

Saphenous sparing evolution

S Ricci¹

¹Studio Medico Parioli, Roma

submitted: Nov 24, 2022, accepted: Feb 6, 2023 , EPub Ahead of Print: April 6, 2023, published: Apr 30, 2023

Conflict of interest: None

DOI: [10.24019/jtavr.146](https://doi.org/10.24019/jtavr.146) - Corresponding author: Prof. Stefano Ricci, varicci@tiscali.it

© 2023 Fondazione Vasculab impresa sociale ONLUS. All rights reserved.

Abstract While Saphenous stripping became the gold standard technique for varicose veins treatment in the second part of last century, soon, leaving the Saphenous stem in place for surgical simplification and, successively, for arterial bypass use became a subject of research, showing uncertain responses. Ultrasound facilities allowed better hemodynamic knowledge; a new hemodynamic approach (CHIVA) appeared that limited venous ablation and redirected the blood to the deep system normalizing the pressures, allowing Great Saphenous Vein preservation. Even new technologic evolutions (thermal, chemical), created for venous ablation, could be converged toward this conservatory attitude simply changing the mental scheme.

Keywords Saphenous sparing, conservative treatment, Saphenous preservation, arterial bypass

The Great saphenous Vein stripping became the gold standard treatment for varicose veins in the middle of the last century, popularized by the Mayo Clinic surgeon Thomas Myers¹ helped by newly designed, long, flexible strippers that pleated up the vein along its length². Just for understanding the enthusiasm of veins surgeons of the time, in 1954 Foote's "Varicose Veins" book³, we can read:

- "It is now realized by most surgeons throughout the world that the accepted surgical treatment of the varix, with but few exceptions, may be stated as follow:

1. The high resection of both or either of the internal and external saphenous veins, with all immediate tributaries.
2. The complete removal of the main trunks and branches of both or either of the internal or the external saphenous vein by stripping
3. The excision of faulty communicating veins and perforators."

In contrast, Rivlin⁴ trying to simplify the stripping procedure ("The long-term results were as poor as the short-term effects were dramatic"), already in 1975 was writing: "as pointed out earlier, the most distal incompetent perforating vein is within a centimetre or two of the level of the tibial tubercle, there is no longer any need for the old-fashioned ankle-length stripper".

Mumm⁵ in 1981 compared by a prospective, double blind, randomized, controlled trial stripping the long saphenous vein, to saphenofemoral ligation and avulsion of varicosities, showing that stripping conferred a significant advantage, but the incidence of paraesthesia and pain biased patient's opinion against stripping.

In the Volume 1, Number 1 (1986) of the Phlebology journal⁶ Negus suggests that stripping from ankle to groin is both unnecessary and undesirable; limiting the stripping operation to the upper calf recurrences were few, neurological complications were minimal, and distal GSV could be preserved for subsequent coronary artery bypass surgery. For this last aspect the author refers to a Lancet paper of 1985⁷ demonstrating that the below the knee segment of the GSV remains patent even after the surgical removal of the main trunk down to the knee and the radical avulsion of all visible varicose veins in the limb. The segment between ankle and knee is the preferred conduit, and if harvested from both legs it yields sufficient length even for multiple grafts.

But already in 1984 Large⁸ warns: "It is believed that many surgeons, by adopting 'stripping' as the routine surgical treatment of significant varicose veins may be sacrificing many major leg veins which could be potentially valuable arterial grafts", suggesting stab phlebectomies for

varices and possible high ligation limited to cases with terminal valve incompetence without saphenectomy.

In 1987 B-mode ultrasound was prospectively evaluated for its ability to preoperatively assess the

adequacy of venous conduit for arterial reconstruction. Table I reported below shows how important was considered the availability of a vein conduit for limb salvage⁹.

Adequate Vein for Vein Grafting	Adequate Segments of Inadequate Length	Unusable Veins
(N= 32)	(N= 10)	(N= 9)
97%	Immediate limb salvage 77%	56%
87%	Graft patency 70%	25%
87.5%	Overall limb salvage 72%	25%

Table I - Limb Salvage and Graft Patency Versus Preoperative Mapping (Results at 12 Months). From (Seeger and coll. Modified table 2)

A saphenous sparing alternative strategy appears contemporaneously at the end of eighties¹⁰ and 1989¹¹ based on Sapheno-Femoral junction external valvuloplasty in severely selected patients, with good short-term results, employed only by few centres, but still at present under attention¹². The possibility of avoiding saphenous ablation depends from the presence of valvular leaflets unable to close for the wall dilatation: the valvuloplasty tries to give back continence by lumen restriction.

In 1990, according to Hammersten and al.¹³, it is possible to perform elective vein surgery for varicose veins with good results and preserve the long saphenous vein, which in turn can be used for future arterial reconstruction in most cases; however, a more aggressive diagnostic and precise therapeutic approach is necessary to achieve as good results in non-stripped limbs as in stripped limbs. Note that at that time still only phlebography was used as diagnostic tool.

Duplex scanning and photoplethysmography are finally employed in 1991 in studying cases with high ligation/stab avulsion trying to identify possible different reasons for variable results in term of GSV reflux recurrence¹⁴.

In 1991 already Mellièrè noted that arterial disease occurs one or several decades after the venous complaint, so every patient with varicose problems may be concerned; contrary to a frequent opinion, great saphenous veins of varicose patients are often suitable for arterial bypass.

It is possible to propose to most patients conservative procedures: ambulatory phlebectomy or sclerosis injections of peripheral veins in case of minor reflux, crosssectomy or CHIVA) in case of major reflux¹⁵. Approximately 80% of the GSV veins in patients consulting for varicosities are normal, slightly dilated or simply have one or more minor areas of dilatation¹⁶.

In a study of Fligelstone et al. in 1993, concerning 75 limbs, high saphenofemoral ligation combined with multiple stab avulsions preserved a GSV with characteristics suggesting suitability for potential use as a vascular conduit after varicose vein surgery: the GSVs were patent from ankle to groin in 68% and from ankle to knee in 82%, with a mean diameter of 4.0 ± 0.1 mm at 12 months control¹⁷.

The same leading Author reviewed in 1995, by ultrasound, 72 patients at a median follow-up of 4 years finding 59 limbs with a patent GSV above and below the knee, the mean length patent being 51 cm¹⁸.

It is in this scientific cultural background that the Franceschi "experience" begins¹⁹ giving a hemodynamic explanation to the venous leg's circulation and suggesting the rationale for the GSV salvage even if incompetent. The CHIVA (Conservatrice et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire) "philosophy", a true hemodynamic revolution in phlebology environment, introduced the concept of sparing the whole venous capital: not only protecting the healthy network, but also saving the

dilated refluxing trunks, in open contrast to the traditional treatments. According to this new theoretical approach, the final purpose is the creation of draining systems for the GSV through re-entry perforators, once the SFJ has been possibly interrupted; retrograde flow in the GSV is armless provided hyper-pressure is eliminated; distal perforators are useful and not the origin of the disfunction. In practice, by isolated strategic interruptions of refluxing points the blood flow can be re-directed through the perforator veins toward the heart reducing the blood columns height and consequently the venous hypertension. The assessment of perforating veins behavior is basically the true CHIVA tactic indicator, allowing: a) junction interruption after tributary disconnection when the re-enter perforator is centered on the saphenous stem (Shunt 1), or b) postponing the junction interruption waiting for a new re-entry activation if the GSV is not sufficiently drained by its own perforator (Shunt 3).

Apart from saving all kind of refluxing trunks, whatever dilated, this procedure has been able to reduce recurrences, minimize complications and make venous surgery an ambulatory procedure. Duplex analysis and interpretation of single cases are both the basic elements of CHIVA, being the strength of the method (possibility to objectify the specific venous hemodynamic anomaly and decide the custom solution), but also the limit (high level Duplex know how, long learning curve, hemodynamic mentality acquisition). In any case the new hemodynamic awareness explained why in the past experiences some cases had good saphenous sparing results (positive drainage) while others did not (inefficient outflow).

Like for religions, CHIVA peculiar non-conformism "gave birth to a Myth where only few "priests" touched by Franceschi's truism would participate"²⁰. In fact initial reception was not favorable, due to a new nomenclature (open/closed shunt, re-entry, N numbered symbols for network, crossotomy, deflux), new classification (6 shunt types), not intuitive treatment procedures (tributary disconnection, staged surgery, retrograde flow persistence). Slowly but constantly CHIVA acquired an important place in the varicose vein's treatment²¹⁻³⁰, however never overcoming GSV ablation tendency, strongly reinforced by the new century heating-based technology (Laser. Radio Frequency) or new chemical tools (foam, glue), all heavily influenced by industrial business and simplified strategy.

CHIVA was adopted in few centers prevalently in France, Italy and Spain, but very enthusiastic. Specific publications began in the '90s by teams²¹⁻³⁰.

Analysis of these publications led to two revisions of a Cochrane systematic review in 2013 and 2015 by Belmont-Montoya's team^{31,32}.

Concurrently in 2009 a simplified saphenous sparing strategy appeared under the name of ASVAL (Ambulatory Selective Varicose veins Ablation under Local anaesthesia)³³ suggesting the simple ablation of the varicose network by Muller's stab avulsion technique, leaving the saphenous stem untouched; as a consequence, the saphenous diameter reduces and occasionally the reflux disappears avoiding saphenous ablation, according to a possible ascending varices pathogenesis. A long term (10 years) analysis over 350 patients suggested absence of reflux in 64,4% of cases, with 76,7 % not needing re-operation³⁴.

The new century starting, while conservative treatments slowly evolve and try to take a position, saphenous ablation attitude had a strong incentive from the application of the new heating and chemical technologies. Laser³⁵ and RF³⁶ thermal closure acquire immediate supporters under industrial boost, relative low Invasiveness, use in local anesthesia, possible office procedure. Foam³⁷, the new variant of sclerotherapy, makes the joy of sclerotherapists who may increase their activity.

These new successful tools are inevitably involved in the conservation approach, trying to make it more attractive and modern looking.

Indeed, in Riobamba (Ecuador) in 2009 with N Morrison^[I, II] and in 2010 with N Morrison and T King^[III], F Passariello conceived and practiced a few cases of the Riobamba Laser Draining Crossotomy (RLDC), realizing the segmental GSV closure near the junction with a variable treated segment length, in order to maintain the washing and the drainage provided by the competent tributaries. In 2011 the same Author described the organizational issues and advantages of this approach³⁸, while in 2013 all the hemodynamic details were systematically defined in the OB-CHIVA (Office-Based CHIVA) protocol³⁹⁻⁴¹. Later, in many meetings and in several countries a preliminary statistics of 14 treated cases was reported. Although a detailed publication about these results is still missing, an interesting web page is available instead since 2013, which thoroughly details information about these presentations⁴².

In 2013 Giancesini⁴³ reported two cases of successful short and fixed length endovenous laser ablation of the GSV according to CHIVA hemodynamic principles; in 2021 this Author reported 79 patients who underwent a fixed 6 cm great saphenous vein ablation by RF or by Laser⁴⁴. A similar experience was published in 2017 by Mendoza on 104 patients⁴⁵ with results comparable to those achieved after surgical crossotomy.

GSV conservation by remodelling using LASER with low linear-endovenous-energy-density (LEED) was also

suggested by Ferracani in 2013 and 2018, with a shrinking effect preserving the systolic flow, in analogy to what occurs in venous valvuloplasty: GSV calibre reduction in 97.9% of 38 cases was achieved⁴⁶⁻⁴⁹.

Following these initial experiences, it is advisable that other mini-invasive techniques (steam, glue, mechanochemical) may be addressed to GSV sparing strategy.

Sclerotherapy too has been shown to offer this possibility: in 2001⁵⁰ and successively in 2007 Bernardini⁵¹ proposed the Echo-Sclerosis hEmodynamic Conservative (ESEC) based on a duplex ultrasound-guided super-selective sclerosing approach, in replacement of the surgical (although limited) CHIVA disconnection gestures.

High intensity focalized ultrasound (HIFU) was conceived long ago and also applied to the venous system⁵². Recently, a new trans-dermal ultrasound and thermal technology has been made available in phlebology, which probably will add new possibilities for conservative treatments due to its focal effect, either by closing or, alternatively, shrinking the affected veins.

Modern looking technologies are strongly stimulating motivations both for physicians and patients but sometimes they seem to complicate simpler actions instead of offering solutions. In fact, a mini-surgical echo guided approach (local anesthesia, 3 mm incision, ligation and division, immediate ambulation) could be often more convenient for GSV groin pre terminal interruption as far as costs, machinery, setting and learning curve are concerned⁵³

Endnotes

[I] Passariello F. The II Hemodynamic Conference. American Foundation of Phlebology, Phoenix (AZ, USA), 2009.

[II] Passariello F. Venous Hemodynamics. American College of Phlebology, Palm Desert CA, USA), 2009.

[III] Passariello F. Office Based (OB) C.H.I.V.A. XI AECH, (Asociación Europea de CHIVA), Puerto Madryn, Argentina, 2010.

References

- 1) Myers TT, Cooley JC. Varicose vein surgery in the management of the post phlebitis limb. *Surg Gynecol Obstet* 99: 733-744 1954
- 2) Bergan JJ, Goldman MP. Varicose veins and telangiectasias. Ch 8. Quality Medical Publishing, Inc. St Louis, Missouri 1993
- 3) Foote RR. Varicose veins. Ch 2. ed.2 London: Butterworth 1954
- 4) Rivlin S. The surgical cure of primary varicose veins. *Br. J. Surg.* 1975; 62: 913-17. DOI: [10.1002/bjs.1800621114](https://doi.org/10.1002/bjs.1800621114)
- 5) Munn SR, Morton JB, Macbeth WAAG, Mcleish AG To strip or not to strip the long saphenous vein? A varicose veins trial *Br. J. Surg.* Vol. 68 (1981) 426-428
- 6) Negus D. Should the incompetent saphenous vein be stripped to the ankle? *Phlebology* 1986 1, 33-35 DOI: [10.1177/026835558600100108](https://doi.org/10.1177/026835558600100108)
- 7) MacFerlane R, Goodwin RJ, Barabas AP. Are varicose veins and coronary artery bypass surgery compatible? *Lancet* 1985;2:859 DOI: [10.1016/S0140-6736\(85\)90125-4](https://doi.org/10.1016/S0140-6736(85)90125-4)
- 8) Large J. A conflict in vascular surgery. *Aust. N. Z. J. Surg.* 1985, 55, 373-376 DOI: [10.1111/j.1445-2197.1985.tb00903.x](https://doi.org/10.1111/j.1445-2197.1985.tb00903.x)
- 9) Seeger JM, Schmidt JH, Flynn TC. Pre-operative saphenous and cephalic vein mapping as an adjunct to reconstructive arterial surgery. *Ann Surg* 1987;205:733-7 DOI: [10.1097/0000658-198706000-00016](https://doi.org/10.1097/0000658-198706000-00016)
- 10) Jessup, G., Lane, R. Repair of incompetent venous valves: a new technique. *Journal of vascular surgery*, 1988; 8 5, 569-75 DOI: [10.1016/0741-5214\(88\)90307-2](https://doi.org/10.1016/0741-5214(88)90307-2)
- 11) Corcos L., Zamboni P., Liboni A.: External valvuloplasty of the s-f junction in early varicose veins of the lower limbs. *Phlebologie — Phlebology* 89 , ed. by Davy A, Stemmer R, Paris: Libbey, 1989, pp 1025-1027
- 12) Mühlberger D, Brenner E, Frings N, Geier B, Mumme A, Reich-Schupke S, Steffen HP, Stenger D, Stücker M, Hummel T. Functional repair of the great saphenous vein by external valvuloplasty reduces the vein's diameter: 6-month results of a multicentre study. *J Int Med Res.* 2021 May;49(5) DOI: [10.1177/03000605211014364](https://doi.org/10.1177/03000605211014364)
- 13) Hammarsten J, Pedersen P, Cederlund CG, Campanello M. Long saphenous vein saving surgery for varicose veins: a long-term follow-up. *Eur J Vasc Surg* 1990;4:361-4 DOI: [10.1016/s0950-821x\(05\)80867-9](https://doi.org/10.1016/s0950-821x(05)80867-9).
- 14) McMullin GM, Coleridge Smith PD, Scurr JH. Objective assessment of high ligation without stripping the long saphenous vein. *Br J Surg* 1991;78:1139-42 DOI: [10.1002/bjs.1800780934](https://doi.org/10.1002/bjs.1800780934).
- 15) Mellièrè D, Cales B, Martin-Jonathan C, Schadeck M. [Necessity of reconciling the objectives of the treatment of varices and arterial surgery. Practical consequences] *Journal des Maladies Vasculaires.* 1991 ;16(2):171-178
- 16) Mellièrè D. Why and when to preserve the saphenous veins of varicose patients to serve as an arterial bypass? [J Mal Vasc. 1994
- 17) Fligelstone L, Carolan G, Pugh N, Shandall A, Lane I. An assessment of the long saphenous vein for potential use as a vascular conduit after varicose vein surgery. *Journal of Vascular Surgery.* 1993 Nov;18(5):836-840. DOI: [10.1067/mva.1993.44789](https://doi.org/10.1067/mva.1993.44789)
- 18) Fligelstone LJ, Salaman RA, Oshodi TO, Wright I, Pugh N, Shandall AA, Lane IF. Flush saphenofemoral ligation and multiple

stab phlebectomy preserve a useful greater saphenous vein four years after surgery. *J Vasc Surg.* 1995 Nov;22(5):588-92. DOI: [10.1016/S0741-5214\(95\)70044-7](https://doi.org/10.1016/S0741-5214(95)70044-7)

19) Franceschi C. Théorie et pratique de la cure Conservatrice et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire. Precy-sous-Thil, France: Editions de l'Armançon; 1988

20) S Ricci - Ambulatory Phlebectomy: sixty-year-old but still looking great. *JTA VR* 2022;7(2) DOI: [10.24019/jtavvr.138](https://doi.org/10.24019/jtavvr.138)

21) Cappelli M, Molino Lova R, Ermini S, Turchi A, Bono G, Franceschi C. Comparison between the CHIVA cure and stripping in the treatment of varicose veins of the legs: follow-up of 3 years. *J Mal Vasc.* 1996;21:40–6 DOI: [10.1007/s100169910064](https://doi.org/10.1007/s100169910064)

22) Zamboni P, Marcellino MG, Cappelli M, Feo CV, Bresadola V, Vasquez G, Liboni A. Saphenous vein sparing surgery: principles, techniques and results. *J Cardiovasc Surg.* 1998;39:151–62

23) Maeso J, Juan J, Escribano J, Allegue NM, Di Matteo A, Gonzalez E, Matas M. Comparison of clinical outcome of stripping and CHIVA for treatment of varicose veins in the lower extremities. *Ann Vasc Surg.* 2001;15:661–5 DOI: [10.1007/s10016-001-0009-8](https://doi.org/10.1007/s10016-001-0009-8)

24) Cappelli M, Molino Lova R, Ermini S, Turchi A, Bono G, Bahnini A, Franceschi C. Ambulatory conservative hemodynamic management of varicose veins: critical analysis of results at 3 years. *Ann Vasc Surg.* 2000;14:376–84 DOI: [10.1007/S100169910064](https://doi.org/10.1007/S100169910064)

25) Zamboni P, Cisno C, Marchetti F, Quaglio D, Mazza P, Liboni A. Reflux elimination without any ablation or disconnection of the saphenous vein. A haemodynamic model for venous surgery. *Eur J Vasc Endovasc Surg.* 2001;21(4):361–9 DOI: [10.1053/EJVS.2001.1338](https://doi.org/10.1053/EJVS.2001.1338)

26) Zamboni P, Cisno C, Marchetti F, Mazza P, Fogato L, Carandina S, De Palma M, Liboni A. Minimally invasive surgical management of primary venous ulcers vs. compression treatment: a randomized clinical trial. *Eur J Vasc Endovasc Surg.* 2003;25(4):313–8. Erratum in: *Eur J Vasc Endovasc Surg.* 2003;26(3):337–8 DOI: [10.1053/ejvs.2002.1871](https://doi.org/10.1053/ejvs.2002.1871)

27) Iborra-Ortega E, Barjau-Urrea E, Vila-Coll R, Ballón-Carazas H, Cairols-Castellote MA. Estudio comparativo de dos técnicas quirúrgicas en el tratamiento de las varices de las extremidades inferiores: resultados tras cinco años de seguimiento. *Angiología.* 2006;58(6):459-68. DOI: [10.1016/S0003-3170\(06\)75009-X](https://doi.org/10.1016/S0003-3170(06)75009-X)

28) Carandina S, Mari C, De Palma M, Marcellino MG, Cisno C, Legnaro A, Liboni A, Zamboni P. Varicose vein stripping vs haemodynamic correction (CHIVA): a long term randomised trial. *Eur J Vasc Endovasc Surg.* 2008;35(2):230–7. Epub 2007 Oct 26 DOI: [10.1016/J.EJVS.2007.09.011](https://doi.org/10.1016/J.EJVS.2007.09.011)

29) Pares O, Juan J, Tellez R, Mata A, Moreno C, Quer FX. Varicose vein surgery: stripping vs. the CHIVA method. A randomized controlled trial. *Ann Vasc Surg.* 2010;251:624–31 DOI: [10.1097/SLA.0b013e3181d0d0a3](https://doi.org/10.1097/SLA.0b013e3181d0d0a3)

30) Zamboni P, Giancesini S, Menegatti E, Tacconi G, Palazzo A, Liboni A. Great saphenous varicose vein surgery without saphenofemoral junction disconnection. *Br J Surg.* 2010;97(6):820–5 DOI: [10.1002/bjs.7022](https://doi.org/10.1002/bjs.7022)

31) Bellmunt-Montoya S, Escribano JM, Dilme J, Martinez-Zapata MJ. CHIVA method for the treatment of chronic venous insufficiency. *Cochrane Database Syst Rev.* 2013;(7):CD009648. DOI: [10.1002/14651858.CD009648.pub2](https://doi.org/10.1002/14651858.CD009648.pub2)

32) Bellmunt-Montoya S, Escribano JM, Dilme J, Martinez-Zapata MJ. CHIVA method for the treatment of chronic venous insufficiency. *Cochrane Database Syst Rev.* 2015;(6) DOI: [10.1002/14651858.CD009648.pub3](https://doi.org/10.1002/14651858.CD009648.pub3)

33) Pittaluga P, Chastanet S, Réa B, Barbe R. Midterm results of the surgical treatment of varices by phlebectomy with conservation of a refluxing saphenous vein. *J Vasc Surg.* 2009;50:107–18 DOI: [10.1016/j.jvs.2008.12.067](https://doi.org/10.1016/j.jvs.2008.12.067).

34) Pittaluga P, 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)

35) Navarro L, Min R, Boné C. Endovenous laser: a new minimally invasive method of treatment of varicose veins - Preliminary observations using an 810 nm diode laser. *Dermatol Surg.* 2001;27:117-22. DOI: [10.1046/j.1524-4725.2001.00134.x](https://doi.org/10.1046/j.1524-4725.2001.00134.x).

36) Merchant R.F.DePalma R.G.Kabnick L.S.Endovascular obliteration of saphenous reflux. *J Vasc Surg.* 2001; 35: 1190-1196 DOI: [10.1067/MVA.2002.124231](https://doi.org/10.1067/MVA.2002.124231)

37) Cabrera J, Cabrera Garcia Olmedo JR.Nuevo método de esclerosis en las varices tronculares. *Patol Vasc* 1995;4:55-73.

38) Passariello F. Office Based CHIVA (OB Chiva). *Acta Phlebol* 2011;12:26-7

39) Passariello F, Ermini S, Cappelli M, Delfrate R, Franceschi C. The office based CHIVA. *Journal of Vascular Diagnostics* 2013;1:13-20 DOI: [10.2147/JVD.S49637](https://doi.org/10.2147/JVD.S49637)

40) Ricci, S. (2013). Comment to: The office based CHIVA, by Passariello F, Ermini S, Cappelli M, Delfrate R, Franceschi C. *J Vasc Diagnostics* 2013;1:13-20. Comment and answers of the Authors. *Veins and Lymphatics*, 2(1), 11. DOI: [10.4081/ByblioLab.2013.11](https://doi.org/10.4081/ByblioLab.2013.11)

41) Passariello F, Gammuto P. Office based CHIVA: A conceptual variation of CHIVA. The OB CHIVA survey. *Reviews in Vascular Medicine.* 2014;2(4):123-6. DOI: [10.1016/j.rvm.2014.07.003](https://doi.org/10.1016/j.rvm.2014.07.003).

42) OB CHIVA. An open access VLAB multicenter research protocol. Available since Nov 19th, 2013. DOI: [10.24019/2013.OBCHIVA](https://doi.org/10.24019/2013.OBCHIVA)

43) Giancesini S et al., Short endovenous laser ablation of the great saphenous vein in a modified CHIVA strategy. *Veins and Lymphatics* 2013; volume 2:e21, pag 76 DOI: [10.4081/VL.2013.E21](https://doi.org/10.4081/VL.2013.E21)

44) Giancesini S, Menegatti E, Occhionorelli S, Grazia Sibilla M, Mucignat M, Zamboni P. Segmental saphenous ablation for chronic venous disease treatment. *Phlebology.* 2021;36(1):63-69. DOI: [10.1177/0268355520946238](https://doi.org/10.1177/0268355520946238)

45) Mendoza E, Amsler F. CHIVA with endoluminal procedures: LASER versus VNUS – treatment of the saphenofemoral junction. *Phlebologie.* 2017;46:5–12 DOI: [10.12687/PHLEB2346-1-2017](https://doi.org/10.12687/PHLEB2346-1-2017)

46) Ferracani E. Internal laser valvuloplasty and venous remodeling using 1470laser. Initial experience. *Flebologia. Sociedad Argentina de flebología y linfología.* 2013;3:39-40.

47) Ferracani E. Saphenous sparing laser modern options. *Veins Lymphat.* 2013;2:e21.

48) Giancesini S. Reply to: Saphenous sparing laser modern options. *Veins Lymphat.* 2013; 2:e21.

49) Ferracani E, Bercovich J and Schulte C. Great saphenous vein remodeling using LASER with low-energy linear endovenous energy density, no tumescence, and associated surgical techniques. *J Phlebol Lymphol* Vol.11 No.1 2018

50) Castagnoli S, Bernardini E, Genovese G. Conservative hemodynamic sclerosis (ESEC) of large truncular varices. *Int Angiol* 2001;20 Abstract; (suppl. 1)

51) Bernardini E, Piccioli R, De Rango P, Bisacci C, Pagliuca V, Bisacci R. Echo-Sclerosis Hemodynamic Conservative: A New

Technique for Varicose Vein Treatment. *Ann Vasc Surg* 2007; 21: 535-543 DOI: [10.1016/j.avsg.2007.03.017](https://doi.org/10.1016/j.avsg.2007.03.017)

52) Schultz-Haakh H, K Li J, Welkowitz W, Rosenberg N. Ultrasonic treatment of varicose veins *Angiology* - 1989 Feb;40(2):129-37. DOI: [10.1177/000331978904000208](https://doi.org/10.1177/000331978904000208)

53) Ricci S, Moro L, Antonelli Incalzi R. Ultrasound assisted great saphenous vein ligation and division: an office procedure. *Veins and Lymphatics*. 2014 Oct 16;3(2). DOI: [10.4081/vl.2014.4428](https://doi.org/10.4081/vl.2014.4428)