Laser Ablation of Unwanted Hand Veins

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Background: Many patients express dissatisfaction with prominent and bulging hand veins. Abolishing these veins with sclerotherapy requires higher concentrations of sclerosing agents than are used for leg veins and often results in a tender, phlebitic cord. Phlebectomy is another treatment option. Endovenous occlusion and shrinkage techniques have been used successfully to treat varicose veins of the lower extremities. The authors demonstrate a new and unique endovenous laser technique to abolish unwanted hand veins.

Methods: Fifty-four hands (28 patients) with prominent hand veins were treated using a 600-μm laser fiber. The Dornier MedTech 940-nm diode laser system was used. The laser fiber was introduced through a 4-French sheath, which tracked as a coaxial system over an 0.018-inch guidewire. Initial entry into the treated vein was accomplished with a 20-gauge angiocatheter percutaneously. On average, four veins were treated in each hand. Tumescent anesthesia was infiltrated around the laser fiber/sheath unit before activating the laser, and all procedures were performed in an office setting. A compressive dressing was used postoperatively.

Results: All but one of the unwanted hand veins were cannulated successfully. The uncannulated vein was treated with sclerotherapy and eventually required phlebectomy. Hand swelling occurred in all treated hands and lasted 2 weeks or less. There was one skin burn of approximately 3 mm at a laser exit site. All 28 patients were satisfied with their results during follow-up, which ranged from 2 weeks to 31 months.

Conclusions: This is the first report of endovenous treatment of unwanted hand veins. Laser ablation of unwanted hand veins can be performed in an office setting. These cosmetically conscious patients were satisfied with their results. (Plast. Reconstr. Surg. 120: 2017, 2007.)

The cosmetic patient generally seeks a more attractive and younger appearance. Facial rejuvenation procedures are abundant and popular and have resulted in an improved appearance for many patients, whereas techniques for rejuvenation of the aging hand have lagged. This lag is attributable, in part, to lack of awareness by physicians and patients of available techniques for effective treatment. The contrast between a rejuvenated face and nonrejuvenated hands may betray a person’s age (Fig. 1). The aged appearance of the hand is distressing to some patients, who seek solutions for this problem.¹

CAUSE OF THE AGED HAND APPEARANCE

Cutaneous changes and atrophic soft-tissue processes lead to the aged hand appearance. Decreased elasticity; atrophy of the epidermis, dermis, and subcutaneous tissues; actinic keratoses; and dyschromias result in an aged hand. The skin appears thin, lax, discolored, and wrinkled, which exaggerates bony, vascular, and tendinous prominences.²⁻⁶ This atrophy renders hand veins more noticeable but does not indicate any actual abnormality of the venous system.⁷ When prominent, tortuous, enlarged veins are the major culprits in producing this unwanted aged look, safe elimination of these veins yields a rewarding result.

ENDOVENOUS LASER ABLATION

In 1999, Spanish phlebologist Dr. Carlos Bone reported on the use of a new method to treat truncal varicosities of the lower extremities using laser energy delivered endovenously by means of a fiberoptic laser fiber.⁸ Since then, laser wavelengths between 810 and 1064 nm (and recently 1320 nm) have proven effective for the treatment of incompetent saphenous veins using endovenous techniques. There has been a plethora of literature published in recent years on this and other endovenous laser techniques. All describe the treat-
Treatment of incompetent (refluxing) lower extremity veins by the introduction of a laser fiber through a hollow catheter, introduced percutaneously over a guidewire. Laser energy delivered at the tip of the fiber releases thermal energy to the blood and the venous wall, causing localized tissue damage. The treated vein is obliterated as the laser fiber is retracted along the length of the vein. This minimally invasive, percutaneous technique is now an established alternative to classic stripping and ligation of the saphenous vein in the treatment of leg varicosities and truncal reflux.

We sought to apply this principle to obliterate unwanted hand veins, providing a cosmetically superior alternative to other available treatments for this problem. This article describes a new and innovative technique of ablation of these unwanted veins using endovenous laser ablation as an office-based, incision-free procedure.

PATIENTS AND METHODS

Fifty-four hands in 28 patients (27 women and one man) were treated with the procedure from July of 2001 through December of 2004. All patients but two had both hands treated. One patient who had only one hand treated was a woman who had undergone prior sclerotherapy of the veins on the dorsum of her contralateral hand by another physician. In 18 of the patients, both hands were treated at the same operative session. In eight patients, the treatments were staged, from 1 to 6 weeks apart. All patients who underwent the laser ablation of unwanted hand veins during the aforementioned period were included.

One patient was 68 years old. The remaining 27 patients’ ages ranged between 41 and 57 years. The mean age for the entire group was 47 years. Our exclusion criteria for this procedure are listed in Table 1.

All procedures were performed in an outpatient office setting. Oral sedation with 7.5 to 15 mg of oral midazolam was used in 18 patients. Less than 12 ml of lidocaine 1% with 1:100,000 epinephrine (for tumescent solution) and 4 ml of lidocaine 1% (for intradermal infiltration) was used. The mean operative time for 27 patients was 45 ± 20 minutes per hand. In one patient where an educational movie on the procedure was performed, the total operative time was 110 minutes. All patients tolerated the procedure well and resumed their usual daily activities immediately after the procedure (when no sedation was used) and the following day for patients who received sedation.

The mean number of veins to be treated with laser ablation was four (range, one to six), for a total of 216. The veins ranged in size between 2 and 6 mm in diameter.

Details of the Procedure

A rubber tourniquet is applied above the wrist and the patient is asked to outline the prominent veins that are unsightly and most bothersome to him or her. Using a marking pen, these veins are traced on the dorsum of the hand. The entry points of the longer veins at the wrist level where they join forearm tributaries are marked. Digital photographs are taken before and after marking.

The hand is rested on an arm board with the patient lying in the supine position. All people in the room wear laser safety glasses. The hand and forearm are circumferentially prepared and draped. A sterile rubber tourniquet is applied at the wrist, just proximal to the veins of interest. Initially, 20-gauge Angiocaths (BD Medical Systems, Sandy, Utah) are

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Table 1. Exclusion Criteria for Use of Laser Ablation of Unwanted Hand Veins

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<thead>
<tr>
<th>Condition</th>
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<tr>
<td>Unavailability of antecubital veins</td>
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<tr>
<td>Connective tissue disease</td>
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<tr>
<td>Blood dyscrasias</td>
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<tr>
<td>Presence of soft-tissue infection</td>
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<tr>
<td>Poor general health</td>
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<tr>
<td>Chronic hand pain, weakness, edema, carpal tunnel syndrome</td>
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<tr>
<td>Presence of dialysis shunt</td>
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<tr>
<td>Radical mastectomy</td>
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<tr>
<td>Previous hand injury or surgery potentially compromising venous drainage</td>
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<td>Disabling arthritis</td>
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used to cannulate the straight veins in a retrograde fashion, entry points being as distal and close to the metacarpophalangeal joints as feasible. Holding the flexed fingers with one of the surgeon’s hands to tighten the skin on the dorsum of the hand and immobilize the veins is helpful for easier cannulation and decreased pain of puncture. Intradermal 1% lidocaine is often used for a more painless entry. The cannulas are capped and secured to the skin with short, 1/8-inch Steri-Strips (3M, St. Paul, Minn.) or skin sutures (Fig. 2).

Veins that cannot be cannulated in an antegrade fashion near the metacarpophalangeal joints, or when technical difficulty is encountered, are cannulated in a retrograde fashion from the wrist level near the entry point of the vein into the hand. The shorter, crossing hand veins that cannot be cannulated are dealt with later, but it is important not to lose the overlying skin markings for these veins.

On average, four to six Angiocaths are placed in each hand. This is the most technically difficult part of the procedure (i.e., inserting the intravenous lines).

An 0.018-inch guidewire (included in the micropuncture kit, see below) is then introduced into each Angiocath. We usually start with the one distal from the surgeon. The Angiocath is withdrawn. The skin at the exit point of the guide wire is injected with a small amount of 1% lidocaine (if not used in the previous step). The tip of a no. 11 blade is used to increase the size of the skin puncture. A 4-French catheter with an inner dilator cannula (Micropuncture Introducer Set; Cook Medical, Bloomington, Ind.) is then introduced over the guidewire and gently introduced into the vein. Countertraction of the skin on the dorsum of the hand and gentle back-and-forth 20- to 30-degree turns of the dilator/catheter complex as it enters the vein are helpful maneuvers for easy, nontraumatic, and quick entry.

The 10-cm-long catheter is advanced until it reaches the dotted mark on the wrist that has been previously placed in the planning phase of this procedure. The dilator is removed. The catheter is capped and a mark or Steri-Strip applied on the catheter, flush with the skin entry point. The steps mentioned in the previous paragraph are repeated for each one of the cannulated veins.

Using a 20-gauge needle mounted on a 20-cc Luer-lock syringe, tumescent anesthesia is injected subdermally over the entire dorsum for the hand. On average, we use 80 cc of 0.1% lidocaine with epinephrine (a mixture of 90 cc of normal saline with 10 cc of 1% lidocaine with epinephrine 1:100,000). The tumescent fluid is
gently massaged over the dorsum of the hand and given 5 minutes to diffuse and provide adequate anesthesia.

Again starting with the cannulated vein most distal from the surgeon, the 600-µm bare tip laser fiber coupled to the Dornier 940-nm diode laser (Medilas Compact; Dornier MedRech Laser GmbH, Germering, Germany), with its pilot light on, is introduced inside the 4-French catheter. It is gently advanced until it is seen transilluminating the skin with its red pilot light as it exits from the tip of the 4-French catheters at the previously dotted point. The catheter is withdrawn while the laser fiber is stabilized inside the vein. The laser is set to deliver 7 W in a continuous mode. It is then activated by the surgeon (with safety goggles on) and pulled back manually at the rate of 2 mm/second (Fig. 3).

The average vein length segment treated is 4 to 8 cm, giving a pullback time of 20 to 40 seconds. The laser is deactivated when the laser tip approaches the exit point to avoid burning the skin at that point. The steps mentioned in the previous paragraph are repeated for each one of the cannulated veins.

Using a no. 2 Ramlet phlebectomy hook and a no. 64 beaver blade, microphlebectomy of the crossing veins (that had not been cannulated) is then carefully performed (see Discussion for further elaboration on this step). A compressive hand dressing with a short stretch bandage is then applied. The patient is asked to remove this dressing in 4 hours and wear a fingerless light compression glove appropriate for the size of the hand. The same procedure can be performed on the contralateral hand at the same setting or scheduled for a later date, depending on patient preference.

**RESULTS**

Seven veins could not be cannulated. Five were treated with phlebectomy at the same setting and two were treated with sclerotherapy. One of these

![Fig. 4. The right hand preoperatively (left) and 6 weeks postoperatively (right).](image1)

![Fig. 5. Three-day postoperative view.](image2)
two sclerosed veins became phlebitic and developed a beaded appearance. This required evacuation of intravascular coagula and eventual phlebectomy. The other 215 veins were successfully treated to patient satisfaction by their 6-week follow-up visit (Fig. 4).

The number of crossing veins treated with phlebectomy is unknown. Follow-up sclerotherapy was needed for some of these veins at 4 to 12 weeks in some patients.

Varying degrees of ecchymosis and edema developed in all hands, often extending distal to the middle phalangeal joint, resolving by 2 weeks in all and earlier in many (Fig. 5). There were no cases of permanent or prolonged swelling.

Two patients required postoperative oral analgesia. One patient developed a 3-mm circular burn at the exit site of the laser fiber (Fig. 6). This resolved with no sequela.

One patient continued to complain of nagging pain at the site of a vein on which phlebectomy was performed and was lost to follow-up after 8 months. There were no instances of infection, neurologic complaints, or complaints of limitations of function of the hand or digits.

The mean duration of follow-up was 13 ± 11.2 months (range, 2 weeks to 31 months). Patient satisfaction was high. Patient satisfaction was reported on their two follow-up visits and often supplemented with postoperative photographs (Fig. 7). All eight patients who had planned a staged procedure followed through with their plans for treatment of the contralateral hand.

**DISCUSSION**

**Other Available Procedures for Prominent Hand Veins**

**Sclerotherapy of Hand Veins**

Hand veins have been treated successfully with sclerotherapy, using such sclerosing agents as polidocanol (up to a 3% concentration) and concentrations of from 1.5 to 3% sodium tetradecyl sulfate. Experience has shown that sclerosing solutions of relatively high concentration are necessary to eliminate hand veins and that the vast majority of these treated vessels develop thrombi. The thrombi cause moderate to severe discomfort in the treated areas. Hand edema is common when the entire superficial dorsal venous network is sclerosed in a single session.

Foam sclerotherapy is gaining a new and important role for the treatment of leg varicosities. It is proving to be more effective than liquid sclerotherapy in certain instances. Its use for hand veins has not been reported but holds potential and may minimize or avoid some of the shortcomings of liquid sclerotherapy of hand veins.

**Phlebectomy of Hand Veins**

Although many practitioners apparently practice phlebectomy of hand veins, there is no available peer-reviewed reference on the subject, only information found in correspondence and brief communications. These communications suggest successful treatment of hand veins by means of phlebectomy, with perhaps fewer postoperative complications. One author commented that this
technique is tedious and demanding, requiring a great deal of skill to achieve the desired result.\textsuperscript{22,23} With sclerotherapy and phlebectomy, the proximal and distal endpoints of vein obliteration and destruction are not predictable. In contrast, with endovenous ablation, the operator has control of these endpoints.

**Fillers and Fat Augmentation**

Fat injections in the hand, first described by Fournier, later described by Dr. Jose Aboudi, and recently popularized by Dr. Sidney Coleman, are a logical alternative to sclerotherapy for reducing the prominence of the dorsal hand veins.\textsuperscript{24,25} The addition of fat also hides the prominence of the tendons and bones seen in elderly hands.\textsuperscript{1,26–28} However, results of fat augmentation of the hand remain inferior to those of the face, particularly with regard to longevity and the need for repeated touchups.\textsuperscript{29}

![Image](https://example.com/image.png)

**Fig. 7.** Before (above) and after (below) treatment.

**Technical Notes**

With endovenous laser ablation, our goal is to effect vein closure with the least amount of blood coagulation and the maximum amount of vein wall contraction. Laser fluence (joules delivered per square centimeter of tissue treated) is the most important parameter in predicting long-term effective vein closure. Proebstle and colleagues\textsuperscript{30} have shown that endovenous laser treatment of saphenous vein failure is related to administration of low laser fluence, with a high incidence of nonocclusion at 3 months when laser fluence levels were below 10 J/cm\textsuperscript{2}.

In our study, we delivered 7 W of laser power at the tip of the laser fiber and gauged the pullback velocity at 2 mm/second. Our parameters of laser power and pullback velocity were extrapolated from settings used for leg veins, producing good long-term results based on our experience and
that of others. Specifically, the laser power generally accepted and found efficacious for the greater saphenous vein is 14 to 15 W. When dealing with nonsaphenous veins, the laser power used is much less; this same article suggested a power of 4 to 5 W. For the treatment of hand veins or small, nonsaphenous veins, the power used is not appreciably different between the wavelength ranges of 810, 940, or 980 nm. Laser fluence was not calculated. Several assumptions and estimates would have to be made to calculate laser fluence when using endovenous laser. A cylindrical model of uniform diameter of vein would have to be assumed. This is difficult to estimate with the use of perivenous tumescent solution that has both vasoconstrictive and compressive characteristics. Furthermore, energy transfer to the inner vein wall surface is not only achieved directly but also indirectly by steam bubble-mediated heat transfer.

We used exclusively a 600-μm (outer diameter, 1 mm) fiber for our laser ablation of unwanted hand vein procedures. This necessitated replacing the initially introduced 20-gauge Angiocath over a guidewire using a coaxial system by a 4-French sheath to accommodate the laser fiber. Newer 200- and 300-μm laser fibers are now available. Their smaller size is advantageous in that they can be introduced through the small Angiocath, thus simplifying the procedure, minimizing the steps needed and resulting in even smaller exit wounds. Although we used the 940-nm diode laser for our procedures, other wavelengths (e.g., 810, 980, and 1320 nm) of proven efficacy for leg veins can be used for this procedure.

Other Considerations

One of the hesitations in ablating veins on the dorsum of the hand is the loss of sites of intravenous access for use in the future. We have examined all our patients for the presence of adequate antecubital veins preoperatively and set that as an important inclusion criterion. Patients with prominent hand veins universally have prominent veins throughout the rest of their upper extremities, so this concern is not alarming to us.

The dorsal network of hand veins is the principal source of venous drainage of the hand according to Moore et al. The superficial and deep volar arterial arches of the hand are each accompanied by a pair of venae comitantes, such that the dorsal network is certainly not the only venous drainage of the hand. We have encountered only transient hand swelling, subsiding in all cases within 2 weeks and in many within days. We have made no attempt to spare the cephalic vein in the hand or to stage the procedure for each half of the hand as suggested by some.

The one exit burn in this series occurred when the operator kept the laser activated as the fiber reached the exit point. This healed with no sequelae (Fig. 8). We recommend that the laser be deactivated within 3 to 5 mm of the exit site to avoid this complication.

![Fig. 8. (Left) Left hand at 1 week postoperatively, showing ecchymosis, mild edema, and exit burn. (Right) Left hand shown 3 months postoperatively.](image-url)
We had no skin burns along the course of the treated veins. Although intravenous temperatures have been reported to be as high as 1334°C (average, 729°C), perivenous temperature was reported to be between 35.6°C and 49.1°C in an animal model. One of the advantages of the tumescent perivenous fluid is that it acts as a heat sink reservoir. It also provides anesthesia, vasoconstriction, and compression of the vein around the laser fiber and facilitates emptying the vein of blood.

CONCLUSIONS

The endovenous ablation of unwanted hand veins is a relatively simple office procedure that is effective in reducing the aged appearance of hands caused by large, dark, tortuous dorsal veins. Patient and physician satisfaction has been high and complication rates have been acceptably low, without any long-term adverse sequelae.

DISCLOSURES

Neither author has any commercial associations or financial disclosures that might pose or create a conflict of interest with information presented in this article. This includes consultancies, stock ownership or other equity interests, patent licensing arrangements, or payments for conducting or publicizing the study described in the article.

REFERENCES