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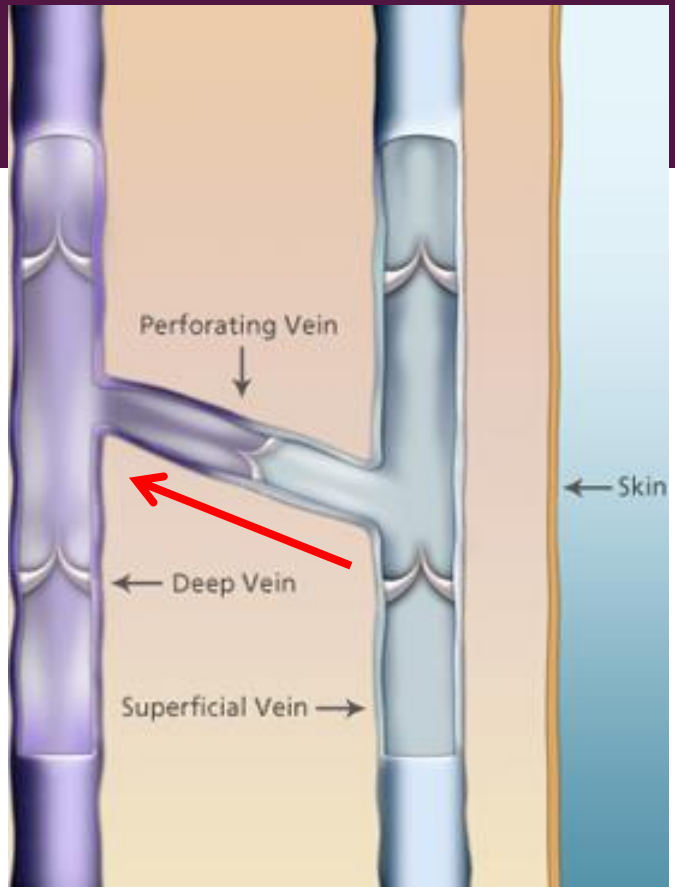
Perforators: When to Treat and How Best to Do It?

Eric Hager, MD

September 10, 2015

Anatomy of Perforating veins

- Cadaveric studies[1] have shown >60 vein perforating veins from superficial to deep
- Normal flow is predominantly superficial to deep with primary function to drain venous flow from the skin
- Pathologic veins allow reversal of flow which inhibits venous drainage

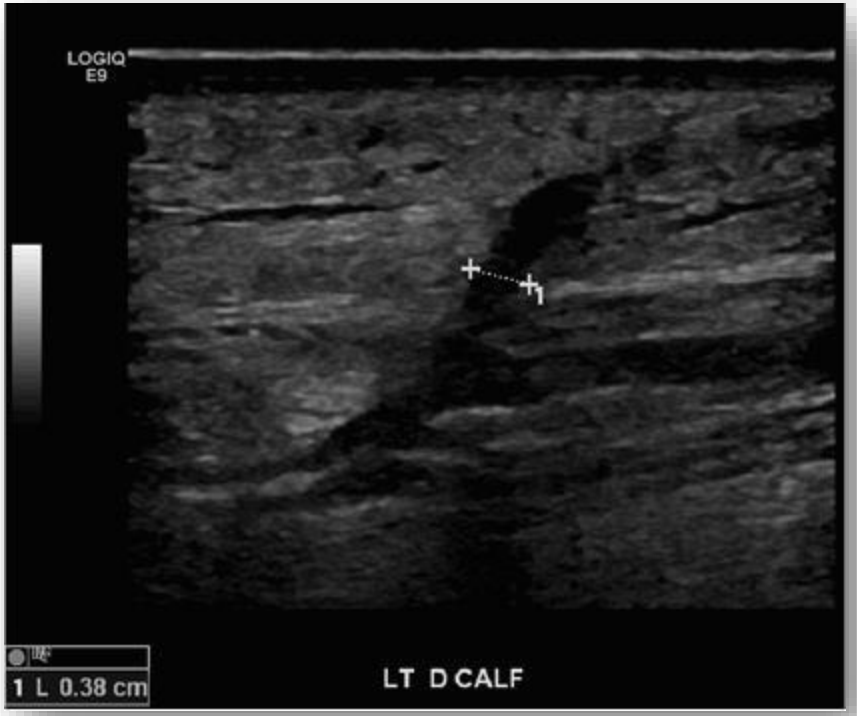


Haruta N, Shinhara R, Sugino K, et al. Endoscopic anatomy of perforating veins in chronic venous insufficiency of the legs: “solitary” incompetent perforator veins are often actually multiple vessels. Int J Angiology. 2004;13:31-36.

Current Societal Guidelines

SVS®
SOCIETY for VASCULAR SURGERY

- SVS ulcer treatment guidelines consider perforating veins to be pathologic with > 500 ms reflux and a diameter > 3.5 mm (2C).
- It is suggested that these be closed by percutaneous methods rather than open surgery (1C)



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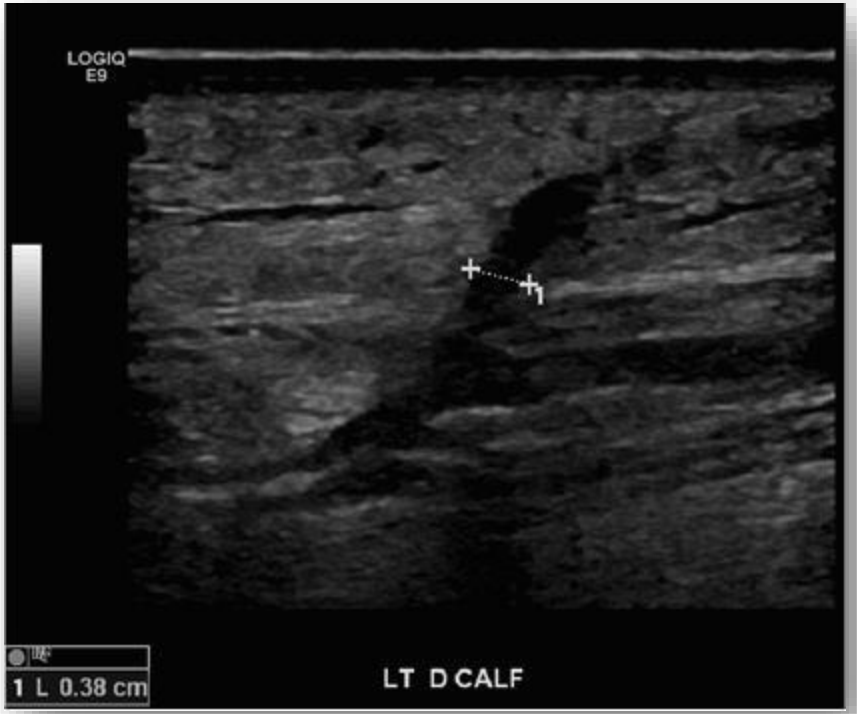
Current Societal Guidelines

SVS®
SOCIETY *for* VASCULAR SURGERY

- Patients considered for perforator closure
  - CEAP 5; perforators in area of healed ulcer
  - CEAP 6; perforator in area of active ulcer



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Why treat perforating veins?

Endovenous ablation of incompetent perforating veins is effective treatment for recalcitrant venous ulcers

Peter F. Lawrence, MD, Ali Alktaifi, MD, David Rigberg, MD, Brian DeRubertis, MD, Hugh Gelabert, MD, and Juan Carlos Jimenez, MD, *Los Angeles, Calif*

- Majority of venous ulcers can be effectively treated with ablation of axial veins and compression therapy
- The presence of incompetent perforating veins (IPVs) can lead to recalcitrant ulceration

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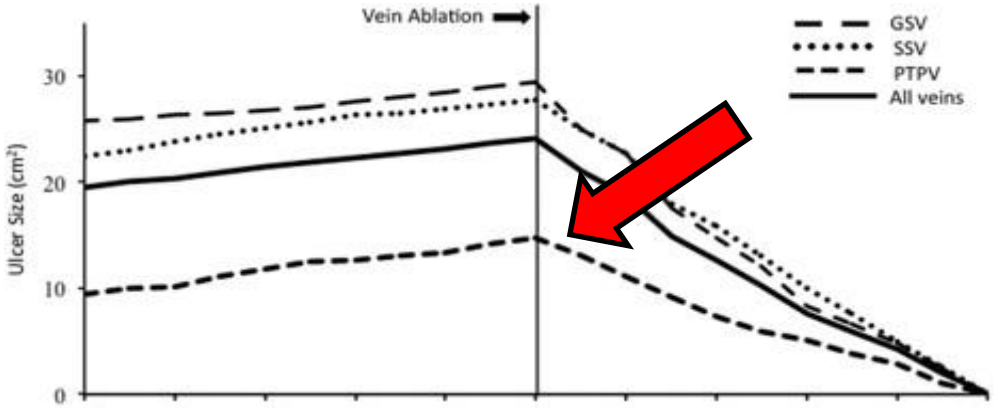
*J Vasc Surg 2011;54:737-42

Why treat perforating veins?

The impact of ablation of incompetent superficial and perforator veins on ulcer healing rates

Michael Harlander-Locke,[a] Peter F. Lawrence, MD,[b] Ali Alktaifi, MD,[b] Juan Carlos Jimenez, MD,[b] David Rigberg, MD,[b] and Brian DeRubertis, MD,[b] *San Diego and Los Angeles, Calif*

- **Successful** ablation of IPVs reduces ulcer recurrence and facilitates healing



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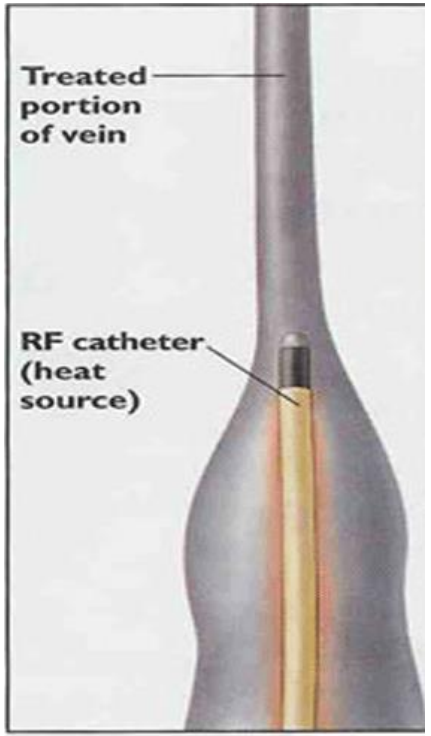
J Vasc Surg 2012;55:458-64

What this means in contemporary venous practice

- **Duplex Results:**
- GSV + perforator
  - GSV ablation first will restore normal flow direction in 50% of pathologic perforating veins.
  - Treat residual pathologic perforating veins in patients with C5/C6 disease
- What about deep reflux?
  - Does not *preclude* therapy of superficial reflux or ablation of pathologic perforating veins



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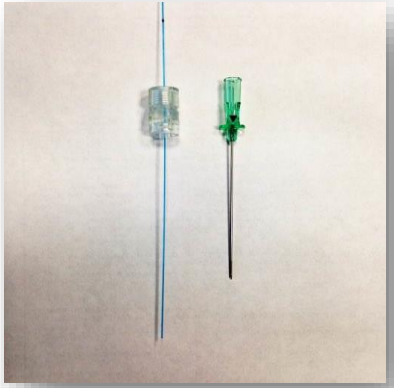
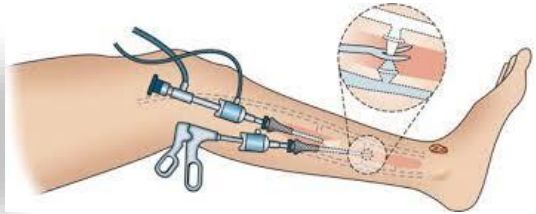
What modalities are available?

- Treatment options:
  - Endovenous laser ablation (EVLA)
  - Radiofrequency ablation (RFA)
  - Ultrasound guided foam sclerotherapy (UGFS)
  - Subfascial endoscopic perforator surgery (SEPS)





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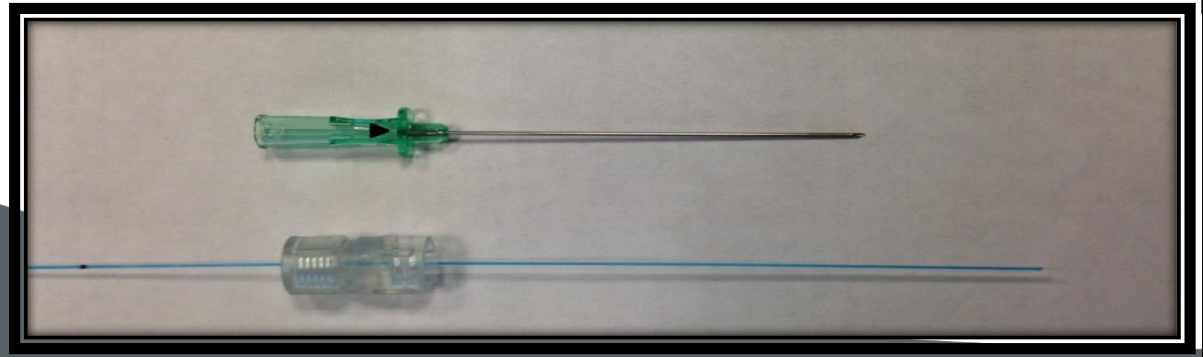
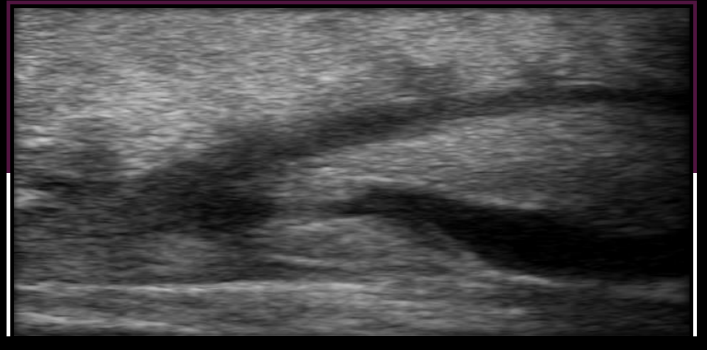
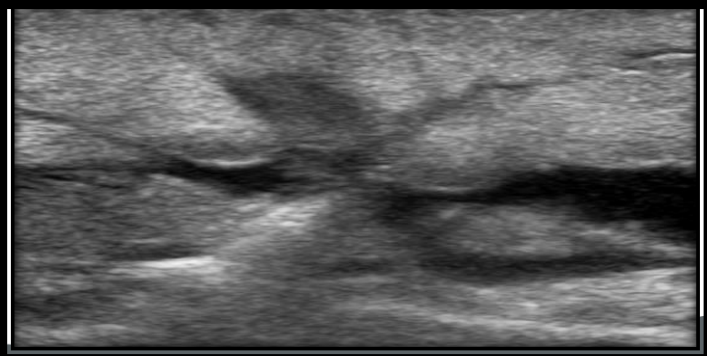
- Percutaneous IPV closure rates range from 60-95%

Endovenous Laser Ablation

- 1470 nm, 400um microfiber introduced through direct puncture 21g needle
- Positioned 2-3 mm from the deep vein
- Lidocaine infiltrated around the laser tip
- The generator set at 6 watts and treated with 50-100 joules per 2mm



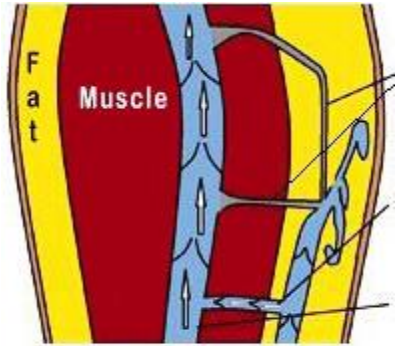




EVLA - Supporting Literature

Eur J Vasc Endovasc Surg. 2015 May;49(5):574-80.
Shi H, Liu X, Lu M, Lu X, Jiang M, Yin M. The effect of endovenous laser ablation of incompetent perforating veins and the great saphenous vein in patients with primary venous disease.

- Retrospective analysis of 132 patients who underwent EVLA at a single institution from 2010 – 2011 and compared to conservative therapy
  - 95 (72%) CEAP 6
- Outcomes:
  - Immediate procedural success was 100%
  - 1 year closure rates were 82%
  - Faster median ulcer healing rate was observed (1.4 mo vs 3.30 mo)
  - No DVT / neuralgia
  - **EVLA is safe and effective and improves ulcer healing rates**



After Endovenous Ablation

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Radiofrequency ablation

- Direct puncture and Seldinger technique both used
- Positioned 2-3 mm from the deep vein
- After local anesthesia infiltration, 4 quadrants treated for 30 seconds each
- Catheter withdrawn 3-5 mm and treated again

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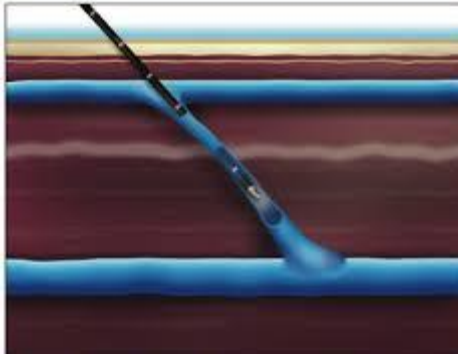
RFA - Supporting Literature

Phlebology. 2010 Apr;25(2):79-84
Marsh, P, Price BA, Holdstock JM, Whiteley MS. One-year outcomes of radiofrequency ablation of incompetent perforator veins using the radiofrequency stylet device. Phlebology. 2010 Apr;25(2):79-84



- Analysis of 75 patients who underwent perforator RFA
  - 60 (80%) CEAP 6
- Outcomes:
  - Immediate procedural success was 94%
  - 1 year closure rates were 82%
  - CEAP and pathological clinical score improved in 49.3%
  - No change in ulcer healing rate, but reduced recurrence rates (12% vs. 43%)
  - 2 tibial vein DVT
  - **Successful RFA improves CEAP class and pathologic clinical scores and reduces ulcer recurrence rates**

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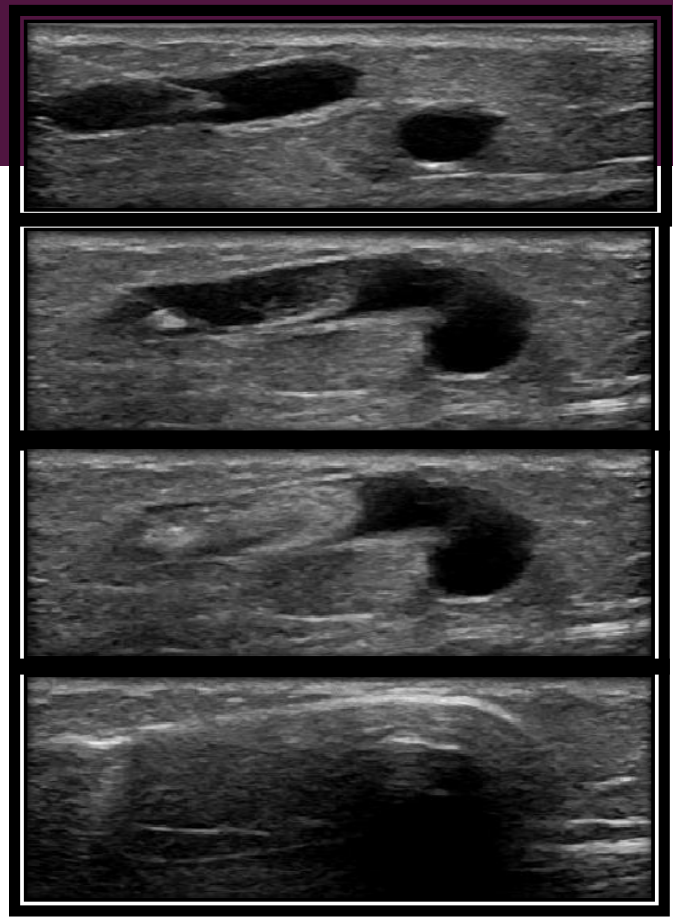
Foam Sclerotherapy

- Communicating vein cannulated with a 23-gauge butterfly needle.
- One cc of 1% polidocanol (Asclera, Merz Aesthetics, Greensboro, NC) agitated with 4 cc room air
- 8 cc maximum foam injected
- Perforator completely filled, compression is held at the junction of the perforator and the deep vein for 2 minutes
- Efforts made to push foam into varicosities



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UGFS - Supporting Literature

Factors that influence perforator thrombosis and predict healing with perforator sclerotherapy for venous ulceration without axial reflux

Misaki M. Kiguchi, MD, MBA,[a] Eric S. Hager, MD,[a] Daniel G. Winger, MS,[b] Stanley A. Hirsch, MD,[a] Rabih A. Chaer, MD,[a] and Ellen D. Dillavou, MD,[a] *Pittsburgh, Pa*

- 62 patients with C6 disease
  - 189 perforating veins treated with UGFS
    - Overall ablation success per injection was 54%
  - 70% healed with successful healed
  - 38% healed with failed ablation
    - P=.02

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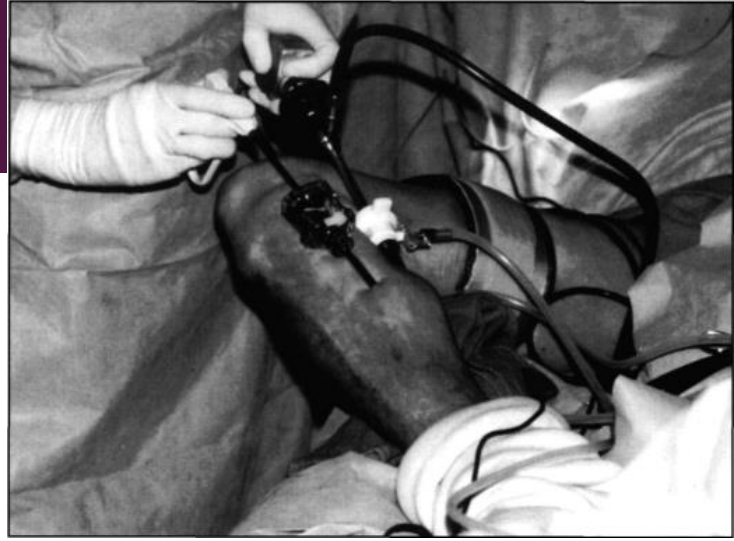
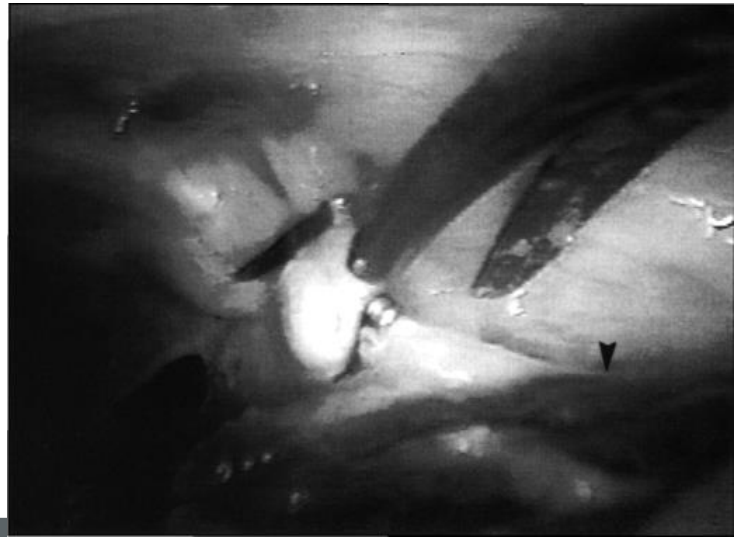
J Vasc Surg 2014;59:1368-76

Subfascial endoscopic perforator surgery

- General anesthesia
- Perforating veins carefully mapped and marked
- Leg exsanguinated and 2x 10 mm Optiview ports placed (3 cm from tibial tuberosity)
- Subfascial space entered under direct visualization
- Perforating veins clipped and divided





SEPS - Supporting Literature

J Vasc Surg. 1997 Jan;25(1):94-105
Gloviczki P, Bergan JJ, Menawat SS, et al. Safety, feasibility, and early efficacy of subfascial endoscopic perforator surgery: a preliminary report from the North American registry. J Vasc Surg. 1997 Jan;25(1):94-105

- Retrospective analysis of 151 patients who underwent SEPS at 17 medical centers from 1993 – 1996
  - 104 (70%) CEAP 6
- Outcomes:
  - Procedural success was 92%
    - VCSS improved from 9.4 to 2.9 (P<0.0001)
    - Ulcer healing rate was 88%
    - **Wound infection 11%**
    - **Neuralgia 12%**

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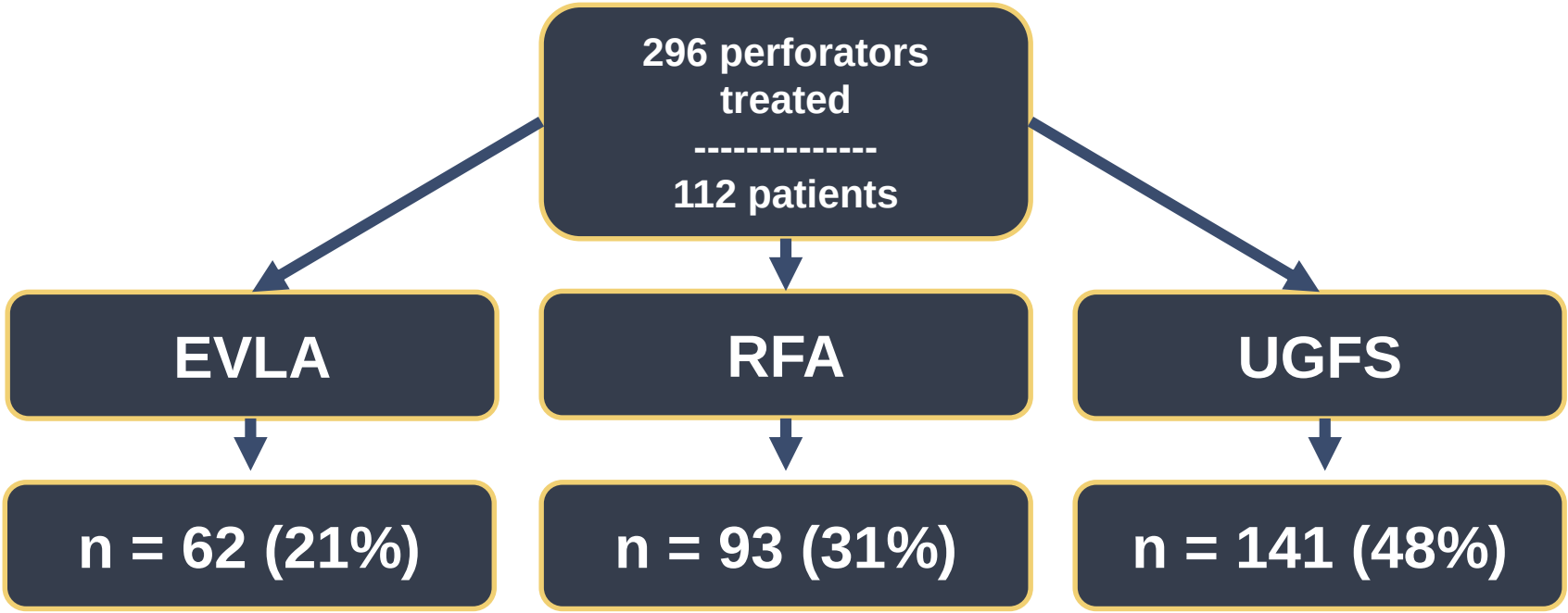
Hager E. Washington C, Steinmetz A, Wu T, Singh MJ, Dillavou E. **Factors that Influence Perforator Vein Closure Rates Using Radiofrequency Ablation, Laser Ablation or Foam Sclerotherapy.** Accepted to JVS



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Patient Demographics

Variable	EVLA (n=25)	RFA (n=49)	UGFS (n=48)	P value
Mean Age	60.7 ± 16.0	61.0 ± 13.0	61.3 ± 13.6	NS
Mean BMI	32.1 ± 10.2	34.3 ± 8.4	31.6 ± 8.2	NS
Deep vein reflux	7 (28%)	13 (33.3%)	16 (33.3%)	NS
Diuretic use	7 (28.0%)	11 (28.2%)	15 (31.3%)	NS
Anticoagulation	8 (32.0%)	13 (33.3%)	18 (37.5%)	NS
Diabetes	4 (16.0%)	5 (12.8%)	9 (18.8%)	NS
Congestive heart failure	4 (16.0%)	4 (10.3%)	3 (6.3%)	NS
Chronic obstructive pulmonary disease	4 (16.0%)	5 (12.8%)	2 (4.2 %)	NS

Perforator Characteristics

Variable	EVLA (n=62)	RFA (n=93)	UGFS (n=141)	P value
Perforator size (mm)	4.9 ± 1.8	5.2 ± 1.5	4.0 ± 0.9	NS
Length > 3 cm	15 (24.2%)	14 (15.1%)	27 (19.2%)	NS
Pulsatility	13 (21%)	31 (33.3%)	45 (31.9%)	NS
Prior GSV/SSV ablation	62 (100%)	88 (94.6%)	135 (95.7%)	NS

Predictor of Success

Modality of Second Procedure	Primary closure rates	Closure rates after prior UGFS	P Value
EVLA	61.3%		
RFA	73.1%		
UGFS	57.4%		

Predictor of Success

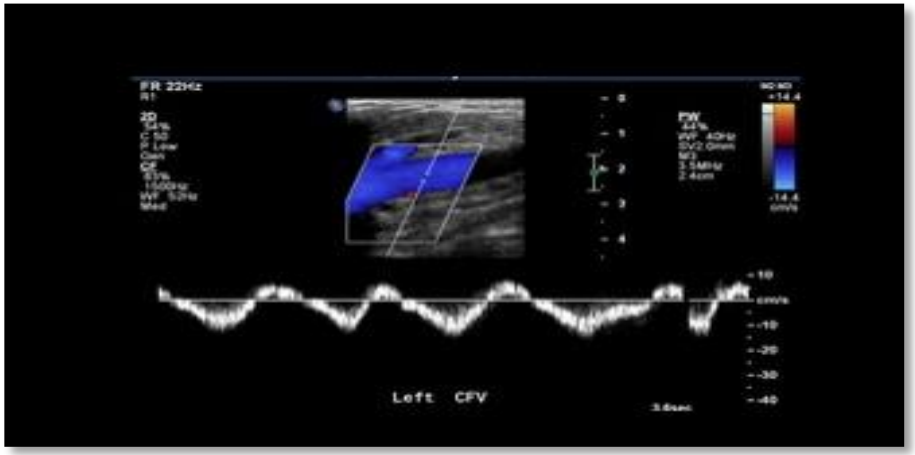
Modality of Second Procedure	Primary closure rates	Closure rates after prior UGFS	P Value
EVLA	61.3%	84.6%	.03
RFA	73.1%	89.1%	.003
UGFS	57.4%	50%	NS

Heat ablation after failed foam sclerotherapy resulted in significantly higher closure rates

Predictors of failure

- All modalities:
  - BMI >50 (p=.05)
  - Pulsatility in the treated vein (p=.05)

- Variables that **did not** affect closure rates
  - Anticoagulation
  - Presence of deep vein reflux
  - Perforator size
  - BMI <50



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Conclusions

1. Pathologic perforating veins can be the cause recalcitrant venous ulceration
2. Current societal guidelines recommend ablation of perforating veins in C5/C6 disease after GSV and SSV ablation
3. Successful perforator ablation leads to increased rates of ulcer healing and a reduction in recurrence rates in conjunction with compression therapy
4. Thermal ablation appears to have higher ablation rates then ultrasound guided foam sclerotherapy

Thank You!

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