

CHIVA for dummies

Stefano Ricci 

Phlebology
2024, Vol. 0(0) 1–7
© The Author(s) 2024
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/0268355231225788
journals.sagepub.com/home/phl



Abstract

Background: Sparing the Great Saphenous Vein capital for possible arterial substitution and recurrence decrease may be an alternative to current ablation options for Varicose Veins treatment. Conservative surgery of varicose veins (CHIVA) was suggested in 1988 by Franceschi, by limited veins interruptions in strategic points. However, the method did not diffuse due to the need for high Duplex expertise to determine the procedure in every single patient.

Method: Evaluation of the literature regarding saphenous sparing, with special reference to CHIVA.

Result: It has been realized that basic Ultrasound expertise is sufficient for performing GSV conservation. Most of the time, only a few parameters are needed: a junction competence assessment and a re-entry perforator position.

Conclusion: For achieving the goal of saphenous conservative treatment, a limited phlebectomy and possible Junction interruption (crossotomy) may be a simplified solution.

Keywords

CHIVA, ambulatory phlebectomy, Duplex ultrasound, hemodynamic surgery, sapheno femoral junction

A great contribution to Phlebology is due to Claude Franceschi, the father of the CHIVA method¹—a conservative alternative for treating varicose veins (VV)—whose theories are still not fully shared.

While saphenous ablation is currently traditionally employed, why should a conservative method (and particularly one sparing the Great Saphenous Vein—GSV) be of interest to treat VV, apart from limiting the length of GSV stripping to below the knee for avoiding saphenous nerve damage²? Some evidence suggests that saphenous conservation could become important for several reasons³:

Simplify the procedure avoiding technological gadgets.

Possibly reduce costs for patients and insurance⁴ as needing an office setting without any technical tool.

Protect the venous capital that is still usable.^{5,6}

Reduce recurrences^{7–9}

Channel the flow of recurrences^{10,11}

Maintain a drainage potential of the lower limbs¹²

Ablation is not needed when GSV is not directly involved.

Like a cultural/scientific revolution, CHIVA (French acronym for “Cure Conservatrice et Hemodynamique de l’Insuffisance Veineuse en Ambulatoire”), a conservative approach for treating varices, appeared suddenly in 1988.¹

At that time, the GSV was commonly stripped out, and later cooked (at different temperatures), sometimes frozen, glued, chemically abused, and considered the most important target to treat in the phlebology community. Perforators were ligated, varices avulsed, by general anesthesia, and bed resting in the hospital. It derived from the Fathers of saphenous ablation (Babcock, Mayo, Keller) and continued for the next 100 years (although with evolutions)¹³ with great satisfaction and earnings. How could a non-conventional method, based on an office approach, by local anesthesia, avoiding hospitalization and allowing immediate ambulation without SV sacrifice prevail over the traditional universal “creed?”

CHIVA appeared to the pupils as a kind of modern Cleansing of the Temple.

CHIVA principles

The main idea of CHIVA is reflux origin suppression without sacrificing the saphenous function, in an office setting.^{1,10,14}

The first step in achieving this goal is to set up individual anatomy, hemodynamic, and related specific tactic surgical

Private Practice, Roma, Italy

Corresponding author:

Stefano Ricci, Private Practice, Corso Trieste 123, Roma 00198, Italy.
Email: varicci@tiscali.it

action. Simple, targeted vein ligations (with limited avulsions) may redirect superficial network vein flow to the deep veins via perforators, which assume a friendly attitude instead of needing the traditional interruption. The hypertension caused by the overflow of the refluxing volume is normalized. The “Shunt” (a source + a tract + a re-entry), once known as “vicious circle,”¹⁵ is a leading diagnostic concept based on Ultrasound analysis: 18 shunt types have been theorized (TEUZPITZ Shunts Classification by CHIVA team 2002)^{10,14,16} with possible superposition. The diagnostic approach may be theoretically confusing for operators who have no solid base of ultrasound diagnostic and do not assess patients on their own. However, the surgical component is simple:

Phlebectomy¹⁷ or Dis-connection of refluxing tributaries¹⁰

Saphenous vein flush ligation and interruption (crossotomy) if needed.¹⁰

Why has this relatively simple treatment alternative encountered so great initial criticism, up to real ostracism? The reasons could be the following:

- “The original sin in spreading novel concepts was certainly the French language.”¹⁰
- Its initial dissemination through non-academic media, to achieve a popular consensus rather than a scientific one. Moreover, the basic book¹ describing the new philosophy was written in a cursive handwriting, marking the distance between academic traditions and the new philosophy.
- Ultrasound expertise was still not common among phlebologists at that time.¹⁴
- The rejection of the theory by those not experts with CHIVA developed a defensive strategy within the CHIVA-Users. They were discredited by being named as “new religion” and as sectarians. The difficulty of official phlebology to deny the ancestors’ inheritance, especially when new technical tools (laser, RF, glue, foam) for GSV elimination could be enjoyed.
- No company that would benefit from the method.
- Limited strong evidence-based literature not always confirming CHIVA better results.^{9,18,19}

Some obstacles have been overcome, but there is still skepticism towards CHIVA, especially outside of Europe. Interestingly, many of the validated tools of Duplex analysis of venous networks^{20,21} now diffusely used have been introduced by CHIVA studies:

Standing position for reflux assessment

Activation maneuvers

The eye sign for Saphenous stems identification, subdividing superficial leg veins into two different networks (N2 and N3)

The alignment sign for AASV identification

The drainage concept of perforating veins depending on their flow

The difference between axial and non-axial reflux

Confirming the interest in this conservative method but also confirming its drawback, in 2005 ASVAL (Ambulatory Selective Varicose Veins Ablation under Local anesthesia²²) was introduced as a simplified saphenous sparing strategy, however, applicable in selected cases. Based on so cold “Ascending theory,”²³ a phlebectomy is the only step of the treatment leaving the refluxing saphenous vein untouched; the saphenous diameter usually decreases, and occasionally the reflux disappears, avoiding saphenous sacrifice in about 60% of selected cases. If a recurrence occurs, the SV can be removed again by a new phlebectomy or alternatively by a saphenectomy. Therefore, in the ASVAL setting Saphenous saving is possible, but not predictable, and is based on chance.²⁴ The theoretically limited base makes the method easily accepted, but out of a scientific coherent model.

How could we overcome this impasse, while maintaining a strong scientific-theoretic base of CHIVA, but allowing for a larger diffusion?

CHIVA simplified

After consulting the publications concerning CHIVA treatment and selecting those involved mostly in theoretic concepts by which the method was progressively developed, it was realized that although theoretic aspects are of major importance for understanding and exploring the CHIVA method requiring deep ultrasound expertise, from a clinical point we may pay attention only to the few, and simple surgical tactic interventions that are basically conditioned by the re-entry perforator(s) position.

Consequently, only a basic Duplex assessment is needed for:

- The SFJ anatomy, caliber, and function: incompetence should be confirmed by Valsalva and compression-release maneuvers.²⁵
- refluxing GSV length.
- Junction(s) of the varicose vein(s) to the saphenous trunk.
- RET²⁶ (see below).

The procedure:

1st step: Phlebectomy of varices until the junction to the trunk (that should be carefully preserved). Refluxing collaterals are separated from the GSV by flush ligation-division-avulsion. The phlebectomy can be changed to a simple disconnection of the vein from the trunk (like CHIVA originally suggested) if complete conservation of the venous network is

preferred. The avulsion of a few last centimeters of very dilated varices is anyway recommended. Additionally, sclerotherapy or other heating endovascular systems can be used to block collaterals at the junction with the trunk.¹⁰

As a result, after the tributaries separation two basic situations may occur related to re-entry perforators:

- If saphenous reflux disappears, it means that the re-entry perforator of the shunt is centered on the tributary, usually in its distal part. (CHIVA calls this a Shunt III) (Figure 1(a)). This result can be predicted during examination by the *Reflux Elimination Test (RET)*: if a finger's compression on the varices near the trunk abolishes the reflux, the RET is positive (Figure 1(b)–(c)). This behavior is present in 60%–70% of the cases.²⁶

If a reflux re-appears after 6–12 months, it will be either by the “activation” of a trunk perforator²⁷ (Figure 2(a)) or, alternatively, by the effect of a new tributary drained by its perforator (same situation than pre-op)¹⁰(Figure 2(b)).

- If saphenous reflux does not disappear, then it means that a re-entry perforator is centered on the trunk itself. In this case, there are two systems present at the same time: one drained by the tributary (excluded by finger compression/phlebotomy) and one drained by the GSV (persisting). (According to CHIVA this is Shunt I + II) *The RET is here negative.*¹⁰ After the removal of the tributaries, the saphenous system will no longer be burdened with the part of the tributary refluxing volume, reducing its reverse flow volume.

Reflux will not be deleted in the GSV but will be reduced in duration and volume (33% of the cases).¹¹

Both cases require a GSV assessment for reflux to be performed at 6–12 months. If incompetence appears (in RET +), persists, or is accentuated (in RET -), it can be decided whether to interrupt the Sapheno Femoral Junction (SFJ). Otherwise, the patient is re-referred to the next control at 12 months. The detection of reflux will only induce treatment if there is a pathology (symptoms and recurrences) present (Figure 3).²⁸

Limited recurrent varices may be treated again, even by sclerotherapy,²⁹ giving the saphenous further forgiveness. For this phase, plethysmography assessment may be helpful.

2nd step: SFJ interruption

The need for the SFJ to be interrupted is strongly related to its preoperative Duplex assessment. Indeed, terminal valve incompetence has only been recorded in half of the GSV incompetence cases.^{30,31} Patients with a competent terminal valve rarely need step 2³²; furthermore, possibly mobile valves in a dilated junction may acquire competence after the expected post-operative caliber reduction.^{33,34} The SFJ incompetence can be left out if the flow rate is limited²⁸ (plethysmography could be the guide).

A crossotomy (flush ligation with junction tributaries preservation) is preferred when SFJ interruption is needed as the junction tributaries drainage is maintained by this technique, keeping a residual limited reverse flow in the

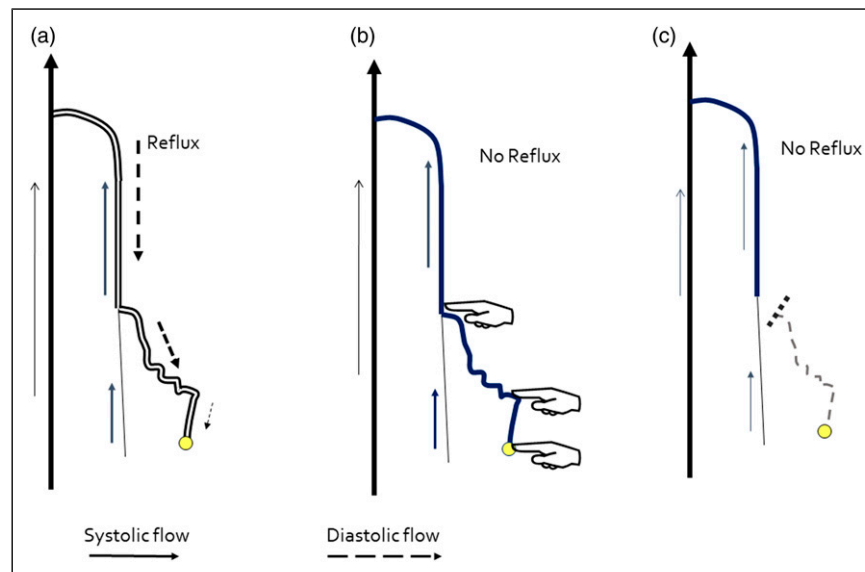


Figure 1. (a): The re-entry perforator (circle) is centered on the tributary vein. (b) Finger compression over any tributary's point stops the reflux. Positive RET (Reflux Elimination Test). (c) Same after a tributary isolated phlebotomy.

saphenous stem. Important to note that this will reduce the tendency for neovascularization of the traditional cross-ectomy (flush ligation with tributaries interruption) when tributaries drainage is interrupted.³⁵ Recent studies have suggested that endoluminal thermic techniques can be used

to achieve a segmental saphenous closure of about 7 cm, by positioning the tip distally to the last draining tributary of the groin. This will allow the tributaries to drain through the junction left open,³⁶⁻³⁸ allowing CHIVA introduction into the current technology passion.

In conclusion, a phlebectomy will resolve the problem in most cases when the SFJ or at least the terminal valve is competent. A delayed junction interruption may help solve most unsolved cases with SFJ incompetence. No saphenous stem sacrifice is needed at all, except for probably very damaged (dilatation, post thrombosis, post sclerotherapy, post-trauma) parts in rare cases.

The high post-treatment compression and immediate ambulation make complications rare. Approximately 10%^{11,39} of the cases have been described as having a limited thrombosis of the GSV at the site of tributary disconnection. It is usually asymptomatic and is quickly resolved with an anticoagulation short treatment and compression. An antithrombosis prophylaxis is recommended if the GSV stem is dilated (>10 cm), if an aneurismatic dilatation is present, if the GSV treated tributary is close to the Junction, if the patient is elderly, or if there are other situations where the risk is high.

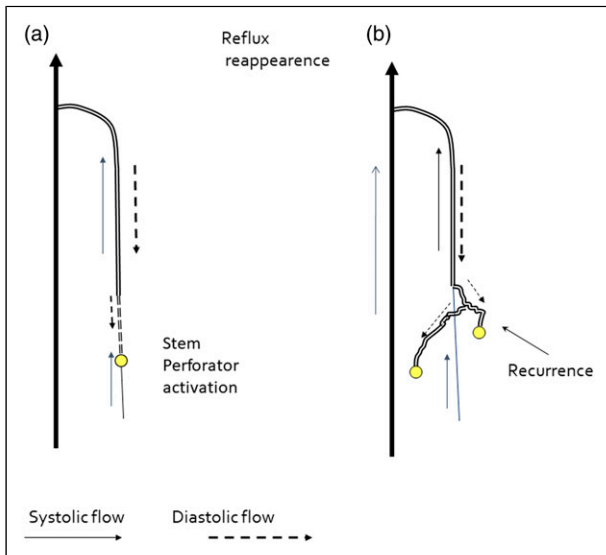


Figure 2. (a) Reflux reappearance after “activation” of a perforator (circle) or (b) after recurrence formation due to varices emptying through their perforators.

Discussion

The Saphenous Saving Strategy (SSS) described above, which is based on Muller’s Ambulatory Phlebectomy,^{17,40}

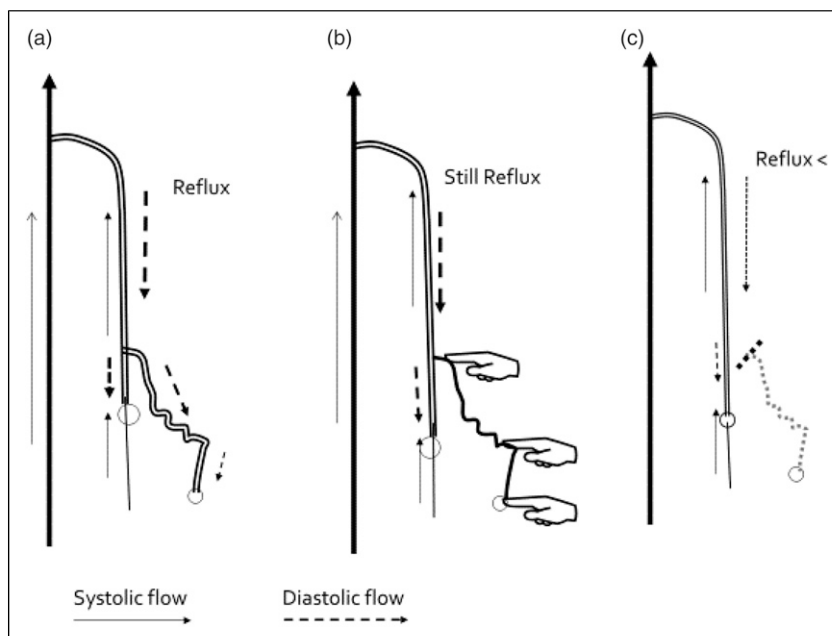


Figure 3. (a) The re-entry perforators (circles) are centered both on the GSV and on the tributary. (b) Finger’s compression over any tributary’s point does not eliminate the reflux in the GSV. Negative RET (Reflux Elimination Test). (c) After the phlebectomy, the reflux persists but is reduced in volume.

can be used to treat most varicose vein situations (presumably 80%) when GSV is involved. It reflects the hemodynamic principles of the CHIVA philosophy, without the need for extensive knowledge of its teachings. Furthermore, it follows the simplified concepts of the ASVAL proposal, but with a reasoning basis. Although useful, the duplex smart expertise is not essential at least at the beginning.

According to the published series, about 50% of patients with varicose veins with GSV reflux have a competent terminal valve, and therefore will not need any junction interruption intervention.^{10,33} The remaining patients will benefit from the phlebectomy effect of stopping the reflux, in the RET-positive cases. In RET-negative cases with persisting reflux, but with a functionally efficient re-entry perforator, and-or limited diameter and-or short length, without symptoms or recurrences, the junction stage can be delayed. Those who have reflux appearing, remaining, or worsening (with symptoms) will receive the crossotomy.^{10,41–44} The crossotomy (with tributaries preservation) will replace the GSV ablation and will maintain a functioning saphenous trunk in the spirit of SSS, enjoying the concept that reflux is the enemy, not the saphenous trunk.

The biggest drawback is the need for a possible second surgical session (although needed presumably in no more than about 20% of the cases), which is an obstacle for assurances, health systems (that dislike doubling operative sessions), and patients who prefer “one shot.” On the other hand, costs seem lower than current corrective GSV ablation methods due to the exclusion of technical equipment and related tools, the office’s easy practicability, and the limited local anesthesia amount and invasiveness. When properly explained the problem of artery substitution, but also the recurrence reduction, better venous drainage potential, and reduced aggressiveness, the GSV salvage is highly appreciated by the patients.

The exclusion of technology tools may be seen as an advantage for cost reduction,⁴ but at the opposite may constitute an obstacle for the companies interests and relative influence on treating indications. If only manual handicraft were needed, companies involved in the “phlebological circus” would lose income, except for color Doppler devices.

Conclusions

With a few exceptions, saphenous sparing is always possible when treating varicose veins due to GSV incompetence, with well-known advantages. The treatment of the varicose tributary first by simple disconnections or more extensive phlebectomy allows for a successive evaluation of the GSV reflux behavior. The frequency of terminal valve SFJ’s competence found in pretreatment investigations

makes it unnecessary to interrupt the junction in half of the cases. In half of the remaining cases, the phlebectomy can eliminate or reduce saphenous reflux. Few patients will require the flash ligation and section without JSF tributaries interruption. A saphenectomy may be considered an exception.

The “difficulty myth” ligated to the original CHIVA application would be abandoned by the method’s simplification; occasional failures of this simplified way of working, naturally happening, should be considered due to the insufficient knowledge of CHIVA details and not to the method’s failure; unsuccess will be progressively reduced by deeper experience.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Stefano Ricci  <https://orcid.org/0000-0003-0294-8148>

References

1. Franceschi C. *Théorie et pratique de la cure conservatrice et hémodynamique de l'Insuffisance veineuse en ambulatoire. Precysous-Thil*. France: Editions de l'Armançon, 1988.
2. Negus D. Should the incompetent saphenous vein be stripped to the ankle? *Phlebology* 1986; 1: 33–36. DOI: [10.1177/026835558600100108](https://doi.org/10.1177/026835558600100108).
3. Franceschi C, Cappelli M, Ermini S, et al. CHIVA: hemodynamic concept, strategy and results. *Int Angiol* 2016; 35: 8–30.
4. Scheerders ERY, van der Velden SK, Goossens LMA, et al. A randomized clinical trial of isolated ambulatory phlebectomy versus saphenous thermal ablation with concomitant phlebectomy (SAPTAP trial). *Br J Surg* 2023; 110: 333–342. DOI: [10.1093/bjs/znac388](https://doi.org/10.1093/bjs/znac388).
5. Melliere D. Why and when to preserve the saphenous veins of varicose patients to serve as an arterial bypass? *J Mal Vasc* 1994; 19: 216–221.
6. Fligelstone LJ, Salaman RA, Oshodi TO, et al. Flush saphenofemoral ligation and multiple stab phlebectomy preserve a useful greater saphenous vein four years after surgery. *J Vasc Surg* 1995; 22(5): 588–592. DOI: [10.1016/s0741-5214\(95\)70044-7](https://doi.org/10.1016/s0741-5214(95)70044-7).
7. Carandina S, Mari C, De Palma M, et al. Varicose vein stripping vs haemodynamic correction (CHIVA): a long term randomised trial. *Eur J Vasc Endovasc Surg* 2008; 35(2): 230–237. DOI: [10.1016/J.EJVS.2007.09.011](https://doi.org/10.1016/J.EJVS.2007.09.011).

8. Pares O, Juan J, Tellez R, et al. Varicose vein surgery: stripping versus the CHIVA method: a randomized controlled trial. *Ann Surg* 2010; 251: 624–631. DOI: [10.1097/SLA.0b013e3181d0d0a3](https://doi.org/10.1097/SLA.0b013e3181d0d0a3).
9. Guo L, Huang R, Zhao D, et al. Long-term efficacy of different procedures for treatment of varicose veins. *A network meta-analysis Medicine* 2019; 98: e14495.
10. Zamboni P, Mendoza E and Gianesini S. *Saphenous vein-sparing strategies in chronic venous disease*. New York: Springer International Publishing AG, part of Springer Nature, 2018. DOI: [10.1007/978-3-319-70638-2](https://doi.org/10.1007/978-3-319-70638-2).
11. Cappelli M, Lova RM, Ermini S, et al. Ambulatory conservative hemodynamic management of varicose veins: critical analysis of results at 3 years. *Ann Vasc Surg* 2000; 14: 376–384. DOI: [10.1007/S100169910064](https://doi.org/10.1007/S100169910064).
12. Skoog J, Nelzén O and Zachrisson H. Venous compliance in great saphenous vein incompetence: pre- and post-interventional changes. *EJVES* 2020; 47: 78–82.
13. Ricci S. The sapheno femoral junction involvement in the treatment of varicose veins disease. *Lymphatics* 2017; 6: 6822. DOI: [10.4081/vl.2017.6822](https://doi.org/10.4081/vl.2017.6822).
14. Franceschi C and Zamboni P. *Principles of venous hemodynamics*. New York: Nova science Publishers, 2009.
15. Trendelenburg F. Ueber die Unterbindung der Vena saphena magna bei unterschenkelvaricen. *Beitrage zur Klinischen Chirurgie* 1890; 7: 195.
16. Mendoza E, Lattimer CR and Morrison N. *Duplex ultrasound of superficial leg veins*. New York: Springer, 2014.
17. Muller R. Traitement des varices par phlébectomie ambulatoire. *Phlebologie* 1966; 19: 277–279.
18. Bellmunt-Montoya S, Escribano JM, Dilme J, et al. CHIVA method for the treatment of chronic venous insufficiency. *Cochrane Database Syst Rev* 2015; 2015(6): CD009648. DOI: [10.1002/14651858.CD009648.pub3](https://doi.org/10.1002/14651858.CD009648.pub3).
19. Bellmunt-Montoya S, Escribano JM, Pantoja Bustillos PE, et al. CHIVA method for the treatment of chronic venous insufficiency. *Cochrane Database Syst Rev* 2021; 9: CD009648. DOI: [10.1002/14651858.CD009648.pub4](https://doi.org/10.1002/14651858.CD009648.pub4). Accessed 10 July 2023.
20. Coleridge-Smith P, Labropoulos N, Partsch H, et al. Duplex ultrasound investigation of the veins in chronic venous disease of the lower limbs--UIP consensus document. Part I. Basic principles. *Eur J Vasc Endovasc Surg* 2006; 31(1): 83–92. DOI: [10.1016/j.ejvs.2005.07.019](https://doi.org/10.1016/j.ejvs.2005.07.019).
21. Cavezzi A, Labropoulos N, Partsch H, et al. Duplex ultrasound investigation of the veins in chronic venous disease of the lower limbs--UIP consensus document. Part II. Anatomy. *Vasa* 2007; 36(1): 62–71. DOI: [10.1024/0301-1526.36.1.62](https://doi.org/10.1024/0301-1526.36.1.62).
22. Pittaluga P, Rea B and Barbe R. Méthode ASVAL (Ablation Sélective des Varices sous Anesthésie Locale): principes et résultats préliminaires. *Phlebologie* 2005; 2: 175–181.
23. Bernardini E, De Rango P, Piccioli R, et al. Development of primary superficial venous insufficiency: the ascending theory. Observational and hemodynamic data from a 9-year experience. *Ann Vasc Surg* 2010; 24(6): 709–720. DOI: [10.1016/j.avsg.2010.01.011](https://doi.org/10.1016/j.avsg.2010.01.011).
24. Pittaluga P and Chastanet S. Treatment of varicose veins by ASVAL: results at 10 years. *Ann Vasc Surg* 2017; 38: E10. DOI: [10.1016/J.Avsg.2016.07.021](https://doi.org/10.1016/J.Avsg.2016.07.021).
25. Cappelli M, Molino Lova R, Ermini S, et al. Hemodynamics of the sapheno-femoral junction. Patterns of reflux and their clinical implications. *Int Angiol* 2004; 23: 25–28.
26. Zamboni P, Cisno C, Marchetti F, et al. Reflux elimination without any ablation or disconnection of the saphenous vein. A haemodynamic model for venous surgery. *Eur J Vasc Endovasc Surg* 2001; 21: 361–369. DOI: [10.1053/ejvs.2001.1338](https://doi.org/10.1053/ejvs.2001.1338).
27. Bailly M. Résultats de la cure CHIVA. In: Cormier JM and Fichelle JM (eds). *Techniques et Stratégie en Chirurgie Vasculaire*. Paris: AERCV, 1992, pp. 255–271.
28. Pittaluga P, Chastanet S, Locret T, et al. The effect of isolated phlebectomy on reflux and diameter of the great saphenous vein: a prospective study. *Eur J Vasc Endovasc Surg* 2010; 40: 122–128. DOI: [10.1016/j.ejvs.2010.03.031](https://doi.org/10.1016/j.ejvs.2010.03.031).
29. Cappelli M and Molino Lova R. CHIVA cure and sclerotherapy. *JTAVR* 2022; 7(1), Epub Ahead of Print DOI: [10.24019/jtav.129](https://doi.org/10.24019/jtav.129).
30. Cappelli M, Molino Lova R, Ermini S, et al. Hemodynamics of the sapheno-femoral junction. Patterns of reflux and their clinical implications. *Int Angiol* 2004; 23: 25–28.
31. Cappelli M, Lova RM, Ermini S, et al. Hemodynamics of the sapheno-femoral complex: an operational diagnosis of proximal femoral valve function. *Int Angiol* 2006; 25: 356–360.
32. Mowatt-Larssen E and Shortell C. CHIVA. *Semin Vasc Surg* 2010; 23: 118–122.
33. Franceschi C, Cappelli M, Ermini S, et al. CHIVA: hemodynamic concept, strategy and results. *Int Angiol* 2016; 35(1): 8–30.
34. Mendoza E. Diameter reduction of the great saphenous vein and the common femoral vein after CHIVA Long-term results. *Phlebologie* 2013; 42: 65–69.
35. Cappelli M, Molino-Lova R, Giangrandi I, et al. Ligation of the saphenofemoral junction tributaries as risk factor for groin recurrence. *J Vasc Surg Venous Lymphat Disord* 2018; 6(2): 224–229. DOI: [10.1016/j.jvsv.2017.09.005](https://doi.org/10.1016/j.jvsv.2017.09.005).
36. Passariello F, Ermini S, Cappelli M, et al. The office based CHIVA. *J Vasc Diagn* 2013; 1: 13–20. DOI: [10.2147/JVD.S49637](https://doi.org/10.2147/JVD.S49637).
37. Gianesini S, Menegatti E, Zuolo M, et al. Short endovenous laser ablation of the great saphenous vein in a modified CHIVA strategy. *Veins and Lymphatics* 2013; 2: e21. DOI: [10.4081/VL.2013.E21](https://doi.org/10.4081/VL.2013.E21).
38. Amsler F and Mendoza E. CHIVA with endoluminal procedures: LASER versus VNUS – treatment of the sapheno-femoral junction. *Phlebologie* 2017; 46: 5–12. DOI: [10.12687/PHLEB2346-1-2017](https://doi.org/10.12687/PHLEB2346-1-2017).
39. Juan J, Escribano JM, Criado E, et al. Haemodynamic surgery for varicose veins: surgical strategy. *Phlebologie* 2005; 20(1): 2–13.

40. Ricci S. Ambulatory Phlebectomy: sixty-year-old but still looking great. *JTAVR* 2022; 7(2), EPub Ahead of Print. DOI: [10.24019/jtavr.138](https://doi.org/10.24019/jtavr.138).
41. Biemans AAM, van den Bos RR, Hollestein LM, et al. The effect of single phlebectomies of a large varicose tributary on great saphenous vein reflux. *J Vasc Surg Venous Lymphat Disord* 2014; 2: 179–187. DOI: [10.1016/j.jvsv.2013.11.003](https://doi.org/10.1016/j.jvsv.2013.11.003).
42. Pittaluga P and Chastanet S. Persistent incompetent truncal veins should not be treated immediately. *Phlebology* 2015; 30(1 suppl): 98–106. DOI: [10.1177/0268355515569141](https://doi.org/10.1177/0268355515569141).
43. Shepherd AC, Gohel MS, Lim CS, et al. A study to compare disease-specific quality of life with clinical anatomical and hemodynamic assessments in patients with varicose veins. *J Vasc Surg* 2011; 53(2): 374–382. DOI: [10.1016/j.jvs.2010.09.022](https://doi.org/10.1016/j.jvs.2010.09.022).
44. Fligelstone L, Salaman RA, Oshodi TO, et al. Flush saphenofemoral ligation and multiple stab phlebectomy preserve a useful greater saphenous vein four years after surgery. *J Vasc Surg* 1995; 22(5): 588–592. DOI: [10.1016/S0741-5214\(95\)70044-7](https://doi.org/10.1016/S0741-5214(95)70044-7).