



A Novel Approach for the Treatment of Spider Veins

Mirsad Mujadzic, MD; Edmond F. Ritter, MD;
and Kenna S. Given, MD, FACS

Aesthetic Surgery Journal
2015, Vol 35(7) NP221–NP229
© 2015 The American Society for
Aesthetic Plastic Surgery, Inc.
This is an Open Access article
distributed under the terms of the
Creative Commons Attribution
Non-Commercial License
([http://creativecommons.org/
licenses/by-nc/4.0/](http://creativecommons.org/licenses/by-nc/4.0/)), which
permits noncommercial re-use,
distribution, and reproduction in
any medium, provided the original
work is properly cited. For
commercial re-use, please contact
journals.permissions@oup.com
DOI: 10.1093/asj/sjv004
www.aestheticsurgeryjournal.com

OXFORD
UNIVERSITY PRESS

Abstract

Background: Spider veins on the lower limbs are very common and have been reported to be present in 41% of women over 50. Sclerotherapy as a traditional treatment for spider veins has a low cost, though it may have adverse sequelae. Lasers have shown fewer but still substantial complications as well. Its lower efficacy relative to sclerotherapy has limited laser application for the treatment of spider veins.

Objectives: To present a new alternative in management of spider veins which involves a low voltage current delivered via an insulated micro needle with beveled tip.

Methods: Thirty female patients were treated with the “Given Needle.” The technique utilizes a micro needle with an insulated shaft with an exposed beveled tip, which is inserted into a hand piece connected to a mono-polar electrical generator. The needle is introduced through the skin into or on the spider vein. The current is then applied with obliteration of the vein.

Results: Twenty patients (66%) had more than a 70% resolution. The most common complication was skin erythema, which developed in 15 patients, followed by bruising in 13 patients. Both of these complications resolved in 2-3 weeks.

Conclusions: A novel approach for the treatment of spider veins has been described. The development of an insulated micro needle with an exposed beveled tip utilizing low current has minimized adjacent tissue damage and improved efficacy. The low cost, low level of complications, and comparable results offer a valuable alternative to sclerotherapy and laser treatment.

Level of Evidence: 4



Accepted for publication December 29, 2014; online publish-ahead-of-print August 5, 2015.

Spider veins on the lower limbs are very common and have been reported to be present in 41% of women over the age of 50 years in the United States.¹ Spider veins occur in two-thirds of patients before the age of 25, and increase in incidence with age. They represent an important aesthetic problem.²

Most cutaneous spider veins are abnormalities of the horizontal vascular skin plexus or capillary loops.³ Spider leg veins are composed of a feeder vessel and ectatic venous sprouts in the reticular dermis. Their depth is between 180 μ m and 1 mm in the skin.⁴ The underlying pathophysiology is a matter of debate. Patients with higher age and chronic venous insufficiency are at greater risk.

Hormonal factors and occupation play a role in the development of spider veins.^{1,5} There seems to be a strong genetic factor since 90% of patients has a positive family history of spider veins.⁶

Dr Mujadzic is an Assistant Professor of Surgery and Dr Ritter is a Professor of Surgery in the Section of Plastic and Reconstructive Surgery, Georgia Regents University, Augusta, Georgia. Dr Given is Professor Emeritus at Georgia Regents University, Augusta, Georgia.

Corresponding Author:

Dr Kenna S. Given, 1467 Harper Street, Augusta, GA, 30912, USA.
E-mail: ksgiven@yahoo.com

Spider veins may have a diameter that reaches several millimeters. This study involves the treatment of the most common type of spider veins, which are 1 mm or less in diameter.

The traditional treatment for spider veins has consisted of sclerotherapy, which involves injecting a small amount of a sclerosing solution into the target vein. However, chemical agents cause damage in the vessel wall with subsequent fibrosis.⁷ Most chemicals capable of denaturing living tissue are also capable of producing uncontrolled thrombosis, unintended destruction of nontargeted vascular tissue, and a wide range of minor and occasional major complications. The most common complications include tissue necrosis, ulceration, scarring, hyperpigmentation, hypopigmentation, matting, and allergic reactions to the sclerosant. Many sclerosant agents have been used but a perfect sclerosant that is complication free and 100% effective has not yet been developed. All sclerosants represent a compromise between efficacy and toxicity.^{8,9}

There has been a longstanding interest in finding an effective, noninvasive alternative to sclerotherapy that would provide equivalent or better efficacy, with a higher level of safety and ease of performance.¹⁰ Consequently, the introduction of lasers in this field was initially accepted with much enthusiasm. A wide variety of lasers has been employed with different levels of success. However, the higher cost of lasers with lower efficacy relative to sclerotherapy and the significant complications such as hyperpigmentation, hypopigmentation, scarring, pain, and ulceration have resulted in limited laser popularity for the treatment of spider veins. Therefore, sclerotherapy has remained the preferred treatment.^{11,12}

Electrosurgery of blood vessels has been used since the 1920s and has greatly improved the efficiency of operative procedures. It employs high-frequency electrical current passing through the tissue, generating heat to deliver the desired clinical effect. This is different from electrocautery, in which electrical current heats an instrument and a clinical effect is achieved when the instrument is applied to the tissue.¹³

However, thermal damage to adjacent tissue has limited electrocautery's usefulness in the dermis.^{3,12} Bollinger reported the formation of scar tissue after the use of electrocoagulation in the treatment of spider veins.¹⁴ A new alternative in the management of spider veins, which involves a low voltage, delivered via an insulated micro needle with beveled tip, minimizing adjacent tissue damage, is presented (Figure 1A).

METHODS

The study was conducted in accordance with the guidelines of the institutional review board and the tenets of the Declaration of Helsinki were followed. Informed consent was provided by all patients in the study. Thirty patients who were treated with the Given Needle from July 2008 to August 2009 were included in the study. Inclusion criteria were patients with spider veins of 1 mm or less in diameter. Exclusion criteria were patients with anticoagulation therapy and/or patients with a known history of keloids.

The technique utilizes a micro needle with an insulated shaft with a beveled tip (US Patent No. US 7,125,406; US 7,628,790), which is inserted into a hand piece connected to a mono-polar electrical generator. The tungsten needle has

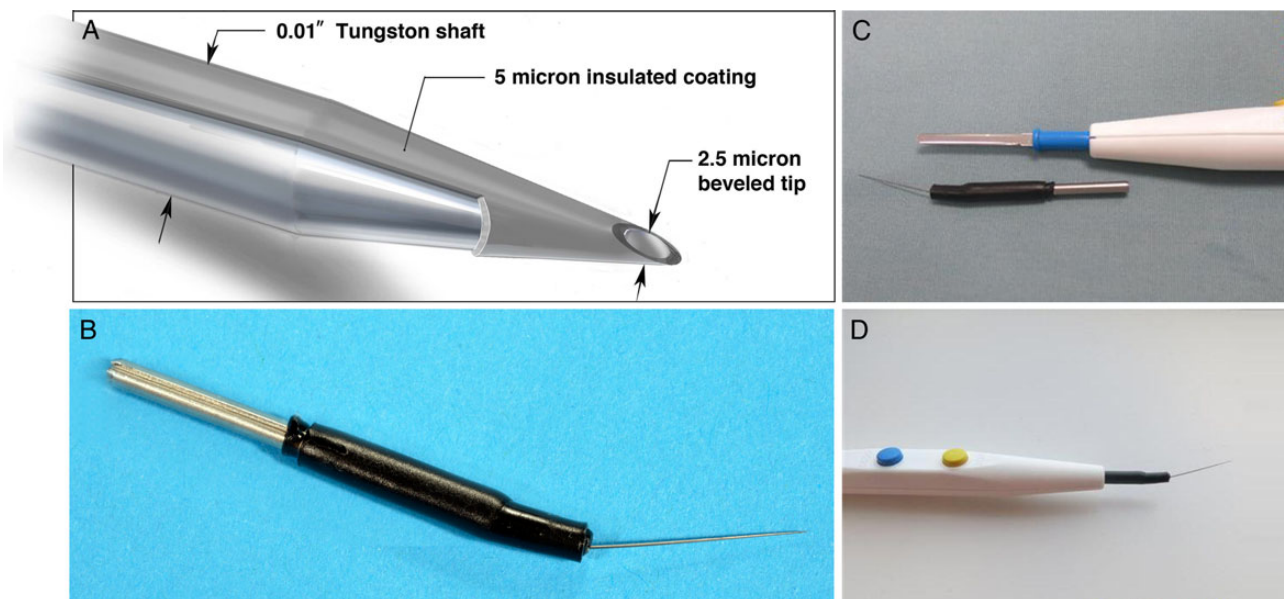


Figure 1. (A) Schematic drawing of Given Needle. (B) The Given Needle (C) Comparison of the Given Needle bottom left with a standard handle tip above. (D) The Given Needle inserted into a standard handle.

a diameter of 0.01” with a biocompatible sheath with a thickness of 0.0002” (Figure 1B). The sheath of biocompatible material covers the entire portion of the needle except the beveled tip to prevent exposure of the shaft to adjacent tissue and to minimize collateral damage (Figure 1C). This study was approved by the Institutional Review Board at Georgia Regents University (Augusta, GA).

The innovation of this device is complete insulation of the whole length of the needle except the beveled tip, which increases precision of power delivery and decreases adjacent collateral damage (Figure 2).

The needle procedure is very simple. A return circuit pad is applied to the trunk extremities. The patient’s skin is prepared with an antiseptic solution. The area is anesthetized with a topical or injectable anesthetic. The needle is inserted into a hand piece, which is connected to a mono-polar generator (Figure 1D). The generator is placed in the cutting mode with the wattage set at 2 MHz (wattage will vary depending on the calibration of the generator). The needle is introduced through the skin into or on the spider vein (Figure 2). The current is then applied with obliteration of the vein. The needle is withdrawn and additional veins are then treated in a similar fashion. To increase precision and efficacy and decrease collateral damage, magnification surgical loupes may be used. This technique presents a visible endpoint to destruction of the vein since one can visualize the disappearance at the time the current is initiated. The risk of allergic reactions, thrombophlebitis, emboli, or nerve damage is low since the primary modality is heat limited to the vein wall. The use of loop magnification of 3.5 or 4.5 is recommended to increase the precision of needle tip placement.



Figure 2. Proper placement of needle in preparation for ablation of vein.

Postoperatively, bacitracin ointment is applied to the treated area. Dry cold packs are recommended for 24 hours and Ace bandages for five to seven days.

RESULTS

Two graders were recruited from the section of plastic surgery by the senior author. They were blinded to the technique used. Grades were submitted anonymously and without consultation. The junior author compiled and analyzed the grades. Thirty patients were treated with the Given Needle. All patients were female with ages ranging from 32 to 67 and an average age of 43 years. Patients had only one pass performed and had a mean follow-up time of 6 months (range, 4-18 months). Typical clinical results are shown in Figures 3-6.

Fourteen patients had 75%-100% clearance. Seven patients had a clearance of 50%-75%. Five patients had a clearance of 25%-50% and four patients had 0%-25% clearance (Table 1). Grading was performed by experienced independent plastic surgeons. Success of treatment was graded on percentage of complete resolution of treated areas.

In order to identify treated areas, marking and preoperative photographs were used. The initial follow-up revealed differences between the treated and adjacent non-treated areas. Adjacent non-treated vessels were used as a reference to frame the treated vessels. Precise anatomic description with measurements was utilized. (e.g., 5 cm above superior edge of patella and 7 cm lateral from ASIS lateral edge of patella line.)

The most common complication was skin erythema, which developed in 15 patients, followed by bruising in 13 patients. Both of these complications resolved in 2-3 weeks and there were no permanent sequelae. Needle stick pain was a complaint in 14 patients, which resolved within 3 days. There were no serious complications such as major vessel thrombosis, serious allergic reactions, hypopigmentation, hyperpigmentation, ulceration, scar formation, or prolonged pain at the treatment site as sometimes seen with sclerotherapy or lasers.

DISCUSSION

Currently, there are two widely used methods for the management of spider veins.

The older method using sclerosing agents is well established among physicians. A new method using lasers is becoming more common with variable success depending on vessel size, body region, and laser type. Both methods treat these lesions with a variable success rate.

In order to effectively sclerose veins, the sclerosant must cause total endothelial destruction, which produces thrombosis, eventual fibrosis, and vessel disappearance.¹⁴ Each class of sclerosants produces this effect with different and

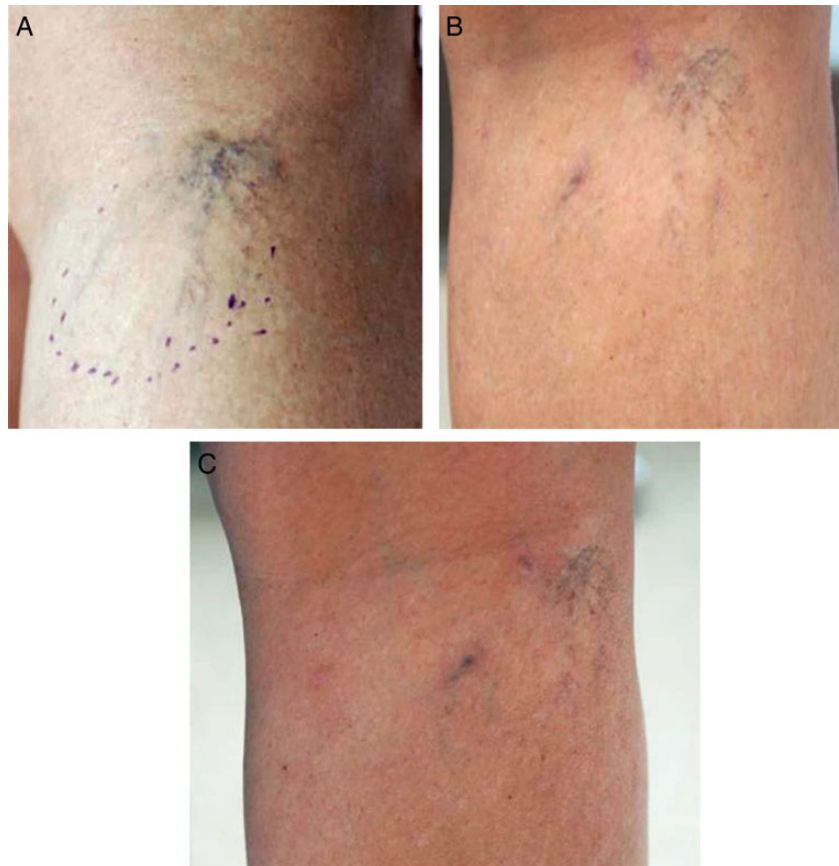


Figure 3. (A) This 41-year old woman presented with untreated spider veins of the right posterior of the calf. (B) Sixteen weeks after treatment. (C) One year after treatment.

highly variable patterns of efficacy, potency, and complications.¹⁵ All sclerosants represent a compromise between efficacy and toxicity.

Despite 150 years of unregulated human experimentation encompassing an enormous range of more or less toxic agents, the “perfect sclerosant,” complication free and 100% effective, has not been discovered.

With sclerotherapy, clearance after one treatment varies from 50% to 84% in 70%-80% of patients.¹⁶ In order to achieve full clearance, up to six treatments may be needed.¹⁷ There are numerous complications and adverse reactions associated with both sclerosants and lasers.

Pain may be very pronounced with a sclerosant if it is injected into perivascular tissue.¹⁸ Extravasation necrosis after the use of commonly recommended concentrations represents a leading disadvantage associated with sclerosant use.⁸ Neovascularization (matting) and treatment failures probably occur at the same rate in all type of sclerosants with equal potency. Hyperpigmentation is reported to be a major drawback occurring in up to 30% of patients.¹⁹ Allergies and anaphylaxis varies between 0.01% and 0.9%. Deep venous thromboses and pulmonary emboli are rare, occurring most often in patients who are not ambulatory

and receive inappropriate compression or have hypercoagulable states. There have been five reported cases of anaphylactic shock leading to death.²⁰

Recent developments in laser technology allow a more selective and better-tolerated therapy. Lasers have shown more success in treatment of facial spider veins. However, laser treatment of lower extremities presents a greater therapeutic challenge. Clinical response depends upon wavelength, fluency, pulse width, pulse duration, cooling, and the diameter and color of the spider leg veins.

In a study performed on 46 female patients after treatment with high energy long pulse NdYAG laser, the author demonstrated favorable results in the treatment of leg veins. In patients with veins less than 1 mm in diameter, 60% had greater than 50% clearance after one treatment and 80% had greater than 50% clearance after two treatments, whereas 1-2 mm diameter showed greater than 50% clearance in 39% of patients after one pass and 67% showed greater than 50% clearance after 2 sessions.²¹

Q-switched Nd: YAG laser has shown favorable results in a study of 62 sites in 50 patients with spider veins of the legs. Greater than 50% improvement has been demonstrated in 73% of patients following one treatment session.

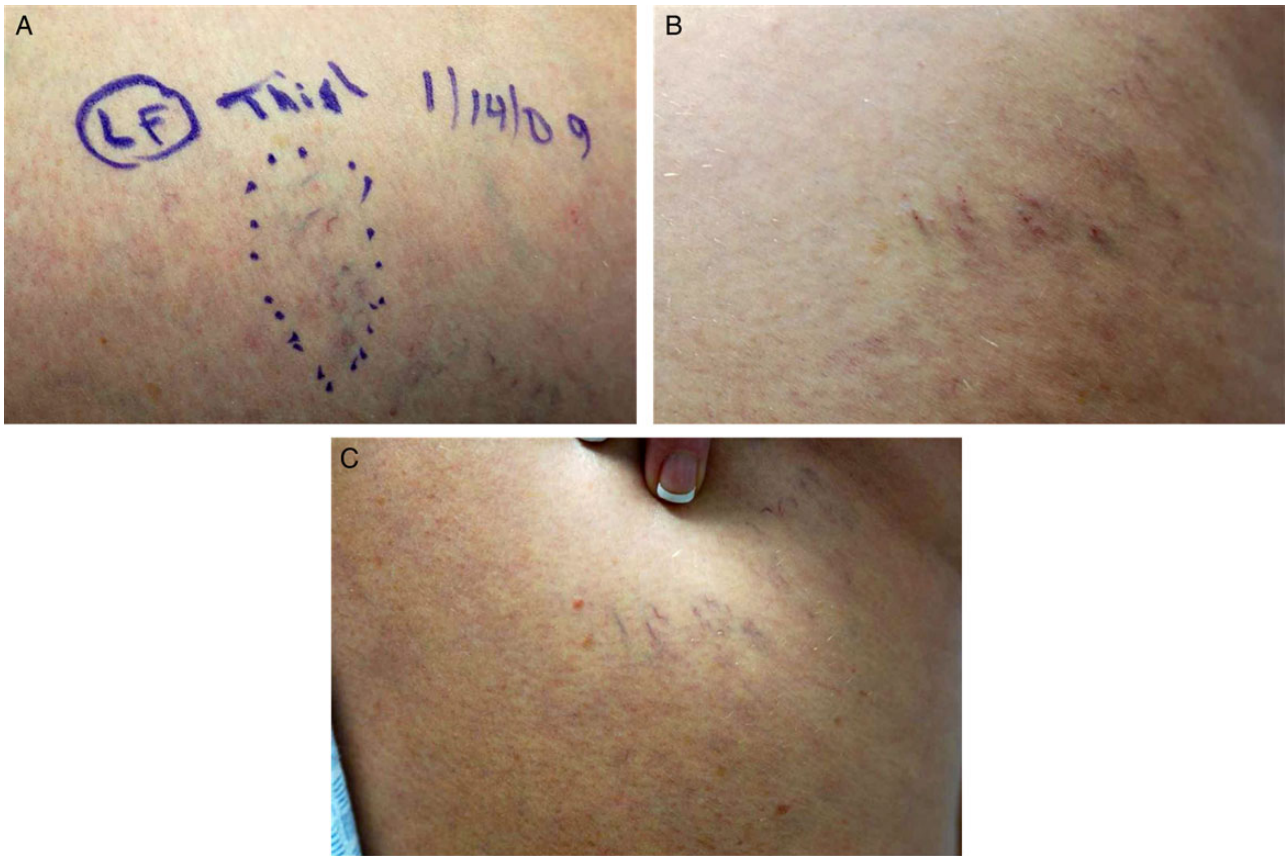


Figure 4. (A) This 41-year old woman presented with untreated spider veins of the left posterior upper thigh. (B) One week after treatment. (C) Five months after treatment.

However, multiple passes and overlapping pulses were generally required to achieve clinical endpoints of vessel disappearance.²²

In a clinical investigation evaluating 72 patients with lower extremity spider veins treated by an intense pulse light source, Green reported significant adverse effects with pain being present in 74% of patients. Hyperpigmentation was observed in 50% of patients and hypopigmentation in 20%. Scarring and textural changes occurred in 21% of patients.²³

A major problem with lasers is the associated discomfort. Because of the pain, patients chose sclerotherapy over the laser. Topical anesthesia was minimally effective. Pain was mitigated by decreasing the spot size, which despite higher energy reduced the pain.²⁴

In studies done by Levy et al and Munia et al, the authors concluded that lower extremity spider veins may be equally treated using Nd: YAG 1064-nm laser or conventional sclerotherapy.^{25,26} However, Munia gave advantage to sclerotherapy due to its lower cost, less pain, and faster improvement. The laser is recommended for patients with matting, needle phobia, or allergic reactions to sclerosant.²⁶ A similar conclusion was found by Lupton et al that despite

recent advances in laser technology, sclerotherapy continues to offer superior clinical effect. As in the Munia study, the authors recommended the laser in leg vein treatment in patients with matting, needle phobia, or sclerosant allergy.²⁷ Levy suggested the combination of both methods with a sequence of sclerotherapy followed by laser, which provided higher clearance.²⁵

The ideal laser has yet to be invented. Laser technology for treating spider veins is better than ever but still far from perfect. Lower efficacy relative to sclerotherapy and significant complications such as hyperpigmentation, scarring, pain, and ulceration have limited laser popularity. Sclerotherapy remains the preferred treatment among the majority of physicians involved in the treatment of spider leg veins.²⁶⁻²⁸

This study of the Given Needle has shown a meticulous and precise approach with clearance of more than 70% achieved in 50% of patients after the first pass. The results are comparable with sclerotherapy and laser, and represents an effective alternative treatment. There has been a low level of side effects.

Local anesthesia may or may not be necessary, depending on the patient's sensitivity to pain and physician preference. A few patients preferred no local anesthesia after the

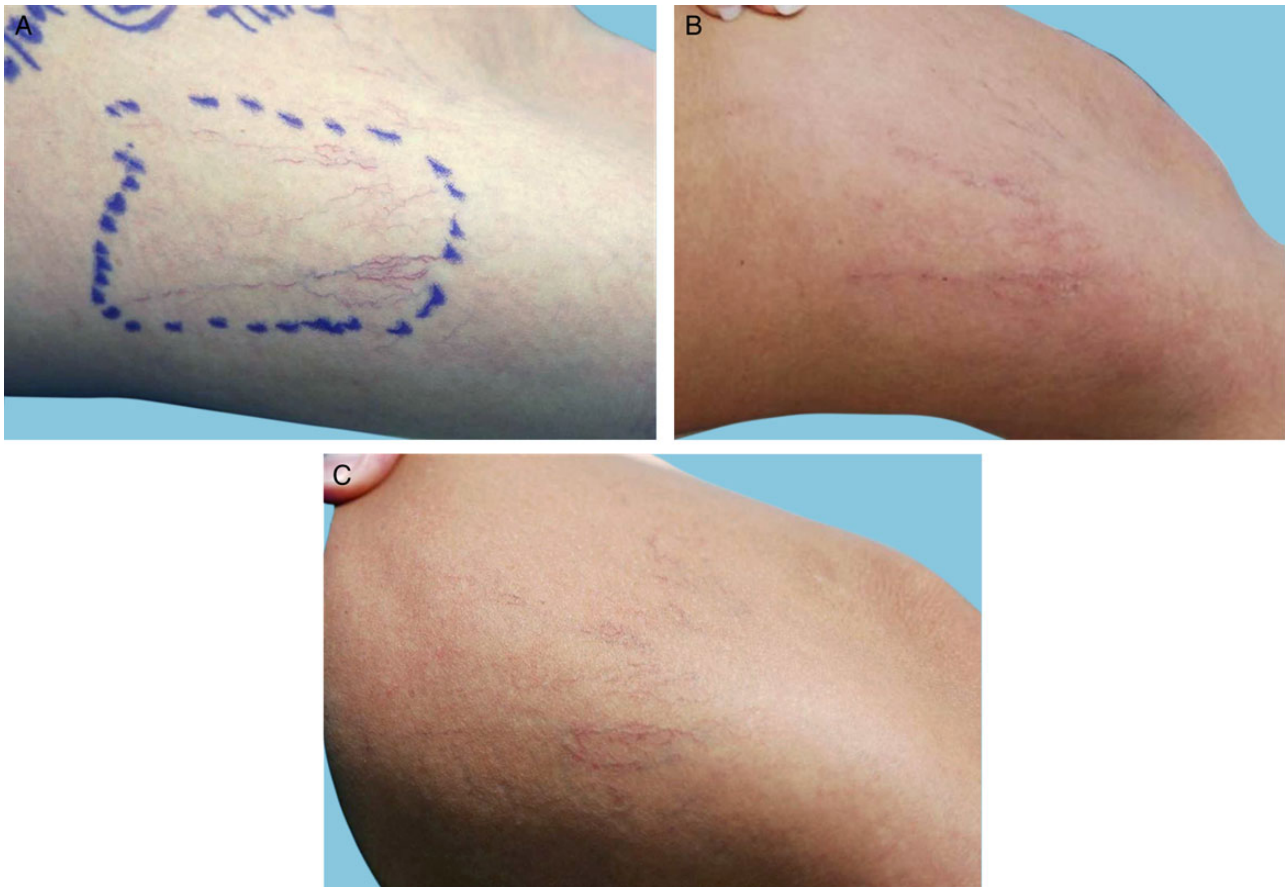


Figure 5. (A) This 36-year old woman presented with untreated spider veins of the left inner knee. (B) One week after treatment. (C) Five months after treatment.

initial trial. No difference was noted in the requirement for additional energy to achieve the same effect of vessel obliteration when lidocaine was used.

With all three methods, the therapeutic end point is vessel obliteration. Sclerosant action is not well controlled since the sclerosant may spread beyond the area of treatment causing complications as previously described. However, thrombosis seen with the needle is well controlled since the energy delivery is precise.

Cost

The treatment cost per session is \$30 with the needle. Sclerosing agents average \$80 per session. The amortized cost of laser treatment per session is between \$250-\$400 (Table 2).

Burns

There were no skin burns in this study. The use of low power, precise insertion, and power delivery at less than a second mitigates this complication.

Although it is possible to deliver enough energy to obliterate all vessels in one pass, doing so would increase the chance of burning adjacent tissue. Therefore, more than one pass with lower level of energy of 2-3 watts and shorter duration of delivery from $\frac{1}{2}$ to 1 second is safer.

Several patients have been treated with facial spider veins. Preliminary results have been very successful. (A video showing treatment of a patient with facial spider veins is available at www.aestheticsurgeryjournal.com.) Due to the lack of feeder veins, the recurrence rate was low. Complications such as bruising and needle stick pain may be more pronounced due to differences in facial vascularization and innervation (Figure 7).

Successful long-term treatment of spider veins of the legs requires the elimination of feeder veins. Spider leg veins, unlike facial-acquired spider veins, are connected to the deeper vessel ecstasies. Therefore, a failure to completely clear spider leg veins of the leg is more common, unless the underlying varicose or feeder veins have been treated previously. Successful treatment of spider veins is best achieved by first treating the underlying venous insufficiency. In situations with varicosities, phlebosurgery should be performed

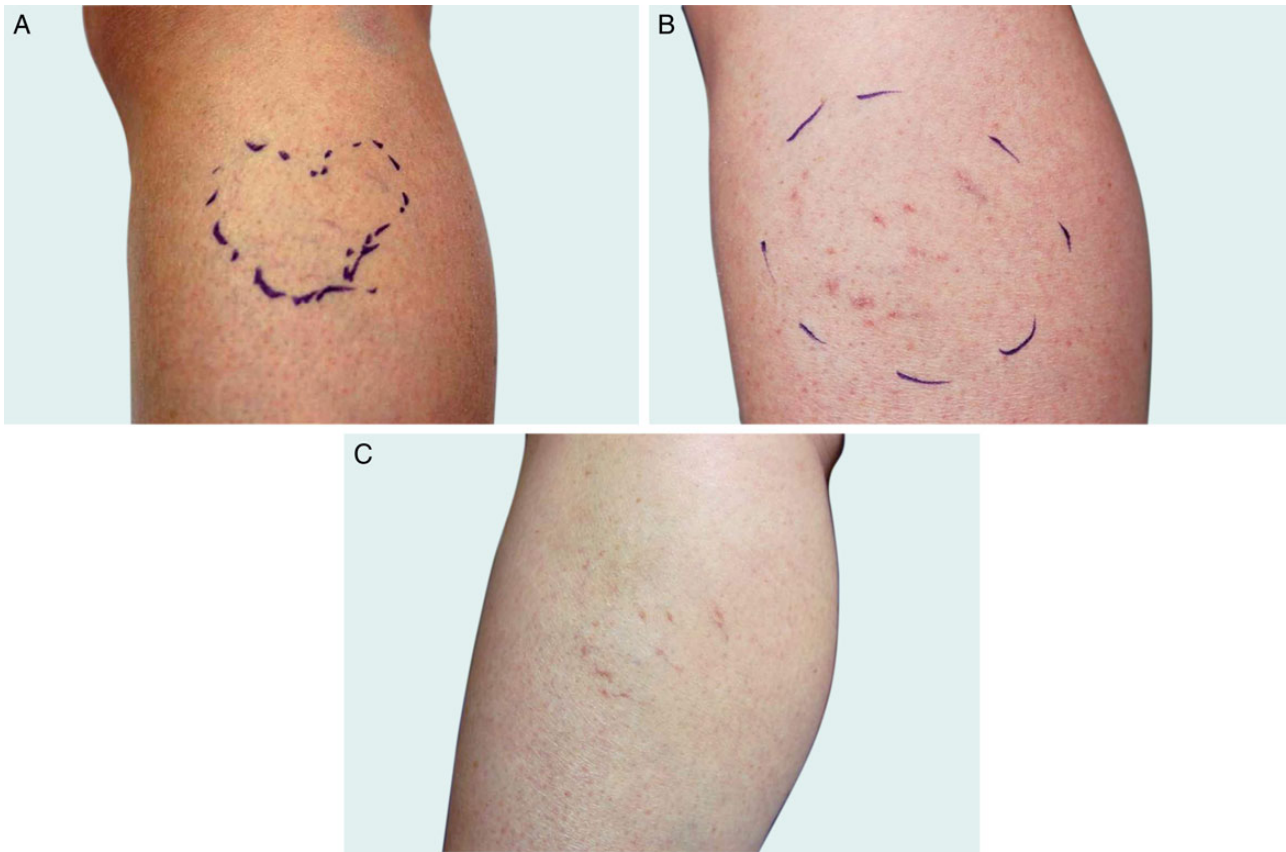


Figure 6. (A) This 49-year old woman presented with untreated spider veins of the left anterior lateral leg. (B) Five weeks after treatment. (C) Three months after treatment.

Table 1. Showing Number of Patients With Percentage of Clearance After Single Treatment With Needle

1=	0%-25%	4
2=	25%-50%	5
3=	50%-75%	7
4=	75%-100%	14
Total		30

Table 2. Comparing Efficacy, Complications and Cost of Sclerotherapy, Laser and Given Needle

	Sclerotherapy	Laser	Given Needle
Cost	\$80-100	\$240-400	\$30
Efficacy	50%-70% clearance in 50%-70% of patients/1 pass	50%-60% clearance in 50%-60% of patients/1 pass	50%-70% clearance in 50%-70% of patients/1 pass
Complication	Moderate potentially fatal thrombosis or allergic reactions	Low to moderate	Low

first to ensure an optimal outcome in the management of spider leg veins.²⁹ The patients in this study were not screened for venous insufficiency and were not previously treated. However, this method clearly demonstrates that spider veins can be successfully obliterated with electrocautery, although new spider veins may occur.

Limitations of this study include a short follow-up time of 6 months, subjectivity of result assessment, and a low

number of patients. A thorough knowledge of the various devices and their risk benefit are necessary prior to treatment. The Given Needle offers a cost-effective alternative with a low level of complications.

FDA approval has been received for treatment of spider veins 1 mm or less in diameter. The potential for use on larger veins will require further evaluation and testing.

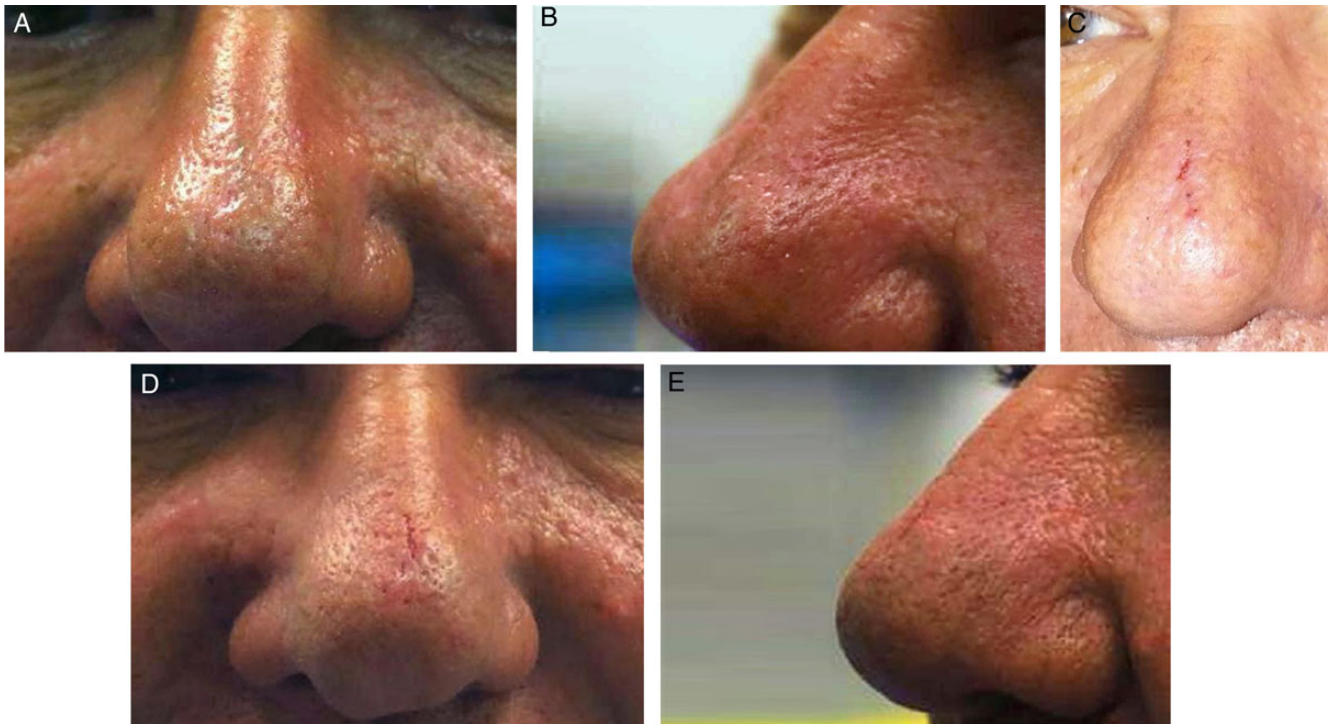


Figure 7. Frontal (A) and side (B) views of a 59-year old man (not part of the original study) who presented with untreated spider veins to the dorsum of the right nose. (C) Five days after treatment. Frontal (D) and side (E) views five months after treatment.

CONCLUSIONS

A novel approach for the treatment of spider veins has been introduced and described. The development of an insulated micro needle with beveled tip utilizes low current to minimize adjacent tissue damage. The low cost and minor complications offer a valuable alternative to sclerotherapy and laser treatment.

Supplementary Material

This article contains supplementary material located online at www.aestheticsurgeryjournal.com.

Acknowledgements

The authors thank Dr Kirit Bhatt and Carol Callahan for assistance with chart review and editing/data entry.

Disclosures

Drs Mujadzic and Ritter declared no potential conflicts of interest with respect to the research, authorship, and publication of this article. Dr Given is President of Spider Vein Solutions, Inc. (Augusta, GA), which owns the patent and markets the needle.

Funding

The authors received no financial support for the research, authorship, and publication of this article.

REFERENCES

- Engel A, Johnson ML, Haynes SG. Health effect of sunlight exposure in the United States. Results from first national and nutrition examination survey, 1971-1974. *Arch Dermatol.* 1988;124:72-79.
- Hercogova J, Brazzinin B, Hautmann G, Ghersetich I, Lotti T. Laser treatment of cutaneous vascular lesions: face and leg telangiectases. *J Eur Acad Dermatol Venereol.* 2002;16:8-12.
- Braverman IM. The cutaneous microcirculation. *J Invest Dermatol Sympos Proc.* 2000;5:3-9.
- Boehler-Sommeregger K, Karnel F, Schuller-Petrovic S, Santler R. Do telangiectases communicate with deep venous system. *J Dermatol Surg Oncol.* 1992;18:403-406.
- Dover JS, Sadick N, Goldman M. The role of lasers and light sources in the treatment of leg veins. *Dermatol Surg.* 1999;25:328-336.
- Bernstein EF. Clinical characteristics of 500 consecutive patients presenting for laser removal of lower extremity spider veins. *Dermatol Surg.* 2001;27:31-33.
- Green D, Theirs BH, Pearson GL Jr., eds. *Yearbook of dermatology and dermatologic surgery.* St. Louis, MO: Elsevier Mosby; 2006.
- Duffy DM. Sclerosants: A comparative Review. *Dermatol Surg.* 2010;36:1010-1025.
- Guex J-J. Complications of sclerotherapy: An Update. *Dermatol Surg.* 2010;36:1056-1063.
- McCoppin HH, Hovenic WW, Wheeland RG. Laser Treatment of Superficial Leg Veins: A Review. *Dermatol Surg.* 2011;37:729-741.

11. Davis LT, Duffy DM. Determination of incidence and risk factors for postsclerotherapy telangiectatic matting of the lower extremity: a retrospective analysis. *J Dermatol Surg Oncol*. 1990;16:327-330.
12. Goldman MP. *Sclerotherapy treatment of Varicose and Teleangiectatic Veins*. 3rd edition. St Louis: Mosby – Yearbook; 2001.
13. Masarweh NN, Cosgriff N, Slakey DP. Electrosurgery: History, Principles and Current and Future Uses. *J Am Coll Surg*. 2006;202(3):520-530.
14. Bollinger A, Holzer J. On the problem of electrocoagulation of the smallest telangiectases. *Zentralbl Phlebologie*. 1966;5(4):185-188.
15. Kobayashi S, Crooks S, Eckmann DM. Dose and time dependent liquid sclerosant effects on endothelial cell death. *Dermatol Surg*. 2006;32:1444-1452.
16. Artemi P. Mechanism of action of sclerotherapy. In: *Pharmacology of Phlebology ACP Australasian meeting* Sept. 2007.
17. Goldman MP. Treatment of Varicose and Teleangiectatic Leg Veins: Double – Blind Prospective Comparative Trial Between Aethoxyskerol and Sotradecol. *Dermatol Surg*. 2002;28:52-55.
18. Puissegur Lupo ML. Sclerotherapy: Review of Results and Complications in 200 patients. *Dermatol Surg Oncol*. 1989;15:2.
19. Goldman MP, Bergan JJ, Guex JJ. *Sclerotherapy treatment of varicose and telangiectatic leg veins*. 4th ed. St. Louis: Mosby Elsevier; 2007.
20. Bergan JJ. ed. *The vein book*. San Diego, CA: Elsevier, Inc.; 2007.
21. Massey RA, Katz BE. Successful treatment of spider Leg Veins with a High Energy, Long-Pulse, Frequency-Doubled Neodymium:YAG Laser (HELP-G). *Dermatol Surg*. 1999;25:677-680.
22. Cisneros JL, De l Rio R, Palou J. Sclerosis and the Nd:YAG, Q-switched laser with multiple frequency for treatment of telangiectases, reticular veins, and residual pigmentation. *Dermatol Surg*. 1998;24(10):1119-1123.
23. Green D. Photothermal removal of telangiectases of the lower extremities with the PhotodermVL. *J Am Acad Dermatol*. 1998;38(1):61-68.
24. Coles CM, Werner RS, Zelickson BD. Comparative Pilot study evaluating the treatment of leg veins with a long pulse Nd:YAG laser and sclerotherapy. *Laser Surg Med*. 2002;28:694.
25. Levy JL, Elbahr C, Jouve E, Mordon S. Comparison and sequential study of long pulsed Nd:YAG 1,064 nm laser and sclerotherapy in leg telangiectasias treatment. *Lasers Surg Med*. 2004;34:273-276.
26. Munia MA, Wolosker N, Munia CG, Chao WS, Puech-Leão P. Comparison of laser versus sclerotherapy in the treatment of lower extremity telangiectases: a prospective study. *Dermatol Surg*. 2012;38(4):635-639.
27. Lupton JR, Alster TS, Romero P. Clinical comparison of sclerotherapy versus long-pulsed Nd:YAG laser treatment for lower extremity telangiectases. *Dermatol Surg*. 2002;28(8):694-697.
28. Wollina U, Schmidt WD, Hercogova J, Fassler D. Laser therapy of spider leg veins. *J Cosmet Dermatol*. 2003;2(3-4):166-174.
29. Weiss RA, Feied CF, Weiss MA, eds. *Vein diagnosis & treatment: a comprehensive approach*. New York: McGraw-Hill Inc.; 2001.