Regarding “Laser therapy and radiofrequency ablation of the great saphenous vein: Analysis of early efficacy and complications”

Puggioni et al1 describe 77 patients undergoing the EVLT procedure with an occlusion rate of 94% and ultrasound findings of clot propagation in three limbs. Comparable analysis in the group treated with radiofrequency was not done in regards to early duplex evaluation postprocedure. This experience with saphenous vein ablation, although small, is considerably different from ours in that they report a 4% incidence of clot propagation into the femoral vein.

We have treated 1800 patients since January 2001 using the 940-diode laser (Skin Pulse S, Dornier MedTech America, Inc, Kennesaw, Ga). About 90% of those vessels treated were the great saphenous vein. Other veins treated included the short saphenous, anterolateral branch, and the thigh extension branch.

All vessels were scanned immediately postprocedure and 2 to 5 days later. One patient, a 55-year-old woman, had an extension of the saphenous clot into the femoral vein. She was treated with aspirin and low-molecular-weight heparin for 5 days until resolution of the thrombus was documented by ultrasound scanning. The other patient was a 22-year-old woman with a clot extension into the popliteal vein after short saphenous vein ablation. In this case, low-molecular-weight heparin was used initially with Coumadin (DuPont Pharma, Wilmington, Del) for 3 months thereafter. Our technique intraoperatively is similar to that described, with minor variations. Application of laser energy begins 1.5- to 2-cm distal to the inferior epigastric vein. Our histologic studies, at least with the 940 wavelength, have shown there is little if any thermal damage beyond 1 cm if a pullback is progressing.2 This was confirmed by microscope evaluation (intact adventitial vessels) of veins treated with varying energies and pulse durations. An energy application of <1 second does not affect the vein wall, only the endothelium and subendothelium. This may be in part due to the higher hemoglobin affinity for the 940 wavelength.

Steam bubble formation has been described previously and is thought to be the causation of thermal injury to the vein.3 If very few steam bubbles are seen proximal to the inferior epigastric vein, then thermal injury is unlikely to occur; hence, normal flow will persist in this segment. Rarely do steam bubbles occur 2 to 3 cm from the point of energy application. Owing to higher hemoglobin absorption with the 940 wavelength, remote thermal injury is more unlikely.

We use no conscious sedation or regional anesthetic. All of our procedures are done with ultrasound-directed dilute Xylocaine (AstraZeneca Pharma, Wilmington, Del) injection. Mild compression is applied over the saphenofemoral junction during the initial 5 to 8 cm of treatment, ensuring that no damage occurs from thermal transmission by steam bubbles. This is done by using the ultrasound probe to compress the saphenofemoral junction. Occlusion of the saphenous vein at the junction with an uncompressed femoral vein is easily visualized. Postprocedure, our patients are wrapped with a three-layer compression dressing. After 2 days, 20-mm compression hose are worn. All patients receive ibuprofen (800 mg, thrice daily) for 1 week. This is done not only for analgesia but also for the mild antiplatelet effect at this dose.

Second, the group reports an effective occlusion rate of 94.4%. I would like to ask the authors if the amount of energy delivered is sufficient. In our experience, the total energy delivered is usually in the range of 100 to 125 J/cm. From their description, there is much less energy delivered.

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REFERENCES

do:10.1016/j.jvs.2005.11.040

Reply

We appreciate the points raised by Dr Bush regarding the incidence of extension of great saphenous vein thrombus into the femoral vein after endovenous laser therapy (EVLT) ablation in our series. We have discussed this issue in a previous communication in greater detail.1 We again emphasize the importance of routine postoperative imaging within 24 to 48 hours to identify and appropriately treat thrombus extension.

Based on our experience, we believe that the etiology of this phenomenon is multifactorial (ie, hypercoagulable state, patient age, prolonged immobilization, too much blood in the great saphenous vein) but agree that technique undoubtedly plays an important role.

We perform EVLT using the technique published by Min et al,2 which involves advancing the wire, sheath, and probe into the femoral vein followed by withdrawal into the great saphenous vein for final positioning. No deep venous thrombosis was reported in their series of 499 patients despite commencing the ablation above the inferior epigastric vein (5 to 10 mm from the saphenofemoral junction) as opposed to 1.5 to 2 cm below the epigastric vein as recommended by Dr Bush. We position the laser probe 10 mm distal to the epigastric vein and keep manipulation above this level to a minimum to minimize thrombus extension.

We agree that steam bubbles rarely propagate 2 to 3 cm from the point of energy application, as we have also observed bubble generation under ultrasound imaging during the course of the procedure. It is unlikely that there was venous wall injury in the femoral vein from steam bubbles in any of these cases, as all thrombus extensions were nonocclusive with attachment to the saphenous vein thrombus rather than the wall of the femoral vein. We have not employed compression of the saphenofemoral junction, but do initiate withdrawal of the probe immediately upon commencing the ablation to prevent full thickness injury of the vein wall.

Regarding the amount of laser energy delivered, we have followed the recommendations of the 810-mm diode laser manufacturer (Diomed, Andover, Mass) as well as the technique described by Min et al,2 with satisfactory rates of occlusion (94.4%). This involves delivering laser energy at 14W in a continuous mode, with withdrawal of the catheter at 3 mm/s, making the energy delivered approximately 50 J/cm.

Previous studies3,4 have confirmed that EVLT failure seems to be related to the administration of lower laser fluence; however, there are no published studies looking at the effect of energies >100 J/cm on treatment success. The need for higher energy delivery noted by Dr Bush et al may be related to the higher hemoglobin absorption with the 940-nm wavelength laser. We have learned with experience that complete emptying of the vein with elevation and adequate tumescent anesthesia ensures direct injury to the vein wall and avoids thrombotic occlusion of the saphenous vein, both to decrease the chance of thrombus extension as well as recanalization in the long-term. In addition, we use now a single dose of low-molecular-weight heparin perioperatively to further decrease the risk of thrombotic complications in selected high-risk patients.

Thrombus extension into the femoral vein caused no symptoms in our patients, and this complication appears much more benign than a femoropopliteal or iliac deep vein thrombosis.