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SHORT REPORT

Endovenous Laser Ablation (EVLA) of Great Saphenous Vein to Abolish ''Paradoxical Reflux'' in the Giacomini Vein: A Short Report

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Introduction. *Reflux in the GSV due to sapheno-popliteal incompetence associated with ascending (paradoxical) reflux in the Giacomini vein is a rare but well described pattern of reflux. Treatment of this type of reflux is controversial and only surgical treatment has been described.*
Report. *We describe 2 patients in whom this type of reflux was successfully abolished following endovenous laser ablation (EVLA) of the GSV with the SPJ and Giacomini vein regaining competency.*
Discussion. *Paradoxical reflux in the Giacomini vein and SPJ is secondary to GSV incompetence which exerts a syphon effect. EVLA of the refluxing segment of GSV interrupts this effect and prevents the paradoxical reflux at the SPJ.*

Keywords: Varicose veins; Endovenous laser ablation (EVLA); Paradoxical venous reflux; Giacomini vein.

Introduction

The Giacomini vein, described in 1873, is a proximal extension of the small saphenous vein in the thigh. It is present in 50–80% of the population,[1,2] and in >50% of the patients it terminates at the great saphenous vein (GSV)[3] in the thigh. This inter-saphenous connection may transmit reflux from the proximal GSV to the SSV (descending or orthodox reflux) or from the sapheno-popliteal junction (SPJ) to the GSV (ascending or paradoxical reflux).[4] In paradoxical reflux, blood from the SPJ ascends through the Giacomini vein to the GSV in the thigh and feeds more distal varicosities associated with the GSV. Antegrade flow through the Giacomini vein occurs during both systole (compression) and diastole (relaxation) of the calf muscle and is a striking feature of this type of reflux which is responsible for about 1% of primary varicose veins.[4] Although there is no consensus regarding the optimum treatment for this type of reflux, surgical division of the Giacomini vein flush with the SSV and the GSV has been described.[5]

This article describes a new approach to the treatment of varicose veins due to paradoxical Giacomini vein reflux by endovenous laser ablation of the incompetent segment of GSV. The relevant fluid mechanics underlying this method of treatment are discussed.

Report

Two patients aged 46 and 52 years (1 male, 1 female) presented with symptomatic primary varicose veins (aching, pruritus), without skin changes. Duplex ultrasonography (DUS) confirmed that the SFJ, proximal GSV and SSV were all competent. There was reflux at the SPJ and in the distal GSV. The Giacomini vein, which terminated at the GSV, was identified in both patients and ante-grade flow was noted during both calf muscle squeeze and release. DUS also confirmed that the varicosities were not arising from the SSV. Endovenous laser ablation (810 nm diode laser, 12 W power, 1 second pulse with 1 second intervals 60–72 J/cm) of the GSV was performed from the mid-calf proximally beyond the junction with the

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Table 1. Standard outcome measures before and 12 weeks after EVLA

	Patient 1	Patient 2
Pre AVVSS	16.5	12.7
Post AVVSS	2.1	0
Pre VCSS	3	3
Post VCSS	0	0
Sclerotherapy	One session	None

AVVSS – Aberdeen varicose vein severity score.
VCSS – Venous clinical severity score.

Giacomini vein. Following treatment a non-stretch compression bandage was applied for one week followed by a class 2 support stocking for a further week. At six weeks, DUS confirmed that both GSVs were occluded throughout the treated lengths and that the SPJs had become competent. The majority of visible varicose veins had disappeared although one patient required sclerotherapy for a residual varicosity. The improvement in symptom severity scores are shown in Table 1 and symptoms had resolved fully in both patients. No reflux was demonstrated in the SSV in either patient, and the diameter of the Giacomini vein had decreased (see Table 2) with ante-grade flow during calf muscle squeeze but no flow following calf release. At 12 weeks the treated GSV was no longer visible on DUS and no residual or recurrent varicose veins were present. The SFJ, SPJ, Giacomini vein and SSV were all competent. The duplex ultrasound scan findings are summarized in Table 2.

Table 2. Summary of the duplex ultrasound scan findings in both patients

	Pre treatment	Post treatment
SFJ	Competent	Competent
Proximal GSV (proximal to Giac v)	Competent	Competent
Distal GSV (Distal to Giac v)	Reflux	Occluded/not seen
SPJ	Incompetent	Competent
SSV	Competent	Competent
Giac v	Ante-grade flow during both calf muscle squeeze and release phases	Ante-grade flow during calf muscle squeeze, no flow during release phase
Diameter of the Giac v in Patient 1	6.2 mm	3.4 mm
Diameter of the Giac v in Patient 2	5.9 mm	3.6 mm

SFJ – sapheno-femoral junction.
SPJ – saphen-popliteal junction.
GSV – great saphenous vein.
SSV – small saphenous vein.
Giac v – Giacomini vein.

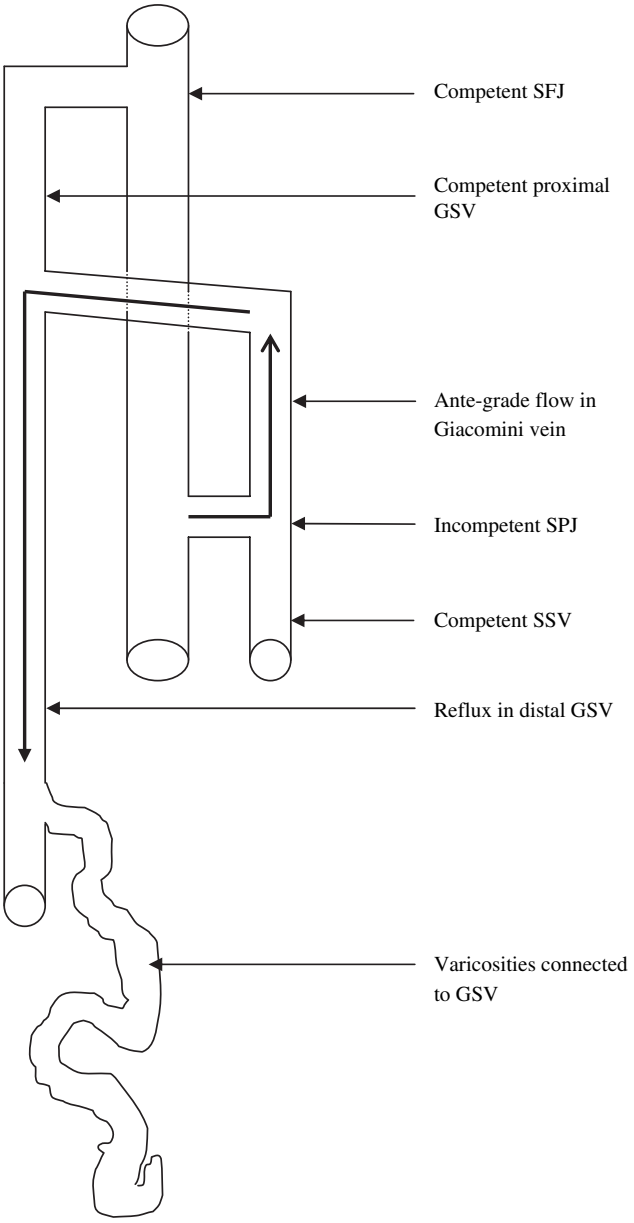

Fig. 1. Diagrammatic representation of paradoxical reflux in the Giacomini vein from the SPJ into the GSV.

Discussion

Blood flows as a continuous column and therefore reflux in one segment of vein is filled by ante-grade or retrograde blood flow in another vein. Appreciation of this is necessary to understand the pattern of reflux and to plan effective treatment for varicose veins. In paradoxical reflux, although the blood from SPJ ascends through the Giacomini vein against gravity, the blood eventually flows downwards to fill the GSV varicosities that are located below the level of the SPJ. Even though blood appears to flow against

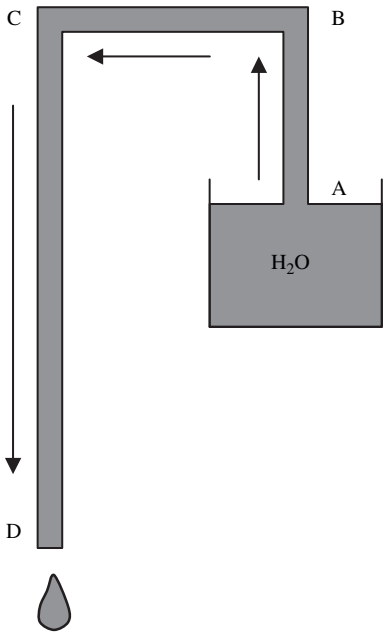

Fig. 2. A simple model consisting of a water reservoir and tubing demonstrates that the water column rises in segment AB before it falls with gravity in segment CD (syphon effect).

gravity initially, the overall net-travel effect in the direction of gravitational force. Thus, the cardinal sign of paradoxical reflux in these patients was the cephalad flow in the Giacomini vein during calf muscle release. In this type of paradoxical reflux, the SSV remains competent due to a healthy valve at the proximal vein, even though the SPJ becomes incompetent. A competent SFJ and proximal GSV are the other characteristic features of this type of reflux (Fig. 1). This pattern of paradoxical reflux can be simulated in a simple experimental model (Fig. 2). Water ascends through the tube segment ''AB'' before it descends in tube segment ''CD''. Water flow in this model is only possible as long as the point D is lower than the point A, effectively working as a syphon. Abolition of segment CD would prevent this syphon effect and stop flow from A to C. This provides the rationale for treating this type of paradoxical reflux by removal or ablation of the GSV. The post-treatment DUS findings confirm that such a strategy was effective since the Giacomini vein diminished in size and the SPJ regained competency thus confirming that the primary anomaly was not SPJ incompetence. Although it might be considered that the SSV might be at increased risk of becoming incompetent once paradoxical reflux in the Giacomini vein had been abolished, this did not seem to be the case again suggesting that the SPJ is not responsible for this type of reflux.

The finding in these two patients highlights the need for detailed DUS assessment to determine patterns of reflux before planning a definitive treatment for varicose veins, particularly when an endovenous ablation technique is to be employed. Further studies with longer follow up are required to establish long term efficacy of this method of treatment for paradoxical reflux. Although alternative management might include ablation of the Giacomini vein, if the GSV is left untreated reflux will persist with the varicosities filling via other GSV tributaries. In view of this, we believe that the approach described in this paper should be considered for other similar patients.

References

1 Vasdekis SN, Clarke GH, Hobbs JT, Nicolaides AN. Evaluation of non-invasive methods in the assessment of short saphenous vein termination. *Br J Surg* 1989;**76**:929–932.
2 Labropoulos N, Leon M, Nicoloides AN, Giannoukas AD, Volteas N, Chan P. Superficial venous insufficiency: correlation of anatomic extent of reflux with clinical symptoms and signs. *J Vasc Surg* 1994;**20**:953–958.
3 Delis KT, Knaggs AL, Khodabakhsh P. Prevelence, anatomic patterns, valvular competence, and clinical significance of the Giacomini vein. *J Vasc Surg* 2004;**40**:1174–1183.
4 Georgiev M, Myers KA, Belcaro G. The thigh extension of lesser saphenous vein: from Giacomini's observation to ultrasound scan. *J Vasc Surg* 2003;**37**:558–563.
5 Escribano JM, Juan J, Bofill R, Rodriguez-Mori A, Maeso J, Fuentes JM *et al*. Haemodynamic strategy for treatment of diastolic antegrade giacomini varicose vein. *Eur J Vasc Endovasc Surg* 2005;**30**:96–101.

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