Editorial Manager(tm) for Plastic and Reconstructive Surgery
Manuscript Draft

Manuscript Number: PRS-D-06-00477R1

Title: Laser Ablation of Unwanted Hand Veins (LAUV)

Article Type: Original Article

Section/Category:

Keywords: laser ablation of unwanted hand veins; dorsal hand veins; hand veins; endovenous laser treatment; aging hands; removal of hand veins; laser removal of hand veins; phlebectomy of hand veins; hand rejuvenation; sclerotherapy of hand veins; endovenous laser removal of hand veins; treatment of aging hands; aged hand appearance

Corresponding Author: Dr. Roxanne J. Guy, M.D., F.A.C.S.

Corresponding Author's Institution: Brevard Plastic Surgery and Skin Treatment Center

First Author: Asad R Shamma, M.D.

Order of Authors: Asad R Shamma, M.D.; Roxanne J. Guy, M.D., F.A.C.S.

Manuscript Region of Origin:

* Cover Letter

Brevard Plastic Surgery and Skin Treatment Center
111 East Hibiscus Blvd.
Melbourne, Florida 32901

February 26, 2006

Rod J. Rohrich, Editor
Plastic and Reconstructive Surgery®
UT Southwestern Medical Center
5323 Harry Hines Blvd., HD1.544
Dallas, TX 75390-8820

Dear Dr. Rohrich:

It is with great pleasure that I submit this manuscript for possible publication in our Plastic and Reconstructive Surgery Journal. I received a letter from Dr. Jim Stuzin on October 14, 2005, asking for a complete paper, based on the abstract from the paper presented in Chicago at the 74th annual meeting of the American Society of Plastic Surgeons.

I am delighted and honored to be a part of this paper and I thank you for the opportunity to present this work.

Sincerely,

Roxanne J. Guy, M.D., F.A.C.S.
Phone: 321-727-1600
Fax: 321-676-3644
rguy@cfl.rr.com

Laser Ablation of Unwanted Hand Veins (LAUV)

Asad R. Shamma, M.D.
Beirut, Lebanon

Roxanne J. Guy, M.D., F.A.C.S.
Brevard Plastic Surgery and Skin Treatment Center
Melbourne, Florida

Presented at the 74th annual meeting of the American Society of Plastic Surgeons, September 25, 2005. Chicago, Illinois.

ABSTRACT

Laser Ablation of Unwanted Hand Veins (LAUV)

Asad R. Shamma, MD, and Roxanne J. Guy, MD

BACKGROUND:

Many patients express their dissatisfaction with prominent and bulging hand veins. The decreased elasticity and loss of adipose tissue that occur with aging accentuate these tortuous veins. Abolishing these hand veins with sclerotherapy requires the use of higher concentrations of sclerosing agents than is used for leg veins and often results in a tender phlebitic cord. Phlebectomy is another treatment option for patients with cosmetic concerns.

Endovenous occlusion and shrinkage techniques have been successfully employed in the treatment of varicose veins of the lower extremities.

Our objective is to 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 Micron Laser Fiber. The Dornier MedTech 940 nm diode Laser system was used. The laser fiber was introduced through a four french sheath, which tracked as a coaxial system over a .018 guide wire. 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 successfully cannulated. 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 in size at a laser exit site. All 28 patients were satisfied with their results during their follow up, which ranged from two 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 are satisfied with their results.

*** Manuscript (Title Page, Abstract, Text, Acknowledgements, References, Legends)**

Response to Comments of Reviewers:

Date: 03-14-2006
To: "Roxanne J. Guy" rguy@cfl.rr.com
From: "Plastic and Reconstructive Surgery" PRS@Plasticsurgery.org
Subject: PRS Decision

Reviewer Comments:

Reviewer #1: This is an excellent paper which I saw presented at the American College of Phlebology Annual Meeting in Nov., 2005. It is of interest to the readership.

I believe that the paper can be improved by elliminating the speculation of many comments. For example, the authors state without proof that all laser wavelengths have the same effect. This is not born out by the literature.

This statement has been revised to: When dealing with nonsaphenous veins, the laser power used is much less; this same article suggesting a power of 4 to 5 watts. For the treatment of hand veins or small, non-saphenous veins, the power used is not appreciably different between the wavelength ranges of 810 nm, 940 nm, or 980 nm..**34** **(**The reference listed next to the statement supports this claim.)

The authors describe an "experiment" where the laser was "tested" in excised leg veins. Leg veins are not the same as hand veins and can not be used as a comparison. In addition, lasers do not have the same effect on veins which do not have blood flow.
This description has been eliminated. The purpose of this exercise was not to compare hand veins to leg veins, but rather to add more information to that extrapolated from the literature on non-saphenous vein ablation, in order to further establish that 7 watts is an appropriate initial setting for hand veins.

The authors failed to state if other veins became more prominent after closure of the dorsal veins. This reviewer's experience is that this effect occurs in up to 20% of treated patients.

In our cases, we did not observe other veins in the general areas of the hands becoming more prominent, nor were there patient complaints of this.

Reviewer #2: This manuscript discusses the authors' technique of laser ablation for unsightly hand veins in the aging pt. While I thought the technique and the results included demonstated an effective technique, I thought the manuscript was unusually written and should be modified prior to publication. The main text of how to utilize this procedure is included in the legends and illustrations of the article, which are interspersed with methodology and the discussion portions of this paper. I would suggest a more traditional format, where the manuscript content is organized to present methodology followed by a discussion, and which the photos and legends included just support what is contained in this article rather that being essentially the main content of the manuscript. An interesting point worthy of discussion is if these patients hands really look much younger after vein ablation, or if other ancillary procedures such as volume addition and skin treatment are really required to produce a more youthful morphology.

The organization of the manuscript has been revised to conform to a more traditional format. For these reported hand vein patients, no other form of hand rejuvenation was performed before or after the LAUV procedure, during the follow up period described in this paper. Thus, the rejuvenative effects on the hands were secondary to vein ablation only.

Reviewer #3: MANUSCRIPT NUMBER 06-00477
BIOSTATISTICAL REVIEW

In this manuscript the authors report on the use of an endovenous laser technique originally used for varicose veins in the lower extremities to abolish unwanted hand veins in 28 patients (27 women and one male). The authors state that this is the first report on the endovenous treatment of unwanted hand veins. The authors note that the main cause of the bulging appearance of hand veins is fat atrophy. They give the pros and cons of sclerotherapy, phlebectomy, and fillers and fa augmentation that have been used in the past and introduce the concept of endovenous ablation referencing the original paper written in 1999. The authors describe how the procedure is done step by step and illustrate the steps in figures. The 28 patients had 54 hands (26 patients had two hands treated) between July 2001 and Dec 2004. In 18 of the patients both hands were treated in the same operation and in eight patients the treatments were one to six weeks apart. All but one patient was treated between 41 and 57 years of age. Exclusion criteria are given in Table 1. The total number of veins they intended to treat was 216 and seven veins could not be cannulated (five were treated with phlebectomy at the same setting and two were treated with sclerotherapy). The authors describe the complications at the end of the results section. The range of follow-up was 2 weeks to 31 months and the authors report that patient satisfaction was high. They note that all eight patients who had a two stage procedure showed up for the second stage. In the discussion section, the authors discuss a wide variety of topics. The topics include additional information on why seven watts of power was used at the tip of the laser fiber, the difficulty patients have describing what bothers them most about their hands, precautions in fat augmentation, the ability to cannulate a vein being a pivotal initial step, use of a 600 micron fiber in their LAUV procedures, the hesitation of ablating veins on the dorsum of the hand, foam sclerotherapy, hand swelling and exit burns, and advantages of tumescent perivenous fluid. The authors conclude that laser ablation of unwanted hand veins can be performed in an office setting and that patients are satisfied with the results. Specific comments include

1. At the end of the Patients and Methods section the author should briefly note how the results will be given.

The organization of the manuscript has been revised to conform to a more traditional format.

2. It is not clear if pre and post-op photos are available on all the hands. If post-op photos are available then the authors should consider having an independent surgeon(s) rate the results.

Full pre and post operative photographs are not available on all patients. Independent surgeon evaluation was not performed. The purpose of this paper was to describe and exhibit the technique and results, photographically.

3. It is also not clear if each patient rated their own results in a standard manner using a rating scale. If results are available from the patients that are simply not the patient saying they were satisfied to their surgeon, then they should be given.

No rating scale was used for the purposes of this descriptive paper.

4. It is not clear from the legends for the figures if the first six figures are from the same patient.

Not all photographs are from the same patient. We chose the best and most illustrative photographs for the point being made in the manuscript.

5. Since this is the first manuscript explaining the use of laser ablation of unwanted hand veins, the authors should present their results in a way that later authors can easily compare their results to these results. For this reason, the authors should present a table by patient that gives the patient

characteristics, relevant information on the operation, the aesthetic results, complications, and other procedures.

This would be a nice adjunct to a follow-up paper showing consecutive cases with full and standardized pre and post operative data and photographs; a scientific paper, rather than a description of technique.

Laser Ablation of Unwanted Hand Veins (LAUV)

BACKGROUND

The cosmetic patient generally seeks a more attractive look and a younger appearance. Facial rejuvenation procedures are abundant, popular and have resulted in an improved appearance for many patients, while techniques for rejuvenation of the aging hand have lagged. This lag is due, in part, to lack of awareness by physicians and patients of available techniques for effective treatment. The contrast between a rejuvenated face and the non-rejuvenated 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**

FIG. 1 Hand of 48 year-old woman.

Etiology 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, rather than any actual pathology 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.

The concept of 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 via a fiberoptic laser fiber.**8** Since then, laser wavelengths between 810 and 1064 nm (and recently 1320nm) 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 treatment of incompetent (refluxing) lower extremity veins by the introduction of a laser fiber thru a hollow catheter, introduced percutanously 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.**9-18**

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, 2001 through December, 2004. All patients but two had both hands treated.

One patient who had only one hand treated was a female who had 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 8 patients, the treatments were staged, from 1 to 6 weeks apart. All patients who underwent the LAUV procedure 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.

Table 1: Exclusion criteria

All procedures were performed in an outpatient office setting. Oral sedation with 7.5-15 mg of oral Midazolam was used in 18 patients. Less than 12mL 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 with intent to treat with laser ablation was 4 (range 1-6), for a total of 216. The veins ranged in size between 2 and 6 mm in diameter.

DETAILS OF 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. 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 prepped and draped. A sterile rubber tourniquet is applied at the wrist, just proximal to the veins of interest. Initially, 20 gauge angiocaths are used to cannulate the straight veins in a retrograde fashion, entry points being as distal and close to the metacarpophalangeal joints (MCP) 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, $1/8^{th}$ inch steristrips or skin sutures. (Fig. 2)

FIG. 2: Angiocaths in place

Veins that cannot be cannulated in an antegrade fashion near the MCP joints, or when technical difficultly 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.

In general, an average of 4-6 angiocaths are placed in each hand. This is the most technically difficult part of the procedure, i.e. inserting the IVs!

A 0.018 guide wire (included in the micropunture 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 an 11 blade is used to increase the size of the skin puncture. A 4 French catheter with an inner dilator cannula (Micropunture introducer set, Cook Inc., IN) is then introduced over the guide wire and gently introduce into the vein. Counter-traction 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 entrance.

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 steristrip 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 micron 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 watts 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)

FIG. 3: Laser activated and fiber withdrawn

The average vein length segment treated is 4-8 cm, giving a pull back 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 number 2 Ramlet phlebectomy hook and a number 64 beaver blade, micro phlebectomy of the crossing veins (which had not been cannulated) is then carefully performed (see discussion section 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 done on the contra-lateral 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 2 were treated with sclerotherapy. One of these 2 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).

FIG. 4: Right hand pre-operation and at 6 weeks post-operation

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

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

FIG. 5: Three days postoperative

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 sequelae.

FIG. 6: Right hand is 5 days postop, left is 14 days postop, showing no edema and illustrating the exit burn wound

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, neurological complaints or complaints of limitations of function of the hand or digits.

The mean duration of follow-up was 13 months +/- 11.2 months (range, 2 weeks - 31 months). Patient satisfaction was high. Patient satisfaction was reported on their 2 follow-up visits and often supplemented with postoperative pictures (FIG. 7). All 8 patients who had planned a staged procedure followed through with their plans to treat the contralateral hand.

FIG. 7: Before and after

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 sulphate (STS).**19,20** 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.**21** 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 via 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.**22,23**

With sclerotherapy and phlebectomy, the proximal and distal endpoints of vein obliteration or destruction are not predictable. In contrast, with endovenous ablation, the operator has control on 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.**24,26** The addition of fat also hides the prominence of the tendons and bones seen in elderly hands..**26-29**

However, results of fat augmentation of the hand remain inferior to those of the face, particularly with regards to longevity and the need for repeated touch ups.**30**

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 cm of issue treated) is the most important parameter in predicting long term effective vein closure. Proebstle and colleagues **31** have shown that endovenous laser treatment of the saphenous vein failure is related to administration of low laser fluences, with a high incidence of non-occlusion at 3 month when laser fluence levels were below 10 J/cm2.

In our study, we delivered 7 watts of laser power at the tip of the laser fiber, and gauged pull back velocity at 2mm/sec. 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 others'.**32** Specifically, the laser power generally accepted and found efficacious for the greater saphenous vein is 14-15 watts.**33** When dealing with nonsaphenous veins, the laser power used is much less; this same article suggesting a power of 4 to 5 watts. For the treatment of hand veins or small, non-saphenous veins, the power used is not appreciably different between the wavelength ranges of 810 nm, 940 nm, or 980 nm.**34** 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.**34**

We used exclusively a 600 micron (outer diameter 1mm) fiber for our LAUV procedures. This necessitated replacing the initially introduced 20 gauge angiocath over a guide wire using a coaxial system by a 4 French sheath to accommodate the laser fiber. Newer 200 and 300 micron Laser fibers are now available. Their smaller size is advantageous in that they can be introduced thru the small angiocaths, 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 (eg 810nm, 980nm, 1320nm) 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 IV 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 principle source of venous drainage of the hand according to Moore, et.al.**41** 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 3-5 mm of the exit site to avoid this complication.

FIG 8: Left hand at 1 week postop, showing

ecchymosis, mild edema and exit burn and again at 3 months postop.

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) **42**, perivenous temperature was reported to be between 35.6 °C and 49.1°C in an animal model.**43**

One of the advantages of the tumescent perivenous fluid is that it acts as a head 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 which 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.

PRODUCTS, DEVICES, DRUGS USED IN THE PROCEDURE DESCRIBED IN THE MANUSCRIPT **LASER ABLATION OF UNWANTED HAND VEINS**

1. Micropuncture kit with guide wire and inner dilator cannula (Micropunture introducer set, Cook Inc., IN).

2. 600 micron bare tip laser fiber coupled to the Dornier 940 nm diode laser (Medilas Compact, Dornier MedRech Laser GmbH, Germering, Germany).

DISCLOSURES

LASER ABLATION OF UNWANTED HAND VEINS (LAUV)

Neither author has any commercial associations or financial disclosures that might pose or create a conflict of interest with information presented in this manuscript. This includes no consultancies, stock ownerships, or other equity interests, patent licensing arrangements, or payments for conducting or publicizing the study described in the manuscript.

Asad R. Shamma, M.D.
Roxanne J. Guy, M.D., F.A.C.S.