

Ligation of the saphenofemoral junction tributaries as risk factor for groin recurrence



Massimo Cappelli, MD,^a Raffaele Molino-Lova, MD,^b Ilaria Giangrandi, MD,^a Stefano Ermini, MD,^c and Sergio Giancesini, MD, PhD,^{d,e} Florence, Grassina, and Ferrara, Italy; and Bethesda, Md

ABSTRACT

Objective: The aim of this study was to compare the recurrence rate after high ties performed with or without sparing of the saphenofemoral junction tributaries.

Methods: There were 867 lower limbs enrolled. All patients underwent a high tie with (group A) or without (group B) ligation of all the junctional tributaries for a great saphenous vein reflux (C2-5EpAsPr). A duplex ultrasound examination detected recurrences.

Results: Median follow-up was 5 years (interquartile range, 3-8 years). Group A had a higher recurrence rate than group B (odds ratio, 7.52; $P < .001$). Group A recurrences (7.4%), compared with group B (1.1%), presented with a more frequent direct stump reconnection (3.7% vs 0.2%; $P < .001$) or newly developed pelvic shunts (3% vs 0.5%; $P < .001$). No significant difference was reported between the two groups in newly incompetent perforating veins.

Conclusions: Ligation of the junctional tributaries is associated with a higher recurrence risk. Further investigations are needed to determine the hemodynamic role of each single junctional tributary. (*J Vasc Surg: Venous and Lym Dis* 2018;6:224-9.)

For many decades, the treatment strategy for superficial chronic venous disease (CVD) has remained unchanged—the ablation of any refluxing vessel.¹ At the same time, despite the technical innovation brought by minimally invasive modern approaches, such as endovenous thermal ablation with tumescent and nonthermal nontumescent devices, no improvement has been reported in terms of recurrence rate.² The recurrence rate among all the different ablative procedures can be associated with an advancement in the technique but not in the scientific strategy. On the other hand, a Cochrane review pointed out the potential recurrence rate reduction following a not-ablative strategy, based on hemodynamic concepts of saphenous sparing.³

According to the literature, >50% of recurrences have been reported from a newly incompetent saphenofemoral junction (SFJ), making this specific anatomic site a region of extreme interest for hemodynamic investigation.^{4,5} In varicose vein surgery literature, the importance of a saphenous flush ligation at the femoral junction has been reported.⁶ Yet, to the best of our knowledge, no specific

studies have been performed regarding the importance of ligation of the junctional tributaries (superficial epigastric, superficial circumflex, and superficial pudendal veins). Thermal ablative and tumescent approaches have demonstrated that leaving these tributaries draining into the femoral stump does not influence the recurrence rate compared with an ablative surgical procedure with tributary ligation.² In varicose vein surgery, there is no clear indication about the actual need for ligation of these vessels, and there is no clear hemodynamic interpretation of their role in junctional recurrence development. The aim of this study was to evaluate the role of junctional tributaries in SFJ recurrence after high-tie procedures, so providing a further step forward to a better hemodynamic understanding of the SFJ site.

METHODS

A retrospective analysis was performed on 1433 limbs of 1216 patients who underwent a high ligation for lower limb CVD (C2-5EpAsPr) incompetence of the SFJ terminal valve and of the great saphenous vein (GSV) trunk. All the patients presented with a perforating vein along the GSV trunk to permit the drainage of blood to the deep venous system (type I shunt according to the Cure Conservatrice et Hémodynamique de L'insuffisance Veineuse en Ambulatoire [CHIVA] classification).⁷⁻¹⁰

All GSV tributaries along the leg presenting with a reflux >0.5 second were flush ligated and disconnected. All procedures were performed by the same experienced surgeon, according to the saphenous-sparing CHIVA strategy, with detailed preoperative mapping.

Because the study was an observational retrospective investigation, conducted by professional health care workers on their own patients, with no transmission of data to anyone else (monocentric study), and

From Private Centro Vena^a and the Don Gnocchi Foundation,^b Florence; Ermini Private Phlebological Office, Grassina^c; the Department of Morphology, Surgery and Experimental Medicine, University of Ferrara, Ferrara^d; and the Department of Surgery, Uniformed Services University of the Health Sciences, Bethesda.^e

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Correspondence: Sergio Giancesini, MD, PhD, University of Ferrara, Via Aldo Moro 8, Cona, Ferrara 44100, Italy (e-mail: sergiogiancesini@gmail.com).

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considering that the procedure was used in normal clinical practice, it was not necessary to obtain ethical approval.¹¹ Moreover, all the patients signed an informed consent allowing the anonymous use of their data for research purposes.

The cohort was divided in two groups: group A, flush high ligation with ligation of all junctional tributaries; and group B, flush high ligation sparing all junctional tributaries. The allocation to the two groups was based on the technical preference of the surgeon. Indeed, anatomic features of the junctional tributaries can make the procedures a little bit more cumbersome, so that simply ligating and disconnecting them can speed up the procedure. At the time of the procedure, the surgeon was unaware of the potential different outcomes of the two groups.

Before the surgical procedure, both groups underwent a detailed ultrasound scan reporting competence of the terminal and preterminal valve, eliciting the flow both by distal compression-relaxation and Valsalva maneuvers. Only in the case in which both maneuvers were positive was the terminal valve considered incompetent.¹²

The surgeon is also an experienced sonographer who has been involved in saphenous-sparing strategy for decades. Patients were always preoperatively mapped, with careful selection of the re-entry perforator along the GSV trunk to keep a draining system and to avoid the risk of GSV thrombosis. The follow-up ultrasound scan was always performed by the same experienced sonologist at 1 week, 3 months, and 1 year after the operation and subsequently once a year. Reflux was elicited in all the patients by distal compression-relaxation maneuver and adding Valsalva maneuver whenever the SFJ was analyzed.¹² Recurrent SFJ venous reflux was considered a dichotomous variable (yes/no).

Exclusion criteria were preoperative presence of refluxing networks other than the GSV one (incompetent pelvic or perforating veins), previous stripping or other procedure for varicose veins, history of deep venous thrombosis or deep venous incompetence, body mass index >35 as a potential risk factor for pelvic reflux,¹³ hypomobility, pregnancy during the follow-up time, history of more than two pregnancies, and follow-up <2 years.

Inclusion criteria were age 18 to 70 years and C2-5EpAsPr.

Surgical procedures on the SFJ. All interventions were performed under local anesthesia (lidocaine 2% without vasoconstrictors, 10 mL). In both group A (so-called cross-ectomy) and group B (so-called crossotomy), special care was taken to achieve a precise SFJ dissection, and two short longitudinal incisions on the fossa ovalis were performed to completely expose the femoral vein.

The GSV was tied flush on the femoral vein using a 3-0 braided nonabsorbable suture and then divided after a

ARTICLE HIGHLIGHTS

- **Type of Research:** Retrospective cohort study
- **Take Home Message:** After high ligation and division of the great saphenous vein (GSV) in 867 limbs with chronic venous disease, recurrent reflux at the saphenofemoral junction (SFJ) at a median of 5 years was associated with ligation of the SFJ tributaries (odds ratio, 7.52; $P < .001$).
- **Recommendation:** High ligation and division of the GSV and sparing of the SFJ tributaries may reduce recurrent reflux at the SFJ in patients who do not have ablation of the GSV.

second 3-0 braided nonabsorbable ligature was applied on the distal GSV stump. In both group A and group B, a titanium clip was placed longitudinally, just underneath the flush ligature, pinching the borders of the femoral vein wall.¹⁴

In group A patients, tributaries entering the SFJ were divided; in group B patients, SFJ tributaries were spared and left connected to the distal GSV (Fig 1). The allocation to group A and group B was random as the surgeon was not considering ligation of the tributaries a potential risk factor for recurrence.

At the end of the procedure, the fascia cribrosa was closed with a 3-0 braided nonabsorbable suture. Subcutaneous tissue was closed with a 3-0 braided absorbable suture, and the skin was subcuticularly sutured with a 4-0 nonabsorbable monofilament. No ablation procedure was performed on the GSV. In all cases, distal incompetent GSV branches along the leg were flush ligated at their confluence with the GSV during the same surgical procedure.

Statistics. Statistical analysis was performed using Stata 7.0 software (StataCorp LP, College Station, Tex). Data are presented as mean \pm standard deviation or as absolute value with percentage. Statistical significance of differences in the characteristics of the study sample between patients who showed recurrent venous reflux and those who did not was tested using the Student *t*-test for independent samples or the Pearson χ^2 test for continuous or dichotomous variables, respectively. Odds ratios (ORs) for the development of recurrent venous reflux according to the surgical procedure were tested using the Fisher exact test. The same test was also used to test ORs for the causes of recurrent venous reflux. Type I error was set at the two-sided .05 level.

RESULTS

After the application of the enrollment criteria, 763 patients (867 limbs; 205 men, 558 women; mean age, 63 ± 13 years) attended all the follow-up visits and were included in the study. Median follow-up was 5 years

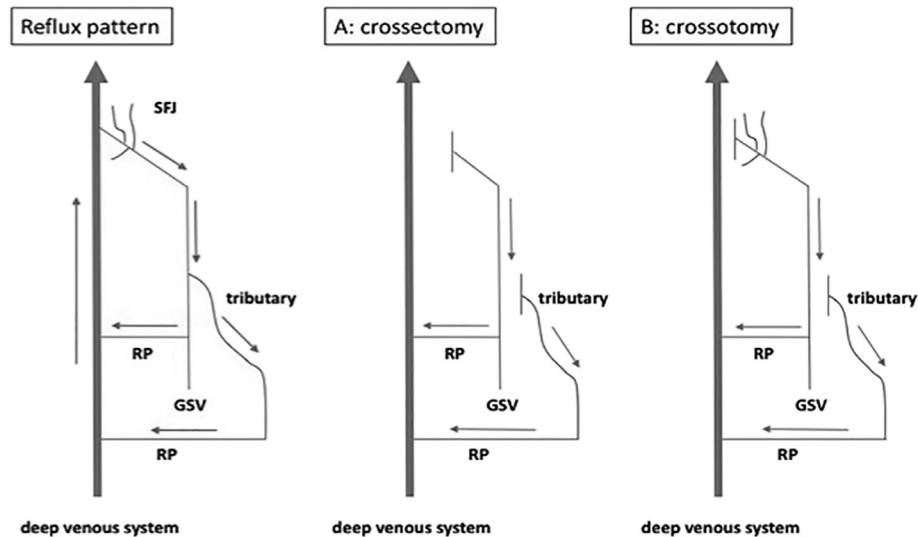


Fig 1. Reflux pattern, crossectomy, and crossotomy. Reflux pattern involving the saphenofemoral junction (SFJ), the great saphenous vein (GSV), and incompetent tributaries along the leg. RP, Re-entry perforator. Group A, crossectomy: high tie is associated with ligation of the junctional tributaries. Group B, crossotomy: high ligation is performed, sparing the confluence of the junctional tributaries with the GSV trunk.

(interquartile range [IQR], 3-8 years). Demographics, clinical presentation, preoperative duplex ultrasound, and mean follow-up duration were similar in the two groups (Table I).

All the procedures were considered technically satisfying at the time of the surgical performance, and no significant complications were reported. In all group B cases, sparing of at least two SFJ tributaries was always technically feasible.

The overall incidence of group A and group B recurrent SFJ refluxes was 3.3% (29/867 limbs). Median time of recurrence was 4.5 years (IQR, 2-6 years) in group A and

3 years (IQR, 2-6 years) in group B. SFJ reflux reappearance was significantly higher in group A compared with group B, 7.4% vs 1.1%, respectively (OR, 6.43; 95% confidence interval [CI], 2.71-15.24; $P < .0001$; Table II).

In comparing the different sources of SFJ recurrence, a direct stump reconnection was found exactly in the site of the previously present native junction in 3.7% (11/297) of group A recurrences vs 0.2% (1/570) of group B (OR, 21.88; 95% CI, 3.14-943.42; $P < .001$). A pelvic source was found in 3% (9/297) of group A vs 0.5% (3/570) of group B (OR, 5.91; CI, 1.46-34.0; $P < .005$). A newly incompetent perforating vein was equally found in both groups,

Table I. Study population (N = 867 limbs)

	Recurrent venous reflux (n = 29 [3.3%])	No recurrent venous reflux (n = 838 [96.6%])	P ^a
Demographics ^b			
Age, years	62 ± 15	63 ± 13	.707
Female sex	19 (76)	539 (73)	.823
Clinical presentation			
Noncomplicated varicose veins	6 (20)	142 (17)	.961
Edema	11 (39)	285 (34)	
Eczema	4 (14)	143 (17)	
Lipodermatosclerosis	7 (25)	218 (26)	
Venous ulceration	1 (4)	50 (6)	
Preoperative duplex ultrasound			
GSV caliber, mm	7.4 ± 1.9	7.3 ± 1.8	.773
Follow-up duration, years	5.7 ± 1.8	5.9 ± 1.7	.541

GSV, Great saphenous vein.

Categorical variables are presented as number (%). Continuous variables are presented as mean ± standard deviation.

^aFrom two-tailed Student *t*-test or Pearson's χ^2 test, as appropriate.

^bDemographics of 763 patients, 25 with and 738 without recurrent venous reflux.

Table II. Odds ratio (OR) for recurrent venous reflux in the saphenofemoral junction (SFJ) region according to the surgical procedure performed on the SFJ (N = 867 limbs)

Recurrent venous reflux in the SFJ region	Group A (n = 297), No. (%)	Group B (n = 570), No. (%)	P ^a	OR (95% CI)
Yes	22 (7.4)	7 (1.2)	<.0001	6.43 (2.71-15.24)
No	275 (92.6)	563 (98.8)		

CI, Confidence interval.
^aFrom two-tailed Fisher exact test.

specifically in 0.7% (2/297) of group A vs 0.5% (3/570) of group B cases (OR, 1.28; CI, 0.11-11.25; *P* = .997; Fig 2; Table III).

DISCUSSION

Recurrence rate remains a problematic issue in modern CVD treatment.¹⁵ Despite the constant improvement in the minimal invasiveness offered by the new therapeutic techniques, the recurrent outcome remains unchanged.² This fact also raises a question related to the hemodynamic role of the junctional tributaries, which are spared and left draining toward the femoral vein in the endovenous techniques, whereas they are usually ablated in traditional varicose vein surgery.

The literature is lacking in-depth investigations into the hemodynamic role of SFJ tributaries, thus not providing a clear technical indication of the need to ligate or to spare these vessels during high ligation procedures. This investigation demonstrates that SFJ tributary ligation is associated with a significantly increased risk of SFJ recurrence (OR, 7.52; 95% CI, 2.91-22.88; *P* < .001). Moreover, it shows that the risk of GSV recurrence fed by direct SFJ recanalization or a pelvic source is significantly higher in case of junctional tributary ligation.

To the contrary, no significant difference is reported in terms of recurrences fed by newly incompetent tributaries between the two groups, even if, considering the small number of evaluated cases, significant conclusions cannot be drawn regarding these specific data.

To the best of our knowledge, the reported topic has never been investigated before, so new data about risk factors in SFJ reflux reappearance are now provided. The phenomenon could be interpreted in association with a flushing effect of the SFJ tributaries on the spared GSV trunk. As the superficial epigastric vein is flushing the femoral stump after an endovenous thermal procedure, the spared SFJ tributaries could offer a flushing flow inside the GSV, so avoiding stasis, inflammation, potential neoangiogenesis/SFJ reconnection, and pathologic share stress.^{5,16,17}

The extent of dissection length has being recognized as a potential risk factor in recurrence development; nevertheless, these data are quite contradictory and unresolved in the literature.¹⁸ Group A underwent a slightly more extended dissection length than group B to isolate a few more millimeters along the junctional tributaries to be ligated and then dissected. Nevertheless, such adjunct dissection was minimal and not

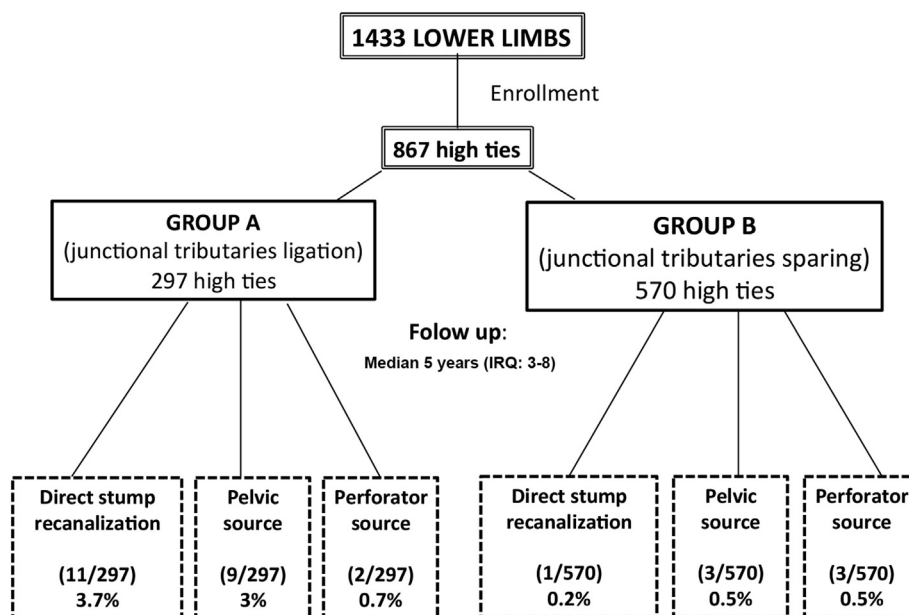


Fig 2. Study population and different types of recurrences in group A and group B. IQR, Interquartile range.

Table III. Odds ratio (OR) for the causes of recurrent venous reflux in the inguinal region according to the surgical procedure performed on the saphenofemoral junction (SFJ; N = 867 limbs)

Causes of recurrent venous reflux in the inguinal region	Crossectomy (n = 297), No. (%)	Crossotomy (n = 570), No. (%)	P ^a	OR (95% CI)
Direct stump reconnection			<.001	21.88 (3.14-943.42)
Yes	11 (3.7)	1 (0.2)		
No	286 (96.3)	569 (99.8)		
Newly developed pelvic shunts			<.005	5.91 (1.46-34.10)
Yes	9 (3.0)	3 (0.5)		
No	288 (97.0)	567 (99.5)		
Newly incompetent thigh perforating veins			.997	1.28 (0.11-11.25)
Yes	2 (0.7)	3 (0.5)		
No	295 (99.3)	567 (99.5)		

CI, Confidence interval.
^aFrom two-tailed Fisher exact test.

considered to be a factor influencing the recurrence rate. The only factor differentiating group A from group B was tributary ligation and dissection, thus adding useful data to the intriguing topic of SFJ recurrence. This factor has to be taken into consideration among the potential possible explanations of the different recurrence rates, and further investigations could start from these data to provide more evidence on the topic.

In our drainage model, GSV was always spared, thus providing a conduit where the superficial abdominal and groin drainage of the SFJ tributaries can download. This feature could reduce the postulated pressure overload in group A compared with group B. Empirically, in the operating room, a dilation of the ligated tributary distal stump is often visible. The phenomenon testifies to a pressure overload caused by the lack of drainage into the GSV trunk of the same ligated tributary. This pressure overload could represent a potential trigger of recurrence linked to the already demonstrated correlation among pressure overload, venous inflammation, and disease progression.¹⁹

Even if indirectly, literature regarding endovenous technique shows that in case of GSV ablation, there is no significant difference in the recurrence rate despite sparing or ligation of the junctional tributaries.²⁰ In this investigation, avoiding ligation of SFJ tributaries showed a decreased risk of pelvic reflux appearance. To the contrary, the present work is demonstrating that in case of GSV sparing, the presence of a junctional drainage may reduce the recurrence rate significantly, a factor to be considered in the already reported reduced recurrence rate after a saphenous-sparing rather than an ablative procedure.³

Even if more basic science and clinical investigations will be performed on this topic, it could be postulated that the reduced recurrence rate in the tributaries-sparing scenario could be associated with the possibility of the groin tributaries draining into the saphenous

conduit in group B, rather than being forced to a closed end by the tributary ligation of group A. Consequent venous hypertension and related biosignaling could be influenced.

Potential limitations of the study are to be found in the retrospective design of the investigation. Further assessments are recommended in a prospective design, with a randomized enrollment, focusing on the number and hemodynamic features of the spared or ligated and disconnected junctional tributaries.

Considering the many possible anatomic and hemodynamic variants in the SFJ region, further investigations should be addressed to selectively assess the specific features of each and every single tributary.²¹

This investigation focused on the assessment of SFJ reflux reappearance rather than on varicose vein recurrence. Further prospective dedicated studies should assess the recurrence rate of varicose veins associated with different junctional treatment approaches. Even with the reported limitation, this study provides evidence that ligation of SFJ tributaries is associated with an increased risk of SFJ recurrence after high ligation procedures.

CONCLUSIONS

Ligation of the junctional tributaries is associated with a higher recurrence risk. Together with the clinical implication addressing the technical strategy, the reported data provide further clues in the intriguing interpretation of the SFJ hemodynamics. The study paves the way for further investigations leading to a deeper knowledge regarding the main site of recurrence in CVD treatment.

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AUTHOR CONTRIBUTIONS

Conception and design: MC

Analysis and interpretation: MC, RML, SE, SG

Data collection: MC, IG, SE
Writing the article: MC, RML, SG
Critical revision of the article: MC, RML, IG, SE, SG
Final approval of the article: MC, RML, IG, SE, SG
Statistical analysis: RML
Obtained funding: Not applicable
Overall responsibility: MC

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