of an incompetent perforating vein on the right lower leg. This was followed with sclerocompression therapy with a cosmetically satisfactory result. Also, he had a cholecystectomy 5 years earlier and a reattachment of a ruptured Achilles tendon on his left side 25 years earlier. He did not use any medication. He had no history of deep venous thrombosis. Duplex scanning demonstrated competence of the greater and lesser saphenous veins and the deep venous system. Only incompetent perforating veins were found. According to the CEAP classification, his limb was classified as $C_{2\text{-}A}E_PA_{P18}P_R$.

The patient underwent an SEPS procedure that was performed under a bloodless field with a roll-on tourniquet (Boazul; TD Medical, Eindhoven, The Netherlands). Preoperatively using duplex scanning, we identified and marked all perforating veins. A small incision was made just posteromedial to the edge of the tibia. After a subfascial pocket was created digitally, an SEPS endoscope was introduced (Olympus Co, Hamburg, Germany; 16 mm diameter with a working channel of 6 × 8.5 mm). Dissection and exploration of the subfascial plane was performed with the endoscope and with a pair of endoscopic scissors. After the superficial dorsal muscle compartment was explored, dissection of the intermuscular septum with exploration of the deep compartment followed. Carbon dioxide insufflation was used to keep the mechanically dissected area open for a better overview. Three large and four small perforating veins were clipped and divided, including Boyd's perforating vein. Electrocautery was not used.

Postoperatively, the patient experienced complete sensory loss in the sole of his left foot, as a result of intraoperative damage to the tibial nerve. There were no signs of improvement during the follow-up period of over 3 years.

Two years after the SEPS procedure, the patient returned with a new problem. He had a recurrent corn that he had failed to notice because of the absence of sensation. This was subsequently excised. One month later, type II diabetes was diagnosed, and the patient was prescribed oral antidiabetic medication. Five months later, the wound still had not healed.

Patient 2. A 55-year-old man presented with varicose veins that he had for more than 30 years. The patient underwent bilateral stripping of the greater and lesser saphenous veins previously, and on the left side, open ligation of incompetent perforating veins was performed. He had had a recurrent ulceration on the medial side of the lower left leg for 8 years.

He was seen in our outpatient clinic for this recurrent ulcer on the left side with complaints of pain around the ulcer and a heavy feeling in the leg. We saw varicose veins on the medial, upper, and lower leg, with lipodermatosclerosis and hyperpigmentation around the ulcer on the lower medial side of his lower leg. He had no history of deep venous thrombosis, claudication, diabetes, hypertension, or rheumatic arthritis. Duplex scanning demonstrated absence of the greater and lesser saphenous veins, insufficiency of the common and superficial femoral veins, the popliteal and gastrocnemial veins, and a number of incompetent perforating veins. His limb was classified as $C_{2,4,6\text{-}sS}E_PA_{S5,D11,13,14,16,P18}P_R$.

The patient underwent an SEPS procedure on the medial side of his left lower leg. This was performed with the same approach as described in the first patient. Six perforating veins were clipped and divided. The problem of deep venous insufficiency was not addressed at this time, unless the ulcer would be refractory to healing despite the SEPS procedure followed by compression bandages.

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Competition of interest: nil.
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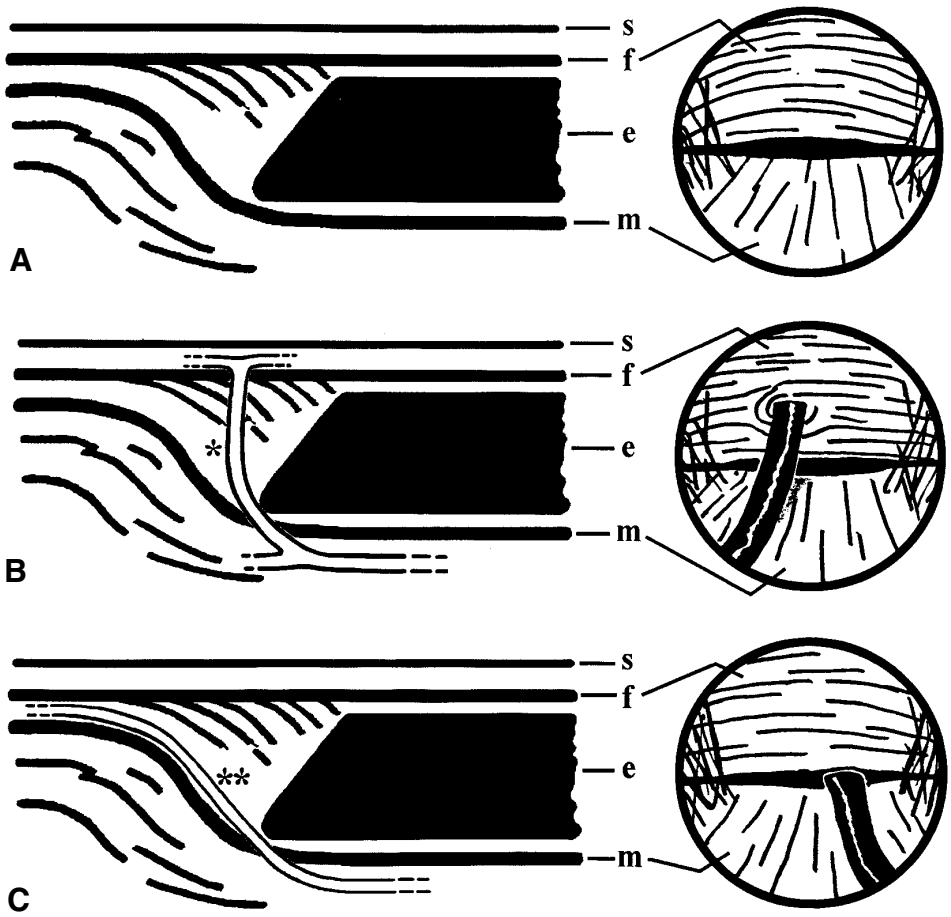
0741-5214/2001/$35.00 + 0 **24/4/113305**
doi:10.1067/mva.2001.113305



A, On the left is the endoscope (*e*) depicted in subfascial space viewed from the side. The skin (*s*) is on top. Its corresponding view through the endoscope is on the *right*; muscle (*m*) is in the lower half of the image and fascia (*f*), in the upper half of the image. **B,** Perforating vein (*), which penetrates fascia and then connects to superficial venous system. **C,** A different structure (**) encountered during the procedure. Its course runs distally, and it does not penetrate the fascia. This could be posterior tibial artery, tibial nerve, or one of the paired posterior tibial veins.

The patient experienced sensory loss on the plantar side of the foot and paresis of plantar flexor muscles of the foot and toes. Neurology evaluation revealed neuropraxia of the tibial nerve. A rupture of a pseudoaneurysm of the posterior tibial artery required an open reintervention. At operation, injury to the posterior tibial artery was noted, and the pseudoaneurysm was treated with excision and primary end-to-end anastomosis. During the procedure, the tibial nerve was found to be intact.

The patient required postoperative physical therapy because of decreased ankle mobility, pain, and paresthesias. He was discharged after a hospital stay of 38 days. Postoperatively, he was treated with compression bandages until the venous ulcer healed 2 and a half months later. At this time, graduated elastic compression stockings were prescribed. After a follow-up of 5 months, he had persistent sensory loss at the plantar side of the foot and paresis of the plantar flexor muscles. He required a plantar splint for stability and ambulation.

DISCUSSION

Complications after the SEPS procedure occur in 5% to 7% of patients and include wound infection, cellulitis, wound dehiscence, skin nerve injury, and subfascial hematoma.[4,7-9] Most of these complications can be treated conservatively. Earlier we reported one case of subfascial infection that required surgical drainage.[4] With our experience of having performed approximately 400 SEPS procedures in our clinic over the last 9 years, it is disturbing to encounter the complications presented in the two patients discussed. We want to be sure one is aware of possible damage to these structures.

When an SEPS procedure is performed for ablation of incompetent perforating veins, the scope is introduced into the medial side of the posterior superficial muscle compartment. Subfascially, this compartment is completely explored, and all perforating veins are clipped and divided. Anatomical studies have demonstrated that only 63% of the perforating veins are accessible from this compartment.[10] The other perforating veins are located either in the intermuscular septum between the superficial and deep posterior compartments or in the deep posterior compartment. Dissection of the intermuscular septum

with full exploration of the deep compartment must be performed to reach these perforating veins. When it is done, damage to the paired posterior tibial veins, the posterior tibial artery, and the tibial nerve should be avoided. In the two cases presented, the tibial nerve and also the posterior tibial artery in the second case were iatrogenically damaged with unfortunate results.

Preventing damage to these structures is achieved by closely following the fascia, combined with carbon dioxide insufflation for a better overview of the mechanically dissected area. It is advisable to divide all perforating veins as close to the fascia as possible, therefore minimizing the risk of simultaneously clipping and damaging other structures. In the second case the side-biting nature of a clip injury probably accounted for the pseudoaneurysm. When dissecting the intermuscular septum and exploring the deep posterior compartment, one should also stay as close to the fascia as possible. When we instead follow the intermuscular septum toward the center of the leg, we could run into these structures.

Before clipping and dividing a presumed perforating vein, especially in the area around the medial malleolus, one should check if it actually perforates the fascia. Near the ankle the endoscope tends to push longitudinal structures (eg, the neurovascular bundle) downward because of the narrow subfascial space, causing them to appear as structures perpendicular to the fascia. As a result of the limited anatomical space in this distal area, carbon dioxide insufflation will only aid minimally in creating a better overview. Because of the bloodless field, the posterior tibial artery or tibial nerve may be mistaken for a perforating vein. Therefore, it is stressed that one should be 100% sure that a structure really penetrates the fascia or has a distally running course toward the foot (Figure). Any structures with a distally running course should not be touched. If one only interrupts structures that penetrate the fascia, complications, as mentioned, can be avoided.

Furthermore, dissection should be performed as distally as possible to reach any Cockett perforating veins because these may contribute to local superficial stasis. Division of this perforating vein should only be performed if dissection in this tight perimalleolar area is possible. Dissection with excessive force and use of the endoscopic scissors could lead to damage to the neurovascular bundle. The use of electrocautery should be avoided, especially in this area because conduction of heat may also contribute to damage to the neurovascular bundle. If preoperative duplex marking indicated an incompetent Cocket (I) perforating vein and endoscopic dissection is not possible, direct ligation can be performed at a later stage. We reserve this approach for the ulcer that is refractory to healing because any incision in the severely diseased skin could lead to wound-healing problems.

All incompetent perforating veins that for 100% certainty perforate the fascia must be divided, and dissection of the intermuscular septum with exploration of the deep compartment is mandatory to accomplish the optimal surgical procedure for venous incompetence in SEPS. When this procedure is performed, it is important to keep in mind the location of these critical structures.

REFERENCES

1. Hauer G. The endoscopic subfascial division of the perforating veins—a preliminary report [German]. Vasa 1985;14:59-61.
2. Sullivan T, O'Donnel TF. Surgical management of incompetent communicating veins. In: Bergan JJ, Kistner RL, editors. Atlas of venous surgery. Philadelphia: W.B. Saunders; 1992. p. 11-24.
3. Conrad P. Endoscopic exploration of the subfascial space of the lower leg with perforator vein interruption using standard laparoscopic equipment: a preliminary report. Phlebology 1994;9:154-7.
4. Pierik EGJM, Wittens CHA, van Urk H. Subfascial endoscopic ligation in the treatment of incompetent perforating veins. Eur J Vasc Endovasc Surg 1995;9:38-41.
5. Gloviczki P, Cambria RA, Rhee RY, Canton LG, McKusick MA. Surgical technique and preliminary results of endoscopic subfascial division of perforating veins. J Vasc Surg 1996;23:517-23.
6. Rhodes JM, Gloviczki P, Canton LG, Heaser TV, Rooke T. Endoscopic perforator vein division with ablation of superficial reflux improves venous hemodynamics. J Vasc Surg 1998;27:839-47.
7. Wolters U, Schmidz-Rixen T, Erasmi H, Lynch J. Endoscopic dissection of incompetent perforating veins in the treatment of chronic venous leg ulcers. Vasc Surg 1996;30:481-7.
8. Gloviczki P, Bergan JJ, Menawat SS, Hobson RW II, Kistner RL, Lawrence PF, et al. Safety, feasibility and early efficacy of subfascial endoscopic perforator surgery: a preliminary report from the North American registry. J Vasc Surg 1997;25:94-105.
9. Rhodes JM, Gloviczki P, Canton LG, Rooke T, Lewis BD, Lindsey JR. Factors affecting clinical outcome following endoscopic perforator vein ablation. Am J Surg 1998;1776:162-7.
10. Mozes G, Gloviczki P, Menawat SS, Fisher DR, Carmichael SW, Kadar A. Surgical anatomy for endoscopic subfascial division of perforating veins. J Vasc Surg 1996;24:800-8.

Submitted Jul 21, 2000; accepted Nov 8, 2000.