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Vascular Research

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**A Journal on Research  
in Vascular Diseases**

**The Official Journal of the Vasculab Foundation**

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# 1

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## **Journal of Theoretical and Applied Vascular Research**

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False image of the *Mauro Bartolo's* painting *Pietas for the saphenous veins*, courtesy of *Giuseppe Calandra*.

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## Editorial Lines

### Non-animal experiments

Many scientific journals deal with animal experiments, but just a few of them face the hard problem of animal replacing or sacrifice/suffer reducing or minimizing, together with the related ethical and legal topics.

Since the 1<sup>st</sup> issue, the Journal of Theoretical and Applied Vascular Research (JTAVR) hosted papers devoted to the methodology for non-animal experiments. JTAVR is open to the discussion about the controversies inside the community of biomedical researchers, i.e. between people who use animals as an unavoidable experimental tool and others which on the contrary point to different research methods.

However, a-priori positions pro or contra total animal replacement in biomedical research do not correspond at all to reality, because the solution is anchored to the ground, it is context dependent and is hidden behind a detailed study of the experiments, aimed to provide a reliable response.

An answer which must not be black or white and must consider instead any involved methodological detail. In addition, there is the strong hope that many actions which were never done will be successful instead in the next future. For instance, consider the unexpected new frontier which in the last years turned up in the field of the organ-on-a-chip technology as well as in research about organoids, spheroids and bio-reactors.

Maybe, not so far in the future, this contra opposition will be seen just as a nonsense.

### History and Philosophy of Science

JTAVR is an interdisciplinary journal actively engaged in fostering an integrative approach to the understanding of medical and biomedical sciences **among its practitioners and the general public**.

Besides promoting research in a highly specific medical areas, the current section of the journal welcomes submissions from scholars active in different fields of **science studies** including history, philosophy, sociology of science and bioethics.

Articles are expected to address themes in biological and medical sciences from a variety of disciplinary and methodological perspectives.

Submissions which fall in one of the following areas are particularly encouraged:

- Historical research on biological theories and practices with particular focus on aspects which show a link to medical research and its applications;
- Historical and sociological accounts of medical and biomedical theories and practices;
- Philosophical or ethical discussions on medical and biomedical topics;
- Book reviews that fall within area of remit.

### Basic Sciences, Biology and Medicine

The Journal of Theoretical and Applied Vascular Research (JTAVR) aims at gathering contributes to vascular research, coming from biology, medicine, surgery and basic sciences like physics, fluid dynamics and bioengineering as well as biochemistry and genetics.

A special attention is given to the cultural aspects behind medical daily work, like experimental designs, models, epistemology, philosophy and history.

This inter-disciplinary approach uses a wider eye/chakra, placing side by side topics which generally could never go together in medical journals, with the hope that it will succeed in producing new interesting fruits in research.

### Editor

Fondazione Vasculab impresa sociale ONLUS, Via Francesco Cilea, 280 - 80127 Napoli - Tel/Fax +39 081 7144110 - jtavr@vasculab.eu - <https://doi.org/10.24019/issn.2532-0831>



The Journal of Theoretical and Applied Vascular Research (JTAVR) publishes scientific papers on vascular diseases, biological research, history and philosophy of science.



Manuscripts are expected to comply with the instructions to authors which conform to the Uniform Requirements for Manuscripts Submitted to Biomedical Editors by the International Committee of Medical Journal Editors ([www.icmje.org/](http://www.icmje.org/)).

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The journal adheres to the principles of the Helsinki Declaration (<http://history.nih.gov/research/downloads/helsinki.pdf>) about research concerning human beings and to the International Guiding Principles for Biomedical Research Involving Animals ([http://cioms.ch/publications/guidelines/1985\\_texts\\_of\\_guidelines.htm](http://cioms.ch/publications/guidelines/1985_texts_of_guidelines.htm)) recommended by the WHO. In addition, the journal strongly supports alternative non-animal experiments, in order to Replace, Reduce and Refine (3Rs) animal experimental designs.

For complete information about publication terms please contact the Editorial Office of JTAVR, Fondazione Vasculab impresa sociale ONLUS, via Francesco Cilea 280 Italy - Phone +39-081-7144110 - E-mail: [jtavr@vasculab.eu](mailto:jtavr@vasculab.eu).

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#### References

- Only cited references can be included in the bibliography. They must be numbered in Arabic numerals, in the exact sequence as they are firstly cited (example: "1").

- Bibliographical entries in the text should be quoted using superscripted Arabic numerals (cited as<sup>1</sup>).

- References must be set out in the standard format approved by the International Committee of Medical Journal Editors (ICMJE), as described in the document Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals <http://www.icmje.org/icmje-recommendations.pdf>.

A simplified but comprehensive list is given in [www.nlm.nih.gov/bsd/uniform\\_requirements.html](http://www.nlm.nih.gov/bsd/uniform_requirements.html).

### Citation examples

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List the first six authors followed by et al.

Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. *N Engl J Med*. 2002 Jul 25;347(4):284-7.

As an option, if a journal carries continuous pagination throughout a volume (as many medical journals do) the month and issue number may be omitted.

Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. *N Engl J Med*. 2002;347:284-7.

## Books and Monographs

### Author(s) and editor(s)

Breedlove GK, Schorfheide AM. Adolescent pregnancy. 2nd ed. Wiecek RR, editor. White Plains (NY): March of Dimes Education Services; 2001.

### Chapter in a book

Meltzer PS, Kallioniemi A, Trent JM. Chromosome alterations in human solid tumors. In: Vogelstein B, Kinzler KW, editors. The genetic basis of human cancer. New York: McGraw-Hill; 2002. p. 93-113.

## Electronic materials

### Homepage/Web site

Cancer-Pain.org [Internet]. New York: Association of Cancer Online Resources, Inc.; c2000-01 [updated 2002 May 16; cited 2002 Jul 9]. Available from: <http://www.cancer-pain.org/>.

### Vasculab mailing list

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## File of tables

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Each figure should be submitted as a separate file. Formats accepted: JPEG set at 300 dpi resolution preferred; other formats accepted are TIFF and PNG. Figures should be numbered in Arabic numerals and accompanied by the relevant title. Figures should be referenced in the text sequentially.

Histological photographs should always be accompanied by the magnification ratio and the staining method.

## Color illustrations

Open Access papers appear electronically. As no printed issues of JTAVR are produced there are NO additional charges for color illustrations.

However consider that many people will print them in black and white. Thus for a better result in communicating your data, test also the black and white printing when choosing colors.

# SAPHENOUS SPARING TREATMENTS

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## PART 1

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### Project plan

The Project is planned in two parts, which will appear in two separate issues of the Magazine.

### Project Editor

Stefano Ricci

### Authors of Part 1

Giuseppe Calandra, Daniele Camilli, Sante Camilli, Massimo Cappelli, Paolo Casoni, Claude Franceschi, Raffaele Molino Lova, Emanuele Nanni, Mauro Pinelli, Matteo Pizzamiglio, Cestmir Recek, Stefano Ricci





# 1<sup>st</sup> International CHIVA Course

Split

27<sup>th</sup> May 2023.

hotel Briig

Lower limb chronic venous  
insufficiency:

Physiopathology

CHIVA hemodynamic strategy

Surgical technique

REGISTRATION LINK:

[https://forms.gle/](https://forms.gle/K37dvB4xDz6PBWAv8)

[K37dvB4xDz6PBWAv8](https://forms.gle/K37dvB4xDz6PBWAv8)

## General information:

27<sup>th</sup> May 2023. Split, Croatia  
Hotel Briig (Prilaz braće Kaliterna 1)

Meeting is intended for:

- Vascular surgeons
- Vascular surgery residents
- Angioradiologists
- Angiologists
- General practitioners
- Students of medical university

Objective of meeting:

to expand CHIVA principles of hemodynamic diagnostic and treatment of venous pathology regarding ethical and objective scientific research.

CHIVA meeting is organized by:

Croatian Society of Vascular Surgery (HDVK)  
University hospital Split (KBC Split)

with the support of:

*Vasculab Foundation*  
*AIFEM*

Registration fee:

50 € (students – no fee)

Registration link:

<https://forms.gle/K37dvB4xDz6PBWAv8>

Dinner @ 19<sup>30</sup>

all participants are welcome

Accommodation partners:

Heritage hotel Fermai  
Residence Stine  
Hotel Briig



KBC Split



# Saphenous sparing treatments and reuse of saphenous veins. How, When, Where, Why

## Invitation letter

**S Ricci<sup>1</sup>**

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submitted: Oct 10, 2022, accepted: Oct 22, 2022, Epub Ahead of Print: Oct 28, 2022, published: Apr 30, 2023  
Conflict of interest: None

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Dear Colleagues and Friends,

Reading the literature in phlebological magazines, it seems as if most experts of Chronic venous insufficiency consider the Great Saphenous Vein (GSV) as an organ without any utility and, even more, the cause of the disease.

However, although involved by the reflux passage, GSV is not cause of the pathology. Historically, it has been easier to strip it (or to cook it, to shrink it, to glue it, to freeze it) instead of trying to heal it. The thorough study of hemodynamics by Doppler and Duplex changed the perspective over the GSV, i.e. it changed from being the cause of the incompetence to become the main way for the reflux to run out.

I was invited by the Chief Editor of JTAVR (Journal of Theoretical and Applied Vascular Research) to plan the Project "Saphenous sparing treatments and reuse of saphenous veins. How, When, Where, Why.", combining different points of view about "Saphenous sparing", which is a controversial topic, but it is as well so actively sustained by several Authors.

I invite You to participate with a contribute of your own and of your collaborators (a short review, an original article, a clinical case, a commented image).

In case You write a short review, You could comply with my (not strict) editorial suggestion, following these non-mandatory basic points:

- How (strategy and technical method to achieve saphenous sparing)
- When (in which cases the goal is possible/impossible/inappropriate)
- Where (in hospital or in office; privately or in the public service)
- Why (the rationale and the importance of sparing)
- What for (substitute as a bypass or anything else)
- How the patient should be informed
- What then (expected results, 2- 5 years outcome, recurrences, solutions)

The technical details of your participation will be included in an accompanying message of the JTAVR Secretariat.

I hope You will participate to this JTAVR Project and, together with the JTAVR editorial team, I am looking forward to receive your confirming answer.

My best regards

**Prof. Stefano Ricci**

**Project Editor**

**"Saphenous sparing treatments and reuse of saphenous veins" JTAVR Project**





# The painting of Mauro Bartolo: ‘Pietas for the saphenous veins’, too many saphenous ablations in the days of academic stripping

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**Abstract** Prof. Bartolo, significant figure of Italian Angiology during the last decades of the XX century and founder of a Roman School of Angiology, was always sceptic about the surgical treatment of varicose veins. The modalities of stripping and its results were not a satisfactory surgical solution of the disease, from a clinical, aesthetic, social and finally economic point of view. Prof. Bartolo preferred conservative treatment in most cases, suggesting to give more space to minimally invasive treatments such as CHIVA, phlebectomy, sclerotherapy with the aim of achieving saphenous sparing and thus paving the way to the cultural foundation of modern phlebology. The current paper contains the translation and reprint of an *Editorial* of Prof. Bartolo about saphenous sparing treatments.

**Keywords** Mauro Bartolo, Saphenous sparing, saphenous ablation, alternatives to saphenous ablation, CHIVA

Prof. Mauro Bartolo<sup>†</sup> (1927-2008) was one of the reference figures of Italian Angiology during the last decades of the XX century and founder of the Italian Society of Vascular Pathology (SIPV). He was Emeritus Chief of the Angiology Department, S Camillo Hospital, Rome, Italy.

He was a humanist doctor with a deep passion for angiology, a passion that he transferred to his numerous

students, but he was also a man with a versatile mind. He was an artist and author of numerous paintings, writer of books on the most varied topics<sup>1-3</sup>, enthusiastic pilot of light aircraft.

Prof. Bartolo with his typical subtle irony loved to indicate phlebology as "The Cinderella" of angiology because it was considered a minor scientific branch and its issues were dealt with superficiality and little or no research in pathophysiology and venous hemodynamics.

Prof. Bartolo continued the studies of Prof. Mario Condorelli on the venous pathophysiology and Bartolo's method of non-invasive measurement of venous pressure is still famous<sup>4</sup>.

During his activity as a doctor, Prof. Bartolo always offered a conservative treatment to his phlebopathic patients, not only for his profound research and respect for the clinical compensatory capabilities of venous diseases but also because in those days traditional venous surgery was not so satisfactory, due to the frequent recurrences and the undesired aesthetic damages.

In his "The Notebook of Phlebology" (Il Quaderno di Flebologia, 2002), he wrote an *Editorial* titled "Too many saphenectomies?", concerning a symposium held during the XXVI Congress of French College of Vascular Pathology (Paris). In the *Editorial* he best expressed his idea of saving the saphenous veins<sup>5</sup> (Fig. 1).

# Editoriale

## In margine al congresso del collegio francese di patologia vascolare di Parigi Troppe Safenectomie?

*Si è svolto anche quest'anno il congresso del Collegio Francese di Patologia Vascolare. Si tratta di un appuntamento abituale, nel corso del quale si fa il punto su molti problemi angiologici. Il discorso non è mai stantio, ed anche i vecchi argomenti sono ripresi con un taglio sempre diverso e spesso dissacrante.*

*Nell'ambito di una siffatta atmosfera si è svolto anche un simposio che potrebbe essere intitolato, da una relazione svolta da Mellièrre, "Pietà per le safene". Un titolo così ambiguo sta a significare l'eccesso di interventismo che vi è su queste vene. Ma non solo di un problema di corretta diagnosi si tratta, o di indicazioni terapeutiche: si tratta di non distruggere un patrimonio di vene che potrebbero essere utili per eventuali by pass coronarici od anche periferici.*

*Con i moderni metodi di studio delle coronarie e dei vasi degli arti le indicazioni al by pass sono molto aumentate e la necessità di reperire il materiale sostitutivo può sorgere da un momento all'altro. In effetti il ricorso alle protesi artificiali ha grandemente deluso e pertanto si tende, appena possibile, ad impiegare materiale autologo, ed in particolare safenico, che permette più lunga durata e permeabilità.*

*Ma si deve dunque restare con una insufficienza venosa e con i relativi fastidiosi sintomi ortostatici aspettando che serva un by pass per il cuore o per le cosce? No, non era questo il senso del messaggio. Il senso era di cercare vie alternative, ad esempio la crossectomia, lasciando in situ la safena, oppure impiegare quella tecnica che recentemente è stata proposta proprio con la finalità di risparmiare materiale per una eventuale riutilizzazione, la CHIVA. In definitiva questo metodo, sempre di conio francese, ha percorso i tempi e il grido di allarme che quest'anno è venuto dal Collegio Francese di Patologia Vascolare. Oppure si può riprendere in considerazione la vecchia e gloriosa scleroterapia di alcuni segmenti venosi, forse troppo affrettatamente messa da parte in questi ultimi anni, si può potenziare l'impiego di una tecnica ideata da Muller, ossia la cosiddetta flebectomia ambulatoriale, che si limiti però a piccole vene.*

*Tutte queste metodiche sono state messe a confronto nel corso di un incontro tra una dozzina di specialisti, angiologi e chirurghi vascolari, cui sono stati proposti una trentina di casi pratici per i quali gli esperti sono stati invitati a indicare estemporaneamente un trattamento; ne è venuto fuori un quadro assai variegato di esperienze. Anche il pubblico, poi, aveva un congegno elettronico per poter dire la sua. Per ciascun caso, perciò, si aveva su di una lavagna elettronica sia l'opinione dei dodici angiologi e chirurghi vascolari prescelti che quella di tutti i presenti. Un modello da imitare per vivacizzare i convegni e soprattutto saggiare la preparazione clinica di molti soloni.*

*Il messaggio sul risparmio delle safene è stato ampiamente recepito: si tratta insomma di operare meno le vene per potere operare di più, e con maggior garanzia, le arterie. Soprattutto, nel caso della necessità di asportazione della safena, si invita a studiare anche le arterie, l'assetto lipidico del paziente e gli altri fattori di rischio arterioso quali il tabagismo, il diabete, l'ipertensione, la familiarità: in caso di positività di questi parametri considerare l'ipotesi che un giorno la safena che stiamo portando via possa servire a salvare un cuore o una gamba.*

**Mauro Bartolo**

Figure 1 - Prof. Mauro Bartolo's Editorial in "Quaderno della Flebologia", courtesy of Servier Italia (Italian language, English translation in the text).





Figure 2 - "Pietas for the saphenous veins", the Mauro Bartolo's painting. Personal collection of Giuseppe Calandra.



## On the sidelines of the congress of the French College of Vascular Pathology in Paris 2002

### Too many saphenectomies?

This year too the congress of the French College of Vascular Pathology was held. It is a regular appointment, during which many angiological problems are analysed. The speech is never stale, and even the old topics are taken up with an ever-changing and often irreverent cut.

In the context of such an atmosphere, a symposium was also held, which could be entitled, from a report by Mellièrè, 'Pietas for the saphenous veins'. Such an ambiguous title signifies the excess of interventism that is done on these veins. But it is not just a problem of correct diagnosis, or therapeutic indications: it is a matter of not destroying a patrimony of veins that could be useful for coronary or even peripheral bypasses.

With modern methods of study of the coronary arteries and vessels of the limbs the indications to the bypass are very increased and the need to find replacement material may arise at any moment. In fact, the use of artificial prostheses has been greatly disappointing and therefore as soon as possible, the tendency is to use autologous material, and in particular saphenous veins, which allows longer life and permeability.

Venous insufficiency must therefore left out with the related annoying orthostatic symptoms waiting for a bypass for the heart or thighs? No, that was not the point of the message. The point is to look for alternative routes, for example crossectomy, leaving the saphenous vein in situ, or alternatively to adopt that technique recently proposed precisely with the aim of saving material for possible reuse, the CHIVA. Ultimately this method, French in origin, has anticipated the times and has inspired the cry of alarm that this year came from the College French of Vascular pathology. Or you can reconsider the old and glorious sclerotherapy of some venous segments, perhaps too hastily put aside in recent years; or you can strengthen the use of a technique devised by Muller, namely the so-called Ambulatory Phlebectomy, however, limited to small veins.

### References

- 1) Mauro Bartolo. "una Cina due medicine" Armando Editore 1983
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- 3) Mauro Bartolo. "Un figlio per cinque giorni" Città Nuova Editrice 1987
- 4) Bartolo M, Nicosia PM, Antignani PL, Raffi S, Ricci S, Marchetti M, Pittorino L. Non Invasive Venous Pressure Measurements

All these methods were compared in a meeting between a dozen specialists, angiologists and vascular surgeons: about thirty practical cases have been proposed for which experts have been asked to indicate treatment extemporaneously; very varied experiences resulted. Even the audience, then, had an electronic device to allow individual comments. Each case, therefore, had on an electronic whiteboard both the opinion of the twelve angiologists and vascular surgeons invited and that of the audience. A model to imitate to liven up conferences and especially to test the clinical preparation of many "Solons".

The message on saphenous sparing has been widely received: in short, it is a question of operating the veins in a way to be able to operate more, and with greater guarantee, the arteries. Especially, in the case of necessity of removal of the saphenous vein, it is suggested to study also the arteries, the lipids condition of the patient and others arterial risk factors such as smoking, diabetes, hypertension, family history: in case of positivity of these parameters let consider the hypothesis that one day the saphenous that we are taking away can save a heart or a leg.

### Mauro Bartolo

Modern phlebology is based on minimally invasive techniques, less or no demolition than in the past; it often offers the saving of the saphenous axis, but guys excited by trunk thermal ablation are still many.

Today the saphenous veins can be treated focally and a new hemodynamic compensation can be developed with a few simple surgical or endovascular gestures. Bartolo's message on saving the saphenous veins was ahead of its time and laid a cultural basis for modern phlebology.

Prof. Mauro Bartolo was my primary mentor. In his memory I used one of his paintings (Fig 2) - that I titled "Pietas for the saphenous veins" and I will always keep jealously - during a congress presentation about saphenous anatomical variations in 2009 in Scanno (Italy)<sup>6</sup>.

in Different Venous Diseases. Angiology 1983, 34, 717 - 723. DOI: [10.1177/0003319783034011055](https://doi.org/10.1177/0003319783034011055).

5) Il Quaderno della Flebologia - N. 22 - 2002 I.F.B. Stroder srl-Firenze

6) Calandra G. Saphenous-femoral junction. Anatomical variations. Giornate Angiologiche Scannesi. Scanno (Italy), 2009.

# Saphenous sparing evolution

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**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 Myers<sup>1</sup> helped by newly designed, long, flexible strippers that pleated up the vein along its length<sup>2</sup>. Just for understanding the enthusiasm of veins surgeons of the time, in 1954 Foote's "Varicose Veins" book<sup>3</sup>, 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, Rivlin<sup>4</sup> 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".

Mumm<sup>5</sup> 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 journal<sup>6</sup> 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 1985<sup>7</sup> 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 Large<sup>8</sup> 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 salvage<sup>9</sup>.

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 eighties<sup>10</sup> and 1989<sup>11</sup> 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 attention<sup>12</sup>. 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.<sup>13</sup>, 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 recurrence<sup>14</sup>.

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, crossectomy or CHIVA) in case of major reflux<sup>15</sup>. Approximately 80% of the GSV veins in patients consulting for varicosities are normal, slightly dilated or simply have one or more minor areas of dilatation<sup>16</sup>.

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  $4.0 \pm 0.1$  mm at 12 months control<sup>17</sup>.

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 cm<sup>18</sup>.

It is in this scientific cultural background that the Franceschi "experience" begins<sup>19</sup> 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”<sup>20</sup>. 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 treatment<sup>21-30</sup>, 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 teams<sup>21-30</sup>.

Analysis of these publications led to two revisions of a Cochrane systematic review in 2013 and 2015 by Bellmont-Montoya’s team<sup>31, 32</sup>.

Concurrently in 2009 a simplified saphenous sparing strategy appeared under the name of ASVAL (Ambulatory Selective Varicose veins Ablation under Local anaesthesia)<sup>33</sup> 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-operation<sup>34</sup>.

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. Laser<sup>35</sup> and RF<sup>36</sup> thermal closure acquire immediate supporters under industrial boost, relative low Invasiveness, use in local anesthesia, possible office procedure. Foam<sup>37</sup>, 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<sup>[I, II]</sup> and in 2010 with N Morrison and T King<sup>[III]</sup>, 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 approach<sup>38</sup>, while in 2013 all the hemodynamic details were systematically defined in the OB-CHIVA (Office-Based CHIVA) protocol<sup>39-41</sup>. 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 presentations<sup>42</sup>.

In 2013 Giancesini<sup>43</sup> 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 Laser<sup>44</sup>. A similar experience was published in 2017 by Mendoza on 104 patients<sup>45</sup> with results comparable to those achieved after surgical crossectomy.

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 achieved<sup>46-49</sup>.

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 2001<sup>50</sup> and successively in 2007 Bernardini<sup>51</sup> 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 system<sup>52</sup>. 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 concerned<sup>53</sup>.

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# Diastolic compression device aimed at stopping refluxing flow

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**Abstract** Theoretical concept of a diastolic compression device is presented. The device could have a form of a pneumatic cuff or a rubber sleeve. Its objective is to exert external pressure below the knee, which would compress the great saphenous vein during the diastolic phase of the calf pump activity, and hinder thereby the saphenous reflux and the occurrence of ambulatory venous hypertension. Based on the results of venous pressure measurements, it is supposed that pressure of about 35 mm Hg would be able to fulfill this therapeutic aim. If tolerated and accepted by the patients, the device could offer, in addition to the current invasive methods and compression stocking therapy, a simple conservative, nonetheless effective treatment of primary varicose veins. It would keep the dividing line of the ambulatory pressure gradient below the knee, as is the case with healthy people, and prevent thereby the progression of the disease. In addition, this conservative method would preserve the great saphenous vein for possible use as a bypass graft in the future.

**Keywords** varicose veins; saphenous reflux; varicose vein recurrence; saphenous vein grafts; ambulatory pressure gradient

## Introduction

Saphenous reflux in varicose vein disease is responsible for the hemodynamic disturbance. Interruption of saphenous reflux removes the venous disorder and restores physiological decrease in pressure in lower leg veins<sup>1-3</sup>. The favorable effect of interruption of saphenous

reflux was demonstrated and published already 1895 by Perthes<sup>4</sup>: when the saphenous reflux was interrupted with a tourniquet, the bulged varicose veins emptied during calf pump activity. Inspired by this event, the idea emerged to convert the diagnostic Perthes test to a comfortable therapeutic method that would be efficient enough and acceptable to the patients.

## Diastolic compression device

The therapeutic methods used in the treatment of primary varicose veins target the elimination of saphenous reflux using crossectomy, stripping, endovenous ablations, and conservative methods. Apart from the invasive methods, a sheer conservative measure might produce the desired beneficial hemodynamic results: a compression device placed beneath the knee, aimed at hindering the diastolic refluxing flow in the great or small saphenous vein. This device must take into consideration two aspects: the intensity of the external pressure required for the elimination of refluxing flow, and whether the necessary pressure would be tolerated and accepted by the patients. Thus, the applied pressure must be reliably efficient and as low as possible.

Results gained from venous pressure measurements in deep and superficial veins of the lower extremity might help to find a solution<sup>5</sup>. Reflux arises during the diastolic phase, i.e. during calf muscle relaxation that follows muscle contraction. Thus, the value of the external compression must be a little higher than the diastolic pressure. In the quiet standing position, the hydrostatic pressure comes to about 85 mm Hg at the ankle and to about 60 mm Hg at the knee

level. During calf pump contraction, the systolic pressure in the posterior tibial vein increases by about 75 mm Hg over the hydrostatic pressure; this increase in pressure is transmitted in varicose vein patients in great part into the great saphenous vein (GSV). During calf muscle relaxation, the venous pressure decreases to about 25 mm Hg in the distal posterior tibial vein and to about 33 mm Hg in the GSV above the ankle. The diastolic pressure in the GSV at the knee level reached the value of  $21.6 \pm 6$  mm Hg after elimination of the GSV reflux by a tourniquet applied in the upper part of the thigh<sup>2</sup>. Theoretically, the external pressure of 35 mm Hg applied below the knee could be able to compress the GSV during the diastolic phase, to hinder the diastolic refluxing flow from the thigh saphenous system into deep lower leg veins, to impede the development of ambulatory venous hypertension, and to reinstall the physiological hemodynamic conditions similar to those in healthy people. The optimal value of the external pressure should be found out by direct pressure measurements; the clinical tests will decide if the opted external pressure would be tolerated by the varicose vein patients.

Although the diastolic compression device would impede the refluxing diastolic flow, contractions of the calf muscle pump would ensure, in spite of the diastolic compression, the physiological centripetal systolic flow toward the heart in the GSV. As mentioned above, calf muscle contraction increases the systolic pressure by about 75 mm Hg over the hydrostatic pressure; thus, it can be supposed that the diastolic compression device exerting pressure of about 35 mm Hg would not hinder the systolic centripetal flow and would not imperil the patency of the GSV.

The device could be made in the form of an inflatable pneumatic cuff or of a rubber sleeve, about 3 cm broad, perhaps with a bulge to specifically compress the trunk of the GSV. The optimal technical construction should be realized by the technicians engaged in the production of compression stockings. The advantage of this device is that the patient himself can easily verify if the compression is effective enough: the varicose veins must empty during calf pump activity.

A similar device has been proposed recently by S. Ricci<sup>6</sup>. Invited commentary to this article has been published in JTAVR<sup>7</sup>. Another device based on the impact of hydrostatic pressure is also conceivable<sup>8</sup>. It would consist of a small sleeve of plastic material. The sleeve is connected to a small-caliber, flat, incompressible, flexible tube reaching up to the axilla. If the whole device is filled with water and applied below the knee, it exhibits in the standing position hydrostatic pressure of about 60 mm Hg below the knee. Shortening the tube will lower the pressure. Another advantage would be that the pressure in the device

decreases in the sitting position and reaches near zero in the recumbent position.

### Keeping the dividing line of the ambulatory pressure gradient below the knee

Placing the device below the knee is well substantiated. This is exactly the area where all potentially incompetent, refluxing superficial veins must pass the small corridor, the bottleneck between the skin and the bones or muscles, and is therefore the ideal site where external compression can exert its optimal impact. In addition, there is another reason for the placing this device below the knee.

Here is situated the dividing line of the ambulatory pressure gradient<sup>2, 5</sup>. Simultaneous venous pressure measurements in the popliteal and posterior tibial veins performed during calf pump activity in **healthy people**<sup>5</sup> displayed very small systolic and diastolic pressure excursions in the popliteal vein. In spite of competent popliteal valves, the decrease in pressure in the popliteal vein was minimal, only 8 mm Hg; the pressure returned immediately to the initial starting value after the calf pump activity stopped. In contrast to that, there was a marked decrease in pressure of 53 mm Hg in the posterior tibial vein. The tip of the catheter in the posterior tibial vein was situated at the level of the greatest circumference of the calf, i.e. near the beginning of the popliteal vein. Hence, the dividing line of the ambulatory pressure gradient in healthy people must be at the junction of the posterior tibial vein with the popliteal vein. In varicose vein patients, the dividing line is translocated during calf pump activity into the thigh between the femoral vein and the incompetent saphenous system<sup>2</sup>. The translocation is induced by the drainage of venous blood from the incompetent thigh saphenous system into deep lower leg veins, and is the typical attribute of varicose vein disease<sup>9</sup>; it does not happen in healthy people.

Thus, placing the compression device beneath the knee would impede this refluxing flow and would keep the dividing line of the ambulatory pressure gradient below the knee, as is the case with healthy people; in this way, it would imitate or even restore the physiological hemodynamic conditions. Averting the translocation of the dividing line into the thigh will preclude the development of preconditions for further progressive deterioration of varicose vein disease. The run of events has been explained in more detail in other articles<sup>9, 10</sup>. This property of the diastolic compression device is a spectacular advantage in comparison with the invasive methods interrupting the saphenous reflux, after which the translocation of the dividing line occurs inevitably during calf pump activity and starts the process leading to recurrence; this phenomenon has been called hemodynamic paradox<sup>9</sup>. For this reason, the device could be a suitable therapeutic

supplement after reflux interruption, e.g. after crossectomy. Crossectomy supplemented by diastolic compression device would be the rational and effective therapeutic combination. It would induce the elimination of reflux and hemodynamic disturbance, and by keeping the dividing line of the ambulatory pressure gradient below the knee it could prevent or delay the formation of recurrent reflux and varicose vein recurrence. On top of that, the external pressure could be lowered, because the diastolic pressure below the knee comes to only about 20 mm Hg after elimination of the saphenous reflux in the groin.

In addition, the device would preserve the GSV for possible use as a bypass graft in the future. The benefit of preserving the GSV for possible use as a bypass has been mentioned in several publications<sup>10, 11, 12</sup>.

### **Is the trunk of the GSV in varicose vein patients suitable for bypass?**

There is so far no consensus whether the GSV of varicose vein patient could be used as bypass graft in arterial reconstructions; nevertheless, there are some reports justifying and supporting the use of these grafts. The trunk of the GSV is not afflicted with varicose degeneration; it is just incompetent<sup>10, fig 3</sup>. In some cases, it can have occasional small bulges, which can be repaired with atraumatic stitches or covered with external protective sleeve. When such veins have been used as arterial grafts, they neither dilated nor tended to form aneurysmatic protrusions. They achieved long-term patency similar to normal vein grafts.

Some authors assessed the suitability of the GSV in varicose vein patients by means of duplex ultrasound examinations and found them suitable for arterial grafting in most cases; the trunk of the GSV was not afflicted with varicose degeneration<sup>13, 14</sup>. Even in patients with excessive below-knee varicosities the below-knee portion of the GSV did not show varicose changes<sup>14</sup>. GSVs harvested from patients with varicose veins were wrapped locally (around the dilated sites) or totally with vascular graft prosthesis and were used for infra-inguinal arterial reconstructions; they showed patency rate of up to 80% several years after surgery<sup>15-18</sup>. Neufang et al.<sup>16</sup> presented long-term results of 57 infrainguinal varicose vein bypass grafts reinforced externally with PTFE prostheses. The patency rate was 73% 5 years after operation. Significant stenosis of a reinforced vein segment was detected in one case after 56 months. Carella et al. mentioned satisfactory results using GSV grafts of 21 varicose vein patients covered by prosthetic mesh in femoro-distal bypasses. No dilatations of the vein grafts were noted<sup>17</sup>. Siani et al. mentioned satisfactory short term results obtained with 4 segmental varicose saphenous vein grafts used for infrapopliteal revascularization<sup>18</sup>.

Reinforced GSVs of varicose vein patients were used also for coronary artery bypass grafting<sup>19</sup>. The patency rate of native veins was 68.7% and that of reinforced grafts 68.3% at 3 years. Hiroshi Iida and Toru Sunazawa covered a small bulge of the GSV with a short cylindric sleeve of GSV and used it for coronary artery bypass in two cases.

Coronarography performed 1 year after surgery showed normal appearance of the grafts, without aneurysmatic dilatation<sup>20</sup>. GSVs gained during varicose vein operations and stored in an organ bank were used as homologous bypass grafts in lower extremities and displayed 84% patency 12 months after arterial reconstructions<sup>21</sup>. As to my own experience, I have used saphenous veins of varicose veins patients as bypass grafts both in peripheral arterial reconstructions and in coronary artery bypass surgery with satisfactory results (unpublished data). There are presumably other surgeons who used saphenous veins of varicose vein patients but did not publish their experience.

### **How often will the preserved GSV be used as bypass in the future?**

No conclusive study has so far been presented to answer this question. The mean age of treated varicose vein patients is significantly lower than of those who are treated for arterial obliterations in the lower extremity or for coronary artery stenoses or occlusions. Moreover, varicose vein operations are performed predominantly on females, whereas arterial reconstructions on males. Nevertheless, the preservation of usable venous segments for arterial grafting without raising the risk of recurrence would be surely advantageous. As discussed in the previous chapter, the GSV of varicose veins patients is principally suitable for use as bypass graft in peripheral arterial reconstructions as well as in coronary artery surgery.

### **Conclusion**

The aim of the diastolic compression device presented in this study is to hinder the diastolic flow in the GSV during calf pump activity. Based on the results of venous pressure measurements, it is supposed that the external pressure of about 35 mm Hg applied below the knee would be able to fulfill this intension. The device would keep the dividing line of the ambulatory pressure gradient below the knee, as is the case with healthy people, imitate or even restore the physiological hemodynamic conditions, and block further progression of the disease. If accepted by the patients, the diastolic compression device could become an effective conservative method in the treatment of varicose vein disease. It could be also used as a supplement after crossectomy in order to thwart the tendency to recurrence. In addition, it would preserve the GSV trunk, which could be used in the future as a suitable bypass graft.



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# Notes on the virtual Phlebectomy: Conservative REflux Elimination Device (CREED)

**S Ricci<sup>1</sup>**

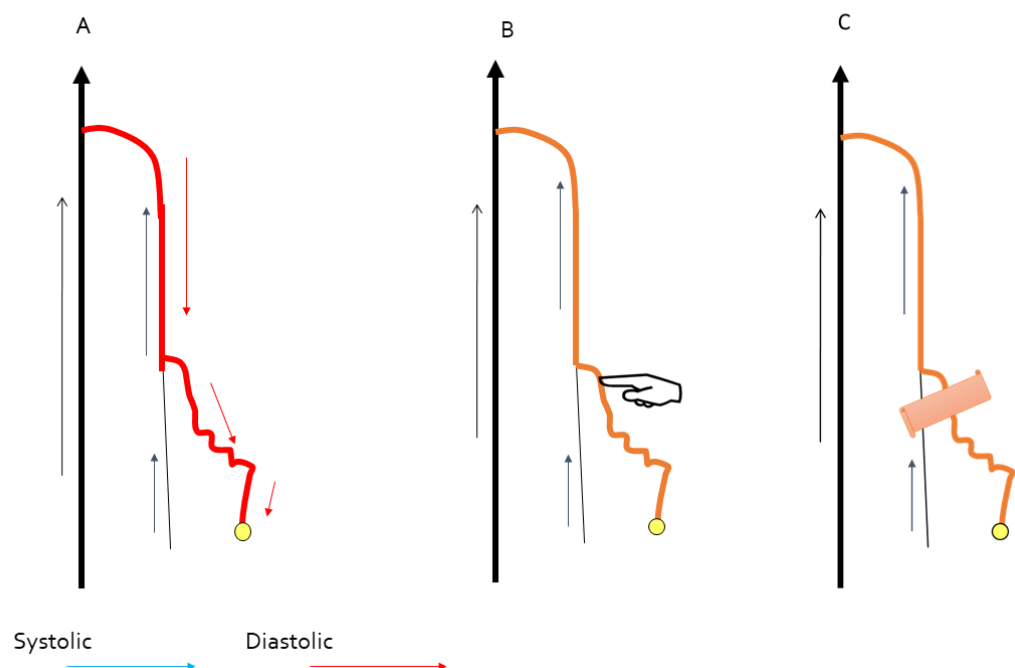
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*Figure 1 - A: Re- Entry perforator (yellow circle) is centered on the tributary vein. B: Finger compression on tributary stops the reflux in the whole system. C: A stable compression by taping maintains temporarily stable the system.*

A finger's compression is able to occlude a tributary varicose vein's lumen and stop the flow of the reflux coming from the Great Saphenous Vein (GSV). As documented by Duplex assessment, the reflux will be abolished both in the distal tributary and in the proximal

GSV stem, provided that the re-entry pathway is centred on the tributary vein (like in about 50% of the cases). (Fig 1 a, b). At the opposite, if the GSV has its own re- enter perforator, the saphenous reflux will persist. This manoeuvre has been called Reflux Elimination Test (RET)<sup>1</sup>

and is one of the basic principles of the conservative management popularized by CHIVA proposal<sup>2</sup>.

Starting from this premise it is advisable that in RET positive cases the finger's action could be changed by an external adequate localized compression (fig 1 c), that could be stable instead of occasional like finger's one. In this way, the reflux abolition could be maintained for a (more or less) longer period, acquiring a therapeutic effect either than the diagnostic action<sup>3</sup>.

The external localized compression by a Conservative REflux Elimination Device (CREED) has been tried by the application of a strip of a taping material (the one in use in the Kinesio taping method<sup>4</sup> placed with a slight pressure exactly in the place where the finger's test was found to be effective for the reflux abolition. (Fig 2). Actually, the exact point is not directly on the tributary junction (to avoid compression on the GSV) but is placed 1 cm distal as to compress the tributary alone. If the varice needs a more active compression for its caliber reduction, a cotton thickness made by a dental roll may be inserted over the point to be compressed.

It could be a more or less temporary solution when a definite treatment must be deferred or it is impossible.

The device suggested is under clinical verification and further experience is needed to confirm its validity.

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*Figure 2 - Taping of thigh and leg tributaries at the junction with the GSV trunk. (courtesy Paolo Casoni)*



# Varicotape: temporary selective varices compression

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**Abstract** We incidentally hypothesized that placing Kinesio tapes over the bulging varicose veins patients had immediate clinical benefit. Refilling Time prolongation after taping seems the explanation of this effect. Fifteen patients were investigated via a clinical questionnaire and photoplethysmography trying to demonstrate the possibility of this type of temporary selective varices compression as a conservative treatment of varicose veins incompetence syndrome. The results were very encouraging suggesting a rapid divulgation of this simple and cheap method.

**Keywords** tributary varices, conservative treatment, taping, selective compression, temporary reflux elimination

## Introduction

Many years ago, watching the Olympic games we started to see athletes with coloured strips stuck on body parts. Now we know that they were kinesiology tapes and “taping” is the practice of positioning the tapes over body parts.

In 1973, Dr Kase created a therapeutic tape and taping technique giving support to joints and muscles, without restricting range of motion. Kinesio Taping first saw worldwide exposure during the 1988 Seoul Olympics. Since then, Kinesio has become a popular form of muscle taping used by sportsmen and kinesiotherapists professionals across the world. It is indicated to relieve pain or abnormal feeling in the skin and muscles; to support the muscles during movement; to remove congestion of lymphatic fluid or haemorrhages underneath the skin; to correct for misalignments in the joint<sup>1</sup>. Millions of users consider Kinesio Tape really a big help, sceptics point to a lack of

scientific evidence. What concerns us here is limited to the material employed (the tapes) and not to the method (Kinesio taping).

## A taping proposal in phlebology

During patient's assessment clinical and instrumental, finger or tourniquet compression may be used for analysing the haemodynamic behaviour of the venous network. In facts, finger or tourniquet obstruction at any point of the refluxing “system” (a “close circle” according to Trendelenburg<sup>2</sup>) stops the blood reverse flow (eliminates the reflux), although leaving the incompetence anatomy unchanged (the valves remaining incompetent), while the physiologic vein drainage runs in deep veins<sup>3</sup>.

Venous Refilling Time (RT) calculation by plethysmography for example, employs the tourniquet exclusion of superficial veins when studying the reflux effect on the limb circulation<sup>4</sup>.

While finger or tourniquet compression is a short-term action eliminating the reflux, we considered the hypothesis of creating a similar, but permanent, effect using the taping material.

Made of a latex-free cotton fibre, the tape is water resistant, breathable, and hypoallergenic. The medical grade acrylic adhesive allows for multiple days wearing time without irritating the skin and it is possible to shower with the tape. Different brands are available online for about 2 Euro per meter. Taping is safe, inexpensive and easily found, easy to apply, durable (at least one week), wettable (allowing a shower), easy to remove, not ugly (skin coloured).

While all the parameters requested for the material are satisfied, the effectiveness of this method needs to be ensured. This was done in this study analysing our preliminary empiric experience.

## Population and Method

A cohort of 15 patients with varices due to Great Saphenous Vein (GSV) incompetence, that could benefit from the occlusion of a refluxing vein identified by fingers occlusion during ultrasound (US) assessment were enrolled after signing a written informed consent at the Ippocrate Medical Centre in Parma. There were 10 females over 5 males; the mean age was  $58 \pm 19$ ; the CEAP class was C2 in 14 cases, C3 in 1. The most favourable case was considered when reflux completely stopped after a localized finger's compression where the compression is over the incompetent tributary; these are RET (Reflux Elimination Test) positive cases, where the re-entry perforator is centred on the tributary varicose vein<sup>5</sup>. Reflux duration important decrease as in RET negative cases (when re-entry perforator is centred on the GSV) was also a good candidate. Multiple varicose tributaries, diffuse varicosities, anarchic distribution were excluded. Skin induration and oedematous legs were excluded too but could theoretically be considered after resolution by bandages or hosiery.

During one month of activity taping occlusion was then attempted and verified by US by refluxing time reduction. The patients were asked to hold the compression for 7 days for a final clinical verification. Four points Likert scale questionnaires<sup>6</sup> for 5 symptoms analysis were also submitted for comparing pre and 7 days post treatment. Photoplethysmography (PPG) (Elcat Vasoquant VQ1000 Quantitative Photoplethysmograph Venous Function Diagnostic system Bgm. - Finsterwalder-Ring 27 82515 Wolfratshausen Germany) was performed pre, with lace, and at 7 days after taping<sup>7</sup>. Complications and adverse effects and negative results were recorded. The study was considered as an extension of the diagnostic procedure and consequently no Ethics Committee was involved in this initial set-up phase.

## Taping methods

If possible, the whole course of the varicose tract, from the reflux origin to re-entry point/s should be covered. (Fig 1)

The origin corresponds usually to the junction of the tributary with the saphenous stem; the re-entry point/s to a perforator/s.



*Figure 1 - 5 cm large tapes are placed along the varicose veins pathway, with transversal positioning over feeding and re-entry points.*

Tapes 5 cm large, can be cut in pieces about 10/15 cm long and applied in succession with small superimposition. At time transversal position may be appropriate, particularly at the tributary reflux origin. Tape's tissue is sufficiently smooth to allow knee flexion without discomfort. Skin hairs should be previously erased and the skin should be dry and clean before taping. After positioning of the tapes a short period of hand compression over the tapes will help for a perfect adherence. A compression hosiery can be overlapped if appropriate in more advanced cases (Fig 2).

Immediate ambulation is allowed.



*Figure 2 - Taping material is smooth and it may cover knee varices (a) allowing free movements (b); if needed, a compression hosiery can be overlapped (c).*



Figure 3 - A dental roll may be used for providing local greater compression as for perforators.

A thickness of cotton (i.e. dental roll) may be placed under the tape in points where greater local compression must be delivered (SFJ, saphenous stem, perforator). (Fig 3)

Tapes removal is easy, despite the high adhesivity, but can subject the skin to an annoying tension; however, removal can be facilitated by the application of an industrial acrylic remover or, more simply, acetone.

A sticky residue can sometimes remain on the skin, being hardly removed by washing, whilst it is also eliminated with acetone.

## Results

In all the 15 cases taping was easily accepted and well tolerated; in no instance the taping needed to be removed. Measurements below are reported as mean  $\pm$  standard deviation. Clinical scoring measured through the Likert scale based on 4 points (0-absent, 1-moderate, 2 severe, 3 very severe) over 5 symptoms (heaviness, pain, cramps, paresthesia, oedema) comparing basal status ( $3,7 \pm 1,3$ ) with the 7 days treatment demonstrated a constant amelioration in 14 cases, one case remaining unchanged. ( $1,4 \pm 1,2$ ;  $p < 0,001$ ) (Fig 4)

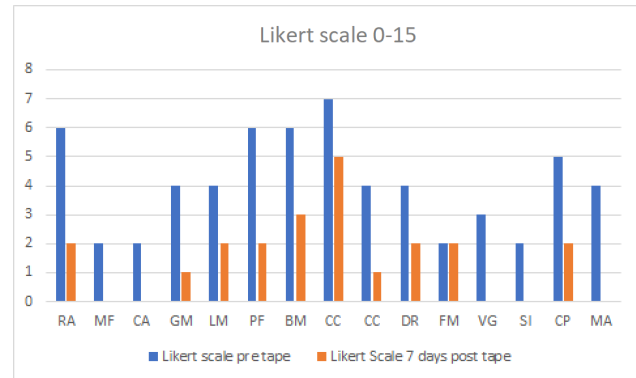


Figure 4 - Result of clinical questionnaire based on 4 points Likert scale of 5 symptoms and signs as heaviness, pain, cramps, paresthesia, oedema. (7 days column is absent when 0 score) ( $p < 0,001$ ).

PPG (Fig 5) showed an immediate significant Refilling Time (RT) lengthening just after tape placement from  $16 \pm 6$  s to  $26 \pm 8$  s; this effect remained unchanged after 7 days with  $27 \pm 10$  s;  $p < 0,01$ .

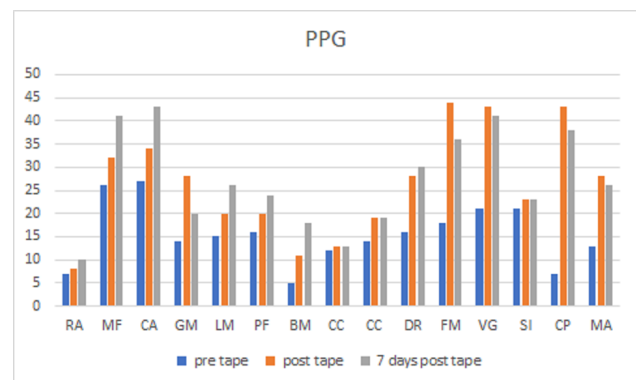


Figure 5 - PPG refilling time (pre, immediate post, and 7 days records), showing a general positive effect.

In 9/15 cases there was a normalization ( $> 20$  s), a partial lengthening in 3 cases; 2 cases instead had no RT relevant change (RA, CC cases in the Fig 5). Interestingly, both these failures of RT prolongation showed a significant clinical improvement (RA,CC cases in Fig 4).

No skin irritation or allergic reactions have been recorded at 7 days control.

## Discussion

A cohort of 15 cases has been observed in this preliminary study with the aim of presenting a new method for varicose veins temporary conservative treatment (Varicotape) by selective temporary, although durable, compression.

Compression of the skin over a dilated vein closes the same vein. At that point no flow is possible in the vascular



bed directly unless another re-entry pathway is present. This peculiar behaviour is studied during Ultrasound assessment of varicose veins patients using finger compression for understanding some aspects of the pathologic network. The placement of a tourniquet (or of an inflatable cuff) may be used to exclude the flow in the varicose veins, but without any selection, acting circumferentially over all the veins. The traditional use of a bandage or of a hosiery obtains a compression of the whole area covered by the tissue but has the well-known disadvantage of a difficult compliance.

In this initial study we observed that the compression of the limited area where the varices are displayed by a particular adhesive tape commonly employed in Kinesio-therapy (we called it Varicotape) is able to obtain a partial reduction of the varicose volume (the blood pooled in the varices) in static position, and to lengthen the refilling time (time to fill the venous network) during ambulation. As a consequence, the venous hypertension ligated to the venous reflux is reduced or eliminated, together with related symptoms. This effect has been observed clinically by the subjective improvement of symptomatology reported by patients (through a questionnaire) and confirmed by ultrasound observation when unhindered by the tape (reflux time reduction or disappearance) and photoplethysmography (RT prolongation).

Taping over varices could be compared to a “virtual phlebectomy. A similar suggestion (CREED – Compression Reflux Elimination Device)<sup>5</sup> was recently issued, proposing to selectively compress only the varicose tributary junction with the saphenous stem by taping or tourniquet positioning, so stopping the reflux both in the same GSV as in the tributary, but leaving the saphenous orthograde flow.

The case with no clinical amelioration (FM case) curiously showed a very good immediate RT recording (44 s). One of the two cases that had no RT amelioration is the C3 case (RA case), possibly because oedema caused hindrances. The mechanism by which clinical improvement was observed in two cases (RA and CC cases) despite failure of RT prolongation is not clear, possibly linked to the “original” Kinesio-therapy effect over pain (although still unexplained)<sup>1</sup>.

The key factor which allows the described result to be achieved is due to the use of the adhesive tape (Varicotape), classically made by soft cotton strips with adhesive acrylic glue, water resistant, breathable, and hypoallergenic that can be worn for several days at a time. The skin-like colour of the tapes suggested has a limited aesthetic impact, especially if a light stocking is used as covering. This could limit the use of heavier stockings notably hated by the great majority of female patients.

The suggested material has a very low cost and is very easily self- placed, once adequate instructions are given to the patient. The tape positioning on varicose network has an indication as a temporary treatment when active treatment of varices is contraindicated (old age, comorbidities, acute disease, fear, refusal, logistics deficiency) or must be delayed (i.e.: hot weather, waiting list, inflammation, infection).

Bulging superficial varices are those that are best compressed by taping. When deeper veins (i.e., saphenous veins sub fascial placed) ought to be compressed, a stronger pressure would be needed by the taping method. In these cases, a thickness of cotton (i.e. dental cotton rolls) may be used under the tape, placed exactly over the vein site, creating a local augmented pressure condition.

We did not observe any skin unwanted reaction at all.

### Possible Indications for Varicotape

1. Tributary varices
2. saphenous axis (Fig 6)
3. junction/groin (Fig 6)
4. perforator

Progressive knowledge of the Varicotape effect could suggest further applications as:

- partial covering of the varicose network could give same effect than total covering, if the varicose vein trunk closure is complete (interruption of the “close circle”). At the limit, compression localized to the tributary junction with the saphenous stem could be sufficient to stop the reflux in the same GSV<sup>5</sup>.
- taping after sclerotherapy may avoid skin bruising and enhance efficacy
- healed ulcer’s site may be protected from skin micro trauma
- post phlebectomy taping may accelerate absorption of bruising and avoid bandaging
- in arteriopathy subjects in whom bandaging is problematic, taping may be used instead when a leg compression covering is needed
- skin induration in long standing CVI patients may be selectively and effectively compressed under bandages or hosiery
- pelvic reflux feeding leg varices can be blocked by taping at the groin
- varicose network can be “prepared” for subsequent ablation by pre-op calibre reduction
- reduction of venous system overcharge in pregnancy waiting for delivery
- faster recalibration of the dilated tributary veins after conservative surgery.



*Figure 6 - Saphenous-Femoral junction and GSV stem, although deeper positioned, may anyway benefit from taping occasionally augmented with a cotton thickness*

This is a preliminary study with limitations in the number of clinical cases and in the amount of available data for research; in particular, a control group comparison with elastic stockings will be needed when a scientific trial will be done based on this kind of taping. Here we just observed a curious original phenomenon, even if stockings effect is well known while taping effect is

new and probably is not the same as stockings. However, due to the great apparent results of this simple taping application, we thought appropriate to quickly divulgate the idea, waiting for more personal (or other's) observations.

## Conclusions

Using simple and inexpensive material it seems possible to reduce the hypertension effect of varicose veins for patients waiting for correction, refusing correction or not able to be treated. It can be considered as a temporary conservative treatment waiting for a more durable procedure, but it could have also a prolonged use in selected cases, allowing consequent direct GSV sparing.

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# Are saphenous sparing treatments beneficial to the hemodynamics of the venous system?

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**Abstract** This short review analyzes first the hemodynamic changes that follow destructive procedures, such as stripping or endovascular techniques, and conservative procedures, such as the CHIVA Cure. Then, the effects of the hemodynamic changes resulting from conservative and destructive procedures are compared with respect to the course over time of the varicose disease, mainly focusing on the occurrence of recurrences and their different hemodynamic characteristics. The results show that both conservative and destructive procedures significantly improve the plethysmographic reflux parameters till their normalization. However, destructive procedures reduce the compliance of the lower limb, which expresses an impaired drainage of the superficial tissue, as documented by the typical occurrence of recurrent varicose veins without a detectable trans-compartmental reflux point that are never found after conservative procedures. On the contrary, conservative procedures, when appropriately performed based upon the type of the venous shunt, preserve the drainage of the superficial tissues making the incompetent venous system more hemodynamically stable, which results in a significantly less frequent occurrence of recurrences.

**Keywords** varicose veins, sparing surgery, CHIVA, venous hemodynamics, recurrent varicose veins

From the patho-physiological point of view, venous disease, either due to obstruction or reflux, is characterized by the increase in the trans-mural pressure (TMP) due to

the increase in the lateral venous pressure (LVP)<sup>1</sup>. In the case of superficial reflux, it has been shown that these hemodynamic changes trigger an inflammatory process of the endothelium characterized by a cytokine cascade with activation of matrix metalloproteinases leading to a sustained remodeling of valves and venous wall resulting in valve incompetence, massive fibrosis of the media and its fusion with the adventitia<sup>2, 3</sup>.

The hemodynamics of superficial venous insufficiency is commonly investigated by using duplex ultrasound (DUS) and plethysmography (PG). DUS is used to identify the venous reflux, defined as a retrograde flow lasting more than 0.5s in the greater saphenous vein, 0.3s in the perforators veins and 1.0s in the common femoral vein<sup>4</sup>, and to characterize the type of venous-venous shunts (location of the escape point, course of the incompetent superficial veins and location of the re-entry perforating vein, i.e. the point through which the retrograde superficial flow re-gains the deep venous system)<sup>5</sup>. While DUS mainly provides “qualitative” information, that are, however, absolutely critical to correctly plan the strategy of conservative procedures, PG provides “quantitative” information, such as reflux parameters and lower limb compliance. The most studied reflux parameter is the venous filling index (VFI), calculated by dividing the 90% venous volume (VV90) by the 90% venous filling time (VFT90), i.e. the time needed to reach the VV90 once the orthostatic posture has been reassumed after leg veins have been emptied with the subject in supine position and



the lower limb elevated at 45 degrees<sup>6</sup>. With regard to lower limb compliance, it is generally assessed at calf level with the subject in the supine position by using the venous occlusion technique and it is calculated as the derivative of the pressure-volume curve during the deflation phase, for pressure between 60 and 10 mmHg<sup>7,8,9</sup>. As calf compliance is assessed during the deflation phase, once the occlusion is removed and the venous system is left free to empty out, calf compliance is affected not only by the elastic properties of the venous wall and of the lower limb tissues, but also by the overall draining capability of the venous system of the lower limb.

In the case of greater saphenous vein (GSV) incompetence, which is the most frequent cause of superficial venous insufficiency, destructive procedures suppress the venous reflux, by either removing (stripping) or occluding (endovascular procedures) the GSV. Park, et al.<sup>10</sup> have, in fact, retrospectively investigated a very large series of patients (more than 1,600 limbs) who had undergone either high ligation plus stripping or radio-frequency ablation for GSV incompetence. Authors compared the plethysmographic parameters recorded preoperatively and 1-month after the procedure and found that reflux parameters were significantly improved ( $p<0.001$ ).

With regard to conservative procedures, they dramatically reduce the flow of the venous reflux by disconnecting the GSV from the escape point(s), as in the CHIVA 1 procedure, for type I shunts, and in the second step of the CHIVA 2 procedure, for type III shunts<sup>5, 11-14</sup>. Indeed, the flow of the venous reflux can also be reduced by occluding the GSV arch just partially, as with Office Based CHIVA<sup>15</sup>. Further, since the origin of the CHIVA, it is an established notion that conservative procedures may also hemodynamically suppress the venous reflux by disconnecting from the GSV the branch where the re-entry perforator vein is located, without disconnecting the GSV from the escape point, as in first step of the CHIVA 2 procedure for type III shunts. With this regard, it has been described a diagnostic test to preoperatively check the reflux suppression by finger compression of the GSV branch where the reentry perforator vein is located<sup>11, 13</sup>, which was given the name “reflux elimination test”<sup>16</sup>. In this last paper, authors also showed that the plethysmographic reflux parameters significantly improved ( $p<0.001$ ) 1 and 6 months after the first step of the CHIVA 2 procedure. Other two papers on factors affecting venous ulcer healing in patients undergone conservative procedures have confirmed that the plethysmographic reflux parameters were significantly improved ( $p<0.001$ ) when the CHIVA strategy had been appropriately selected based upon the type of the venous-venous shunt<sup>17, 18</sup>.

Altogether, these data show that, in patients with GSV incompetence, plethysmographic reflux parameters are considerably improved after both destructive and conservative procedures. Accordingly, the first message to take home is that to reduce the pathogenic effects of the venous reflux on lower limb tissues it is not necessary removing, or destroying, the GSV, which, instead, can be spared and possibly used later in life as an arterial graft. In fact, the retrograde flow detected within the GSV after conservative procedures is not “per se” a limit to its use as a graft<sup>19, 20</sup>, GSV rarely shows bulges that, in any case, can be “repaired”<sup>19</sup> and the GSV fragmentation, foreseen in the original description of the conservative procedures<sup>5</sup>, is seldom necessary in clinical practice (in authors’ experience less than 2% of cases over more than 3,000 operated GSVs, personal unpublished data). Interestingly, the TMP reduction due to the dramatic decrease in the reflux flow, decreases the GSV caliber<sup>21</sup> and “maintains” the normal histologic architecture of the venous wall<sup>22</sup>. Further, the suppression of the oscillatory component of the reflux favorably modulates the inflammatory endothelial phenotype and mitigates the inflammatory process responsible for the sustained damaging of venous valves and wall<sup>2</sup>.

The second message to take home from the papers that have investigated the effects of destructive<sup>10</sup> and conservative<sup>16-18</sup> procedures on plethysmographic reflux parameters comes out from the analysis of the figures reported in the papers. In fact, VV reduction after both destructive and conservative procedure was around 25-30%, while VFI reduction was 75% after destructive procedures<sup>10</sup> and around 45-50% after conservative procedures<sup>16-18</sup>. As VFI is the ratio of VV to VFT, the greater VFI reduction found after destructive procedures, in spite of the VV reduction comparable to that found after conservative procedures, is necessarily due to the greater increase of VFT after destructive procedures, although rough data on VFT are not reported in the papers. This strongly suggests that destructive procedures impair the venous drainage of the lower limb. In fact, once the escape point has been closed, independent of the performed procedure, the filling of lower limb veins, which is only due to the “vis a tergo”, depends on the arterial-venous gradient. Accordingly, the longer VFT found after destructive procedures is explained by the reduced arterial-venous gradient, which, in the absence of peripheral artery disease, is due to the increase in the pressure on the venous side resulting from the impaired venous drainage.

Other studies on venous compliance also support the thesis that destructive procedures impair the venous drainage of the lower limb. Skoog, et al.<sup>23</sup> have, in fact, shown that, in patients with GSV incompetence, calf

venous compliance was significantly reduced 1 month after GSV radio-frequency ablation. The compliance reduction is related to the increased resistance to the outflow of the superficial tissues which slows down the flow speed and increases the LVP and, hence, the TMP. As venous compliance shares an inverse relationship with the TMP, the reduction of the venous compliance found after destructive procedures results in an increase in the TMP. Once the “hemodynamic reserve” (supra- and trans-fascial network)<sup>24</sup> has been exceeded, the increase in the TMP triggers the occurrence of recurrences, that, typically, never exhibit a detectable trans-compartmental escape point<sup>25</sup>. Further, observations from everyday clinical practice show that patients with primary varicose veins exhibit few DUS detectable perforating veins, either incompetent or not, while after GSV stripping patients show more perforating veins with respect to the preoperative assessment, independent of whether they present with recurrent varicose veins<sup>26</sup> or not. This suggests that once the lower limb has been deprived of its physiological, low resistance draining system, i.e. the GSV, the superficial tissues of the lower limb seek somehow to empty out and that perforating veins represent the “hemodynamic reserve” for the drainage of the superficial venous system.

With regard to conservative procedures, other observations from everyday clinical practice support the thesis that these procedures preserve the venous drainage of the lower limb. In fact, after the procedure, high resolution DUS shows a spontaneous, slow velocity, retrograde, breath-phasic flow in the thigh GSV, when the subject lays in supine position, which represents the rest drainage of the superficial tissues [<https://www.studioflebologicocappelli.it/deflusso-post-chiva/>]. Further, pulsed doppler DUS shows a double anterograde flow in the GSV thigh tributaries, when the subject performs a dynamic test in upright position. The diastolic component of the anterograde flow, which is never detectable when the escape point is open, represents the ability of the muscle pump to create a diastolic depression gradient between the GSV tributary and the re-entry perforator vein, which allows the drainage of the superficial tissues through the preserved retrograde GSV during exercise. These observations highlight the concept that the GSV retrograde flow detectable after conservative procedures is only fed by the superficial tissue outflow, and that, on the contrary, the GSV retrograde flow found in patients with an open escape point, is also fed by a relevant hemodynamic overload through the escape point itself. Thus, it is not surprising that the GSV retrograde flow resulting from conservative procedures shows a much lower pathogenic potential than the GSV retrograde flow found in patients with an open escape point.

Finally, once the more favorable effects of conservative procedures on the hemodynamics of the

venous system have been established, it appears quite sensible to verify whether they also improve short- and long-term outcomes. Indeed, a small number of Randomized Controlled Trials (RCTs)<sup>25, 27-29</sup> and Metanalyses (MAs)<sup>30, 31</sup> have compared the results from destructive and conservative procedures. Generally speaking, RCTs comparing the results from all the various procedures used for the treatment of varicose veins unavoidably suffer from the “detection” bias (instrumental outcome assessors are not blind with regard to the performed procedure) and from the “performance” bias (the awareness of both participants and personnel with regard to the assigned treatment arm)<sup>32</sup>. Thus, all RCTs show a “moderate quality” evidence according to the GRADE criteria<sup>33, 34</sup>, which does not mean at all that the treatment providing better results cannot represent a “strong, in favor” recommendation, as quality of the evidence and strength of recommendations are quite different concepts<sup>35, 36</sup>. Further, in some RCTs including the CHIVA cure<sup>27, 29</sup> there are relevant biases that affect the CHIVA arm, concerning both the selected CHIVA “strategy” (type III shunts treated by the CHIVA 1 procedure)<sup>5, 11-14</sup> and the surgical “tactic” (crossectomy instead of crossotomy)<sup>5, 14, 37</sup>, so that these RCTs should not be taken into any consideration.

That being said, hereafter the results of the RCTs and MAs that have compared the results from destructive and conservative procedures are shortly reported. The RCT of Carandina, et al.<sup>25</sup> compared the results from GSV stripping and those from CHIVA Cure and found a significantly lower incidence of recurrences in the CHIVA arm. Parés, et al.<sup>28</sup>, in their RCT with 3 arms (stripping with clinical marking, S-CM, stripping with duplex marking, S-DM, and CHIVA Cure) also found an incidence of recurrences significantly lower in the arm CHIVA with respect to the arm S-CM and to the arm S-DM. The MA of Bellmunt-Montoya, et al.<sup>30</sup> analyzed the three RCTs on the comparison between stripping and CHIVA Cure available at the time of the study<sup>25, 27, 28</sup> and found a significantly lower cumulative Risk Ratio for recurrences in favor of the CHIVA Cure. Finally, Guo, et al.<sup>31</sup> in their more recent “network” metanalysis of 39 RCTs concerning all available procedures to treat varicose veins, alone or in combination, found that the CHIVA Cure was associated with significantly higher Odds Ratios with regard to the successful treatment rate and significantly lower Odds Ratios with regard to the recurrence rate.

Altogether, the results from the aforementioned RCTs and MAs also controvert the widely held theory that the retrograde GSV flow resulting from crossectomy/

crossotomy, and more generally from any conservative procedures, might trigger the occurrence of recurrences<sup>38</sup>.

In conclusion, this short review shows that GSV sparing treatments are actually beneficial to the hemodynamics of the venous system. In fact, although both destructive and conservative procedures improve, till normalization, the plethysmographic reflux parameters, destructive procedures seriously jeopardize the venous drainage of the lower limb. This makes the venous hemodynamics unstable, resulting in a more frequent occurrence of recurrences that are an expression of the need of lower limb superficial tissues to somehow empty out and that never show a trans-compartmental reflux point. On the contrary, conservative procedures, in spite of leaving a retrograde flow in the GSV, reduce the pathogenic effects of the reflux, due to the dramatic reduction of the reflux flow, and preserve the venous drainage of the lower limb. This makes the venous hemodynamics more stable and, consequently, results in a significantly less

frequent occurrence of recurrences that always show a trans-compartmental reflux point.

### Saphenous sparing treatments: bullet points

- To reduce the pathogenic effects of the venous reflux on lower limb tissues it is not necessary removing, or occluding, the GSV;
- The saphenous retrograde flow resulting from sparing treatments shows a much lower pathogenic potential than that found in patients with an open escape point;
- Contrary to destructive procedures, saphenous sparing treatments preserve the drainage of the superficial tissues of the lower limb;
- Saphenous sparing treatments result in a significantly lower incidence of recurrence over time than destructive treatments;
- Saphenous sparing treatments are actually more beneficial to the hemodynamics of venous system than destructive treatments.

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# An Overview on Venous Valvuloplasty and Saphenous Sparing

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**Abstract** Venous valvuloplasty (VV) has been proposed for over 50 years to obtain functional reconstruction in patients with chronic venous insufficiency. The various techniques used have given long-term positive results in about 80% of the cases treated, which is moderately better than ablative techniques for the same pathologies. VV seems to be advisable in cases of poor compliance of the deep venous system following ablation of the great saphenous vein. Furthermore, it allows the saving of the saphenous conduit, which represents a precious advantage in case of need for arterial replacement surgery. So far it did not get widespread. Reasons for this include: rather strict eligibility criteria, which reduce the number of possible beneficiaries; the greater complexity of the procedure, both diagnostic and operative, compared to the endovascular ablative techniques proposed in recent decades; the scarce availability of adequate medical devices. Current research seems oriented towards the development of prosthetic neo-valves, made of biomaterials engineered with innovative techniques, which can be positioned by catheter in the deep venous system.

**Keywords** Chronic venous insufficiency, Saphenous sparing, Venous valvuloplasty, Venous neo valve, Hemodynamic patterns of venous reflux.

## Introduction

Venous valvuloplasty (VV) is a surgical technique that aims to remodel and correct the morphology and/or repair the function of the venous valves (generally bicuspid, in the shape of a swallow's nest), applicable in

selected cases of anatomical or functional valve defect. In the most common case, the technique is applicable to valves that do not function correctly due to the elongation of the free edge of the valve flaps or cusps which, for this reason, have lost the ability to face each other in the closed position; therefore, such valves are no longer able to maintain the unidirectional flow of venous blood, resulting in valve insufficiency or incompetence. This condition involves the onset of reflux (retrograde, inverted, pathological flow) and, consequently, chronic venous insufficiency (CVI): a generally progressive syndrome with various clinical features, including varicose veins (VVs), edema, dermatitis, ulcer and other complications. In these cases, VV is one of the techniques that implement the conservative/reparative treatment strategy and contrasts the commonly used ablative strategy through venous stripping, endovascular thermosclerosis, and more.

## Surgical techniques

Two main surgical techniques have been developed to perform VV: internal valvuloplasty and external valvuloplasty. The first consists of anatomical repair of the valve with access to the vein lumen. It is performed with the aim of shortening the free edge of the valve flaps by plicating them, performed near their apical insertion on the venous wall. It was first proposed by Kistner RL<sup>1</sup> and then with modifications by Raju S<sup>2</sup>, Sottiurai VS<sup>3</sup>, Tripathi R<sup>4</sup> and others. External valvuloplasty, on the other hand, does not require access to the venous lumen, having the objective of reducing the valve axial diameter by positioning, outside the valve, a suitably calibrated medical device in order to involve a rearrangement of the valve leaflets and therefore

their mutual rapprochement during closure with the repair of their function. It was first proposed by Hallberg D<sup>5</sup> and, with modifications, by Jessup G<sup>6</sup>, Lane RJ<sup>7</sup> and others<sup>[I]</sup>. A variant of the technique aims to neutralize the excess length of the valve leaflets by inducing an appropriate and selective increase of the inter-commissural diameter of the valve, which is finally ovalised. This selective deformation is obtained by the application, around the valve, of an oval section medical device which exerts an inelastic compression orthogonal to the valve leaflets (Zukowski SL)<sup>8, [III]</sup> or an elastic traction parallel to these leaflets on the intercommissural axis (Camilli S)<sup>9, [III]</sup>. Internal valvuloplasty is applicable only to the most functionally relevant and easily accessible valves of the deep venous system, but not to those of the superficial circulation which are smaller in size, while external valvuloplasty is also practicable on the greater saphenous vein (GSV), usually at the groin.

At the same time, in case of anatomical or functional defect of the venous valves, other researchers have preferred a different approach: valve replacement with an implantable prosthesis by open access (Taheri SA et al)<sup>10</sup> or by percutaneous catheterization (Quijano RC<sup>[IV]</sup>, Pavcnik D<sup>[V]</sup>, de Borst GJ<sup>[VI]</sup>, Gonzales-Perez F<sup>[VII]</sup>, et al.), but short-term complications, mainly thrombotic, have so far prevented its clinical use. However, a preliminary clinical study of a bioprosthetic valve device (VenoValve) is still ongoing, with promising results<sup>[VIII]</sup>. Other researchers have preferred to experiment with the creation of an autologous venous neo valve, generally performed at the level of the common femoral vein, with encouraging results, although found on a limited series of patients affected by primary or post-thrombotic deep venous insufficiency (Opie JC<sup>11</sup>, Maleti O<sup>12</sup>).

## Eligibility and indication

In order to obtain the desired technical and functional success, VV requires adequate length and freely floating valve flaps in the venous lumen, although they must not be hypo-plastic or sclerotic. In order to visualize and to evaluate the valve morphology and its dynamics, an accurate preoperative study by duplex scanning is necessary, while for the deep venous system a descending/retrograde venography is also advisable in most cases. Indeed, the eligibility requirements for the procedure are present just in selected cases. These requirements are more easily found in young patients or with recent VVs and a clinical history free from phlebitis or venous thrombosis.

Internal VV is usually reserved for one or two proximal femoral vein valves, usually in primary deep

venous insufficiency (PDVI). External VV, on the other hand, is feasible on both the femoral and saphenous veins, usually at the saphenofemoral junction (SFJ). A useful contribution to the execution can derive from the intraoperative use of a flexible angioscope<sup>13</sup>. The positioning of the medical device and its correct calibration are crucial for the functional result. Moreover, it should be considered that, even in the case of correct indication and positive outcome of VV, the repair of one or two functionally relevant proximal valves does not completely solve the pre-existing reflux in the more caudal venous duct, as it is fed by tributary veins. Furthermore, in the case of incompetent tributaries, these too must be evaluated and possibly treated with one of the techniques in use for the interruption of the escape points (selective ligation, phlebectomy or targeted sclerosis, etc.), but still preserving the whole outflow route (GSV plus SFJ). Finally, the outflow in the treated vein will still have a bidirectional motion, mainly orthograde/ascending in the systolic muscular phase, but also retrograde/descending in the diastolic phase, with re-entry through the caudal perforating veins. In this way it is possible to obtain a significant reduction in the volume and/or speed of venous reflux, a better and more lasting overall hemodynamic balance, and thus also slow down the natural worsening evolution of CVI.

The final hemodynamic result partly shares the so-called CHIVA strategy (Cure Conservatrice et Hémodynamique de l' Insuffisance Veineuse en Ambulatoire, proposed by Franceschi C)<sup>14</sup> which however often requires the interruption of the SFJ and therefore the definitive abolition of the orthograde saphenous outflow.

## Discussion

In phlebology, the need and the impetus for the conservative strategy, above all of the GSV, derive from the fact that the ablative strategy, commonly adopted in case of superficial venous reflux, generally allows excellent results in the short-term follow-up (f-u), but in the medium to long term f-u results of are not as good and often disappointing. In fact, already about 3 years after the ablative treatment, both the stripping techniques and the intravenous ablation techniques lead to the VVs recurrence in about 20% of cases, which rises to 30-50% 5 years after the treatment, while the rate of reoperations approaches 40 percent, whatever the ablative technique adopted<sup>15-20</sup>. Some authors, who have reflected on these data, have concluded with clear perplexity about the advantages of the so-called "endovenous revolution", both in terms of clinical and economic benefit, and propose to question the guidelines suggesting intravenous thermal ablation as a first choice technique in the treatment of VVs<sup>21</sup>.

Table I

## Definition and prevalence of the hemodynamic patterns of venous reflux

	Pattern	prevalence (%)
1	Incompetence of the SFJ and GSV trunk, with substantially competent perforating veins	30-40
2	Reflux circuits with large incompetent perforating veins, but with hemodynamic predominance of the reflux from	
	2.a the incompetent GSV	20-30
	2.b the femoral-popliteal vein axis	5-15
	2.c the deep femoral vein	4-8
3	Atypical reflux, with competent SFJ and VVs fed by reflux from veins of the abdominal wall or pelvis-perineal region. Pelvic varicocele or pelvic congestion syndrome or venous malformations may be present.	10-30

SFJ - Saphenous Femoral Junction; GSV - Greater Saphenous Vein; VVs - Varicose Veins. Details in the text.

Among the causes of long-term disappointment or failure of the ablative strategy is that it depends on the functional integrity of the deep system. This prerequisite is almost a-priori assumed and shared by most doctors, while the compensatory role of deep veins is, on the other hand, an uncertain expectation and therefore always to be evaluated carefully in the preoperative phase.

In the period 1986-2004, one of the authors developed an observational study on a single center cohort of about 1500 unselected patients, affected by primary and secondary VVs, including descending/retrograde phlebography during the Valsalva maneuver<sup>22</sup>. The study highlighted some different hemodynamic reflux patterns, summarized in 3 main ones: a typical reflux pattern (pattern 1), with incompetence of the SFJ and trunk of the GSV, with substantially competent perforating veins; a combined pattern of reflux (pattern 2.a-b-c), consisting of a variegated basket of reflux circuits with large incompetent perforating veins, but with hemodynamic predominance of the reflux in the incompetent GSV (2.a) or in the femoral-popliteal vein axis (2.b) or in the deep femoral vein (2.c); and finally an atypical reflux model (pattern 3), with substantially competent SFJ, but with VVs fed by reflux coming from veins of the abdominal wall or from the pelvis-perineal region, in the presence or absence of pelvic varicocele or

pelvic congestion syndrome or other venous malformative pathologies.

In case of GSV ablation, the deep system will be able to demonstrate an optimal supply function in patterns 1 and 3; on the contrary, no good functional substitute can be guaranteed a priori in pattern 2.a and will surely be inadequate in pattern 2.b-c.

The statistical prevalence of hemodynamic patterns (Table I) was estimated summarily: pattern 1 was frequent and was estimated at 30-40%; pattern 2.a was estimated at 20-30%; pattern 2.b at 5-15%; pattern 2.c at 4-8%; pattern 3 at 10-30%. The variability and difficulty of the estimate depended on the cohort of cases examined per year and on the study and adopted evaluation method. In clinical practice, in the individual patient, a mixture of the patterns described can be found. Excluding patients with a history of deep vein thrombosis (DVT), patterns 2.a-b-c are sometimes difficult to identify and require special attention, especially in the initial phase, when reflux may be variable or sporadic, seasonal, related to the menstrual cycle or to the lifestyle or the physical activity of the individual patient, even in the hours preceding the hemodynamic examination.

Considering all the above, the deep venous system, although efficient in most cases (i.e. in patterns 1 and 3),



may be more or less inadequate to compensate saphenous duct ablation (GSV and SFJ) in the long term: this can happen in pattern 2.a, but it certainly happens in pattern 2.b-c. In all these cases, belonging to pattern 2, it can reasonably be argued that the ablation of the superficial venous collector (the GSV) and the interruption of the orthograde outflow path (the SFJ) can be considered – per se – an aggravating factor of an already present inadequate compliance of the deep venous system and which favors the development of collateral venous circuits, pre-existing or newly formed (neoangiogenesis ?) and with the consequence – in the long period of time – of varicose recurrences and reoperations. Therefore, in order to obtain a better and more lasting hemodynamic balance, it appears useful and necessary to pursue not only the elimination – as far as possible – of the reflux, but also – in eligible cases – the preservation of the orthograde outflow route, adopting a conservative/restorative technique. This should include: valve repair with one of the VV techniques, the most appropriate to the individual case (to achieve abolition or reduction of predominant reflux); preservation of the orthograde outflow pathway (the GSV and SFJ); and also selective vein disconnection of incompetent tributaries (for the abolition of the escape points). The adoption of this treatment strategy seems particularly rational in young patients or with recent VVs and long-life expectancy. Indeed, these patients are generally eligible for conservative treatment and can also benefit from the preservation of a venous heritage that can be valuable, in the future, as an autologous substitute in the vascular field. Saphenous sparing appears particularly advisable in secondary VVs in the early stage of DVT, in which the pathogenesis of saphenous incompetence is mainly related to hemodynamic overload into the superficial venous system induced by increased outflow resistance in deep venous vessels.

Concerning the prevalence of eligible cases, it should be considered that the deep venous system can play an adequate role of compliance in patients with patterns 1 and 3; therefore, saphenous sparing does not seem necessary for hemodynamic purposes, though it would have value as preservation of a vascular conduit. Conversely, saphenous sparing would be indicated in patients with combined reflux

(pattern 2.a-b-c): with warm recommendation in subgroup 2.a, but with strong recommendation in subgroup 2.b-c, also associating femoral VV in the case of PDVI or the construction or implantation (?) of a neovalve in the case of post-thrombotic or malformative CVI. In conclusion, the prevalence of cases that could benefit from valve repair and saphenous sparing (great eligibility) can be estimated at approximately 30% of all CVI cases with combined reflux (pattern 2.a-b-c), while actual saphenous sparing depends on the reflux pattern found and valve morphology assessment in the individual patient, but also on the materials and devices available.

## Criticisms and perspectives

The first attempts to perform VV date back to over 50 years ago. The various published case studies, generally limited and not homogeneous, declare results considered positive on average over 80 percent of cases, even in the mid-long term (3-5 years) and the hemodynamic degradation – anyway evolutionary – is slowed down and probably related to a better or more stable overall hemodynamic balance. However, none of the various VV techniques have become widespread. On the contrary, the ablative strategy is implemented widely, and sometimes in a superficial and uncritical way. Among the various explanations of the widespread preference for ablative procedures, conservative/reconstructive treatments require more diagnostic attention and surgical experience; are applicable only to carefully selected eligible cases; require a more structured operating environment and often the use of implantable devices that are not readily available; may require planned therapeutic adjustments. Therefore, VV techniques are burdened by a fair amount of complexity and clash with the seduction of minimally invasive techniques proposed in recent decades and which have spread successfully.

However, the efforts of researchers to develop simpler and more effective devices and techniques than those proposed up to now should be encouraged, also exploring new materials and tissue engineering techniques<sup>23-24</sup>.

## Endnotes

[I] Venocuff II device, consisting of a silicone sheet reinforced with a Dacron mesh. AllVascular Inc, St Leonards (NSW), Australia.

[II] EVS device (external valve support), consisting of a sandwich of ePTFE reinforced by a lattice metallic. WL Gore & Associates Inc, Newark, USA.

[III] OSES device (oval shaped external support) consisting of a lattice Nitinol oval elastic stent. Assut Europe spa, Magliano dei Marsi, Italy.

[IV] VenPro endo-bioprosthesis consisting of a biological valve supported by a metal stent, tested by Baxter International Inc, Deerfield, USA.

[V] Endo-Bioprosthesis consisting of a biological membrane supported by a metal stent, tested by Pavcnik D et al., Portland, USA.

[VI] VenaSail alloplastic endo-prosthesis consisting of an ePTFE monocusp membrane supported by a metal stent, floating like a sail, tested by de Borst GJ et al., Vasc Surg dept, UMC, Utrecht, The Netherlands.

[VII] Hybrid endo-bioprosthesis made of engineered elastin-like and combined with a resorbable magnesium stent, still being tested. Correspondence: fernandez@ame.rwth-aachen.de

[VIII] VenoValve endo-bioprosthesis device, still being tested as a pivotal study by EnVVen Medical corp. Irvine, Ca, USA.

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# Memorial pages

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## Hugo's memorial

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*Prof. Hugo Partsch (1938-2023)*

When I heard of Hugo's departure for his new life, I could barely believe it was true, as the immortality of such a giant of phlebology and lymphology should not allow him to leave us all poorer..here.

Hugo's outstanding career and cultural contribution to world phlebology and lymphology does not need to be re-confirmed in any memorial. More probably, he represented a sort of lighthouse which illuminated our travel

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across the stormy waters of the ever-changing seas of phlebology science.

I had personally occasion to meet Hugo some 25 years ago in Sydney (UIP world congress), when he showed a great attention towards some "innovative" anatomical and hemodynamic aspects of chronic venous diseases which were presented by some of us. After becoming UIP president, his curiosity and open-minded attitude towards the proposals aimed at advancing the science of phlebology, led him to organise a number of consensus conferences on several topics.

For some unknown reason Hugo asked me to help him with an educational project ("living veins and lymphatics", an interactive CD with videos, power point presentations and some internet references, ... quite innovative for that time).

In fact, he was a fervent supporter of the need to consider veins and lymphatics as two traveling companions functionally and mutually united, in good and bad times, for the centripetal drainage of fluids and macromolecules<sup>1</sup>.

One year later he wanted to involve me in the duplex investigation world consensus conferences of UIP, together with giants such as K. Myers, A. Nicolaides, P. Coleridge-Smith, N. Labropoulos, S. Ricci and A. Caggiati<sup>2, 3</sup>. His continuous stimulus to advance the duplex ultrasound consensus projects was a real challenge and an extremely rewarding input for all of us.

Many more common initiatives followed and I kept learning a lot every single day from this master of the masters, both under the scientific point of view and under the ethics, the sobriety and the foresight point of view.

Hugo lifelong published an extremely high-level literature concerning a vast series of phlebology and



lymphology topics. His major focus on the active mechanisms and the outcomes of compression therapy, allowed generations of health professionals to understand and apply the principles of this cornerstone treatment in acute and chronic venous and lymphatic diseases.

What we can do is to remember his vivid eyes fully open towards an honest scientific research and a fruitful and appropriate clinical practice. His combination of humanity and strictness was a formidable gift, in a world of “cold” protocols, but also full of easy enthusiasms and of industry-based inputs. Embracing the world vascular specialists in his arms, he was able to harmonise a

vast number of controversies in congresses, papers and consensus documents.

His legacy is especially linked to his ability to affirm and demonstrate strong truths to advance the real and useful medical progress; but also, Hugo will be remembered for his determination to balance these evidences and the guidelines with the patient-centred approach and with the need for a continuous update of biomedical science, which is, in fact, a continuously changing base of knowledge<sup>4</sup>.

### Attilio Cavezzi

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## Dr Michel Perrin's obituary

### R Milleret<sup>1</sup>

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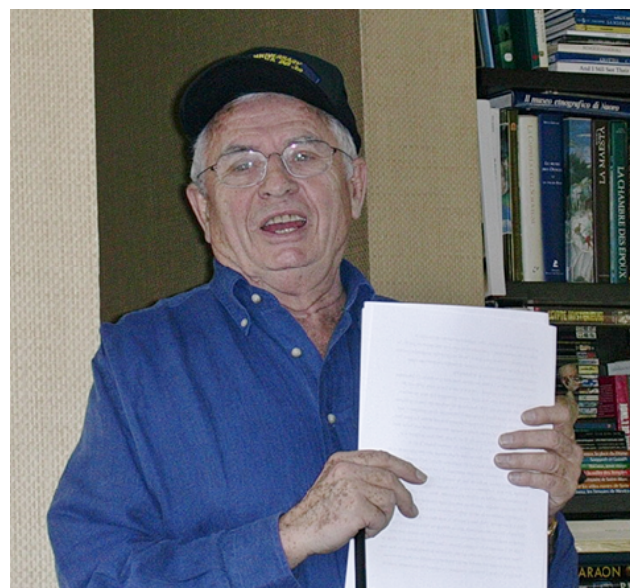
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Michel was a legend since his days as a medical student in Lyon, in the Fifties.

In this time, surgical trainees lived in the hospital and worked days and nights without “compensatory rest time” as is it compulsory nowadays. He was always on the bridge, eager to learn and improve his surgical skills, which were appreciated by all his mentors.



*Dr. Michel Perrin*

Despite being a brilliant resident and a born teacher, he was denied a career in University and public hospital because no tenure was available. Thus he funded a private hospital in Lyon with two colleagues: his Clinique du Grand Large became a world renowned centre for venous surgery, visited by dozens of surgeons from all around the world. Michel Perrin kept an open mind and had a talent to detect and adopt promising new techniques in vascular surgery.

He was one of the first surgeons to organize a vascular laboratory and submit his patients to Doppler studies before and at follow-up, thanks to François Becker, a pioneer of vascular medicine in France.

Michel practised both arterial and venous surgery, focusing his interest on veins 40 years ago.

He taught cryo-stripping, a less aggressive way of removing saphenous trunks, to many colleagues, before endo-venous techniques appeared.

Deep veins surgery was in its infancy: he did not hesitate to travel to Hawaii and meet Prof Kistner to learn his valvuloplasty technique, then he toured the USA and visited the other proponents of these new techniques, particularly S. Raju who became a close friend.

Back in France his department became a European reference centre for deep veins surgery until his retirement in 1998. Michel Perrin had a true scientific mind, he was involved in the development of the CEAP classification, initiated by his friend Bo Ekloff.

At a time when surgeons rarely included meaningful statistics in their publications, he promoted evidence-based medicine, designing clinical studies when most university surgical departments had not yet embraced the practice.

René Milleret

Born in Oran, French Algeria, in 1933, Michel had a childhood memory of a historical event: the Mers-El-Kebir attack of the French fleet by the Royal Navy in 1940.

He developed a life-long interest in naval studies and became an expert, visiting Pearl Harbour several times and was even asked to give a talk on the Jutland battle for French Navy officers.

Another of his fields of expertise was gastronomy and wines: he opened unforgettable bottles for his visiting colleagues, and treated them in the famous restaurants which grace Lyon, World's capital of gastronomy.

Michel was an "Honnête Homme", the French version of a perfect gentleman.

He had a quick and witty mind, irony without wickedness: spending time with him was always a fascinating experience and a pleasure.

He died on March 7<sup>th</sup>, aged 90: a long life dedicated to medicine. Until his very last days, he would answer to dozens of mails asking for his experienced opinion on difficult cases.

The thousands of colleagues who met him over the years will not forget his vibrant and fascinating personality.

# Vascular News

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## Medicine: it's time to change

Report of the Congress 'Medicina: è tempo di cambiare' (Medicine: it's time to change), San Benedetto del Tronto (Italy)

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On February 4th 2023 the Congress “Medicina: è tempo di cambiare” (“Medicine: it's time to change”) took place in San Benedetto del Tronto (Italy). The congress expressed the growing interest of scientific community towards a new vision of biomedicine scientific research and medical practice. In fact, integrative medicine, translational medicine, epigenetics, psychoneuroendocrineimmunology define a broader framework of a less reductionist medical approach to the patient.

A more comprehensive and less drug/technology-centric way of diagnosing and treating chronic degenerative diseases (CDD) is being advocated in several publications in the last decade. Conventional biomedical science of our days suffers from a series of critical issues both in scientific research and in clinical practice; a movement is thus emerging, the so-called "choosing wisely", which aims to bring the pathophysiology of diseases back to the center and above all indicates how to choose the diagnostic-therapeutic path wisely, evaluating the cost-effectiveness and risk-benefit ratio more suitable for patients.

Since the introductory lecture ([https://www.youtube.com/watch?v=ujYlh\\_BeNtc&t=578s](https://www.youtube.com/watch?v=ujYlh_BeNtc&t=578s)), the critical issues of scientific research and medical practice in several fields were highlighted, focusing on the need to carefully evaluate the abuse of medicines and health technologies, also shining a light on the possible conflicts of interest in scientific publications and on the many ethical and deontological problems of current medical science. Numerous publications have in fact elucidated how too often the guidelines are based on studies sponsored by companies, also by virtue of the limited possibilities of independent research. Furthermore, a high percentage (over 50%) of therapeutic approaches lack a high-level validation as to Cochrane reviews, systematic reviews, metanalysis, which explains why several currently used protocols, often based on rigid guidelines, have shown their undeniable limits in terms of efficacy, safety, cost/effectiveness.

Of interest, speakers and audience shared the concept that the complexity of medical science requires a certain grade of liberty of the health professional, who should merge evidence-based medicine with own science and conscience, to reduce overuse and mistakes (medicine is still the third leading cause of death in USA, after cardiovascular and neoplastic diseases) and to be more comprehensive and patient-centred in her/his clinical practice.

Finally, it was highlighted as on one side medicine has prolonged average lifespan (not the maximum lifespan), but on the other side it has not prolonged healthspan, which creates an exponentially increasing number of diseased and disable patients over the 70 years of age, in need of costly drugs and technologies. Hence, this “dangerous” discrepancy brings the risk to rapidly lead the current national health systems and, more broadly, our western society to a socio-economic collapse.

The session about psychoneuroendocrineimmunology (PNEI) was aimed at presenting the clear-cut evidence concerning the strong influence of the early life adversities on adult's diseases, through the complex network of stress resilience alterations. Basically, it was shown how the vast majority of CDD, such as cardiac-cerebral atherosclerosis, neurodegeneration (Alzheimer, Parkinson etc.), diabetes, obesity, autoimmunity and cancer, are strictly dependant upon the dysfunctionality of the mind-body network. More specifically, a great number of studies have documented

the extremely relevant influence of altered management of chronic stress and of an altered lifestyle (e.g. a disrupted sleep) on several metabolic pathways, with detrimental repercussions on the onset and evolution of CDD, on aging and on early all-cause mortality.

Of interest, the assessment of heart rate variability was shown to be a reliable technique, increasingly used and appreciated in terms of investigation of PNEI, psychobiological resilience and specifically autonomic nervous system dysfunction (being the latter one of the main factors).

Diagnostics and therapy of cardio-cerebro-vascular atherosclerosis have been re-assessed through a series of presentations which highlighted the sound data concerning the multi-factorial pathophysiology of this disease. Oxidative stress and inflammation have been acknowledged as the basic pathomechanisms which lead to plaque formation, due to the oxidation of a specific fraction of LDL particles (namely the small and dense LDL). By virtue of these “innovative”, but evidence-based concepts, a reappraisal of the blood screening of atherosclerotic patients has been proposed, aiming at including oxidized LDL, apolipoprotein B and similar biomarkers which assess the true atherogenic biochemical pathways and risk factors.

Most speakers presented a relevant amount of well-referenced literature to dispel the “old” myth of cholesterol as the culprit of the atherogenesis. Furthermore, based on several publications in high-level journals, the evidence concerning the multiple adverse effects of lipid lowering medications on human health was presented. Similarly, it was proven that all-cause mortality is clearly higher in patients with lower levels of cholesterol and LDL, which accounts for the necessity to significantly reduce the use of statins, anti-PCSK9 etc. Furthermore, these drugs were documented to bring little if no benefit in terms of cardiovascular disease (CVD) while inducing, conversely, several CDD primarily due to the serious damage they inflict to mitochondria.

The pandemic of diabetes (diabetes and obesity) was discussed in a few presentations, revealing the extremely detrimental role of inappropriate high nutritional load of carbohydrates (and consequent insulin excess) in current western-style diets. Vice-versa, the beneficial role of specific saturated fats, such as butyrate, in CVD, oncology and other microbiota-related CDD has been highlighted, as specified in sound literature data.

Prof. Pescarmona highlighted the relevance of mitochondria function and of iron metabolism in pathophysiology of diabetes and metabolic syndrome, detailing a few innovative therapeutic possibilities and evidencing a few critical issues regarding a few conventional anti-diabetic drugs. Moreover, most speakers have focused on the extreme importance of a proper diet (calorie-restriction, intermittent fasting and low-carb diet,

intake of non-processed food, etc.) in the fight against most CDD.

The incidence of autoimmune diseases is worryingly growing in the general population, especially in females due to specific genetic and epigenetic reasons. While the current immune-depressive medications tend to cure the signs and symptoms of these patients, it has been outlined how a correct therapeutic approach should take in account all those psychosocial, lifestyle, nutritional and environmental factors which objectively are at the root of these diseases. Though neglected in the conventional medical approach, several non-pharmaceutical measures were documented to be of help in these syndromes, where the improvement of psychological stress management and of erroneous habits objectively play a determinant role.

Biophysics-based treatments, such as photobiomodulation, microcurrents, quantum magnetic resonance/bioresonance, are still little known and diffused in medicine, though a series of scientific publications are documenting the relevant role of mechanotransduction (the basic phenomenon induced by these biotechnologies) in cell metabolism and stem cell vitality/development.

Cell senescence, aging and CDD share a series of deranged biochemical pathways, again based on mitochondria dysfunction, but also on the so-called “inflammaging” (chronic low grade cellular inflammation as culprit of aging and of CDD), altered apoptosis, oxidative stress and so on. Mitochondria role goes far beyond the classical ATP production, being at the intersection of several dysmetabolisms, psycho-biological conditions and stressor-based cellular pathways.

The possible interaction with mitochondria through hormesis (“mitohormesis”) permits to elicit a beneficial increase of psychobiological resilience of the individual, thanks to the exposure to low-dose stressors (such as fasting, cold/heat, polyphenols), which overall brings a better longevity. The complexity of the main hallmarks of aging has been elucidated, and most advanced research on these topics has been presented, explaining how longevity medicine is increasingly becoming of paramount importance in the medical community.

A specific session was dedicated to pharmacotoxicity and environmental toxicity; it was highlighted how statins bring a significantly increased risk of various CDD while showing a neutral or detrimental effect on all-cause mortality; similarly, a large number of studies have documented that proton pump inhibitors are linked to severe adverse effects, namely an increased incidence (OR 1.58-5.40) of gastro-oesophageal-pancreatic cancer, diabetes, asthma, dementia and, intuitively, gut microbiome alterations. Lastly, sound data were presented on: a) the need to combine vitamin D supplementation with vitamin K2 (to avoid side-effects and to potentiate its efficacy), b)



the necessity to administer only the methylate form of folic acid in low dose (well below 1 mg per day), c) the abused administration of opioids which bring a series of psycho-neurological adverse effects, as well as an increased death rate.

Moreover, chemical and physical pollutants were shown to interfere, also under the form of endocrine disruptors, with human health contributing especially, but not only, to metabolic diseases.

The last session focused on integrative oncology, once again presenting some evidence on the relevance of PNEI system on the onset and prognosis of neoplastic diseases. A few complementary treatments, such as oxygen-ozone therapy, cannabinoids and high dose melatonin,

were discussed together with the proposal for a science-backed beneficial nutritional plan, mostly based on a lower carbohydrate intake, for neoplastic patients.

Ultimately, the event has represented a first step in trying to share broader scientific horizons in biomedical discipline, presenting a wide range of evidences against a few currently used therapeutic approaches and in favour of a more integrated medicine, not solely based on drugs and technology, aimed at “choosing wisely” through a less reductionist approach.

The videos of all the presentations (Italian language) of the congress are available at the link <https://www.youtube.com/@associazionenutrage9969/videos>

**Attilio Cavezzi**

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## CHIVA approach to venous insufficiency

Report of the Webinar - MASTERCLASS of the Brazilian Association of Phlebology and Lymphology (ABFL), with the support of the Vasculab Foundation, Mar 28, 2023, Brazil

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submitted: Mar 9, 2023, accepted: Mar 9, 2023, Epub Ahead of Print: Apr 29, 2023, published: Apr 30, 2023  
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**MASTERCLASS**  
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DATE: MARCH, 28 2023  
TIME: 7:30 PM

**The hemodynamic approach to venous insufficiency allows a better diagnosis and more physiological treatments: CHIVA**

Dr. Angelo Scuderi  
Coordinator

Dr. Claudia Sathler  
Commentarists

Dr. Felipe Faccini  
Commentarists

DR. CLAUDE FRANCESCHI  
SPEAKER

VISIT [www.ABFL.com.br](http://www.ABFL.com.br)

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## The hemodynamic approach to venous insufficiency allows a better diagnosis and more physiological treatment CHIVA

Claude Franceschi

Discussants: Felipe Faccini and Claudia Sathler  
Moderator: Angelo Scuderi

Dear Colleagues and Friends of Phlebology

On the 28th of March at 7:30 pm (Brasília time) we organized a virtual meeting that I consider important for those who wish to deepen their knowledge in modern phlebology.

For approximately a century, the treatment of varicose veins was limited to the destruction of saphenous veins (either by “stripping or phlebo-extraction or more recently using laser, radiofrequency, glue or even foam). With that, we were convinced over the years that this would be enough to treat varicose veins and prevent recurrences.

Now, we all had the opportunity to see the inconsistency of these statements. Not only the saphenous vein destruction is not enough to treat varicose veins, but we also know that recurrences occur regardless of the technique used to destroy these veins.

I am now approaching fifty years of uninterrupted practice in phlebology and having destroyed thousands of saphenous veins (I consider myself a “serial killer” of saphenous veins), came to the conclusion that I was really

wrong in the approach to “varicose disease” (I like to use this expression that was coined by the late Prof Mario Degni, instead of simply “varicose veins” as it gives the idea of continuity).

My “conversion” occurred when I met Claude Franceschi and his fascinating theories on venous hemodynamics.

In this webinar, we had Claude Franceschi as a guest, telling us about hemodynamics and his CHIVA strategy.

Claude Franceschi is French and speaks English, Italian and Spanish perfectly. Nevertheless, we provided a simultaneous translation from English to Portuguese and vice versa.

In addition, he was willing to speak “live”, despite the time difference, which entailed an extra sacrifice for him due to the late hour in Europe.

Participation was free

Claude Franceschi talked for 25 minutes about the importance to evaluate the venous disease under the hemodynamic point of view. This approach allowed us to understand the symptoms, the trophic alterations and how to treat the disease more adequately with better physiologic results, avoiding an useless destruction of the Great Saphenous Vein. He described the method CHIVA to treat the venous disease.

After the presentations the Panelists made comments about their experience with CHIVA. They used the opportunity to ask to Prof Franceschi details about the procedure.

After that Dr. Scuderi provoked the audience (about 64 doctors) to do a questions and comments.

At the end, after one hour, the moderator Dr. Scuderi closed the session thanking the participation of all.

I would like to share the comment of **Felipe Puricelli Faccini** (Discussant) about Franceschi’s presentation

*First, I would like to congratulate Prof. Franceschi for the presentation. It is worth mentioning that Franceschi's contribution to Phlebology is greatly important. He joined the medical experience with knowledge of Physics, and previous medical knowledge to develop important knowledge to better treat venous patients.*

*The presentation covered most aspects of hemodynamics. Of course, the topic needed much more than 25 minutes to be fully discussed, but the presentation entices the appetite of the viewers to further study venous hemodynamics.*

*I studied in Brazil and have performed hundreds of saphenous ablations and strippings before studying hemodynamics and migrating to preserve the saphenous vein in all cases. I did this migration because I realized that I could obtain good results without destroying the venous capital of the patient.*

*The saphenous vein may be important in the future of the patient. A saphenous bypass graft may save the life or limb of the patient. The saphenous vein may be the natural bypass if the patient suffers a trauma or thrombosis of the deep system. Furthermore, the saphenous vein kept in place avoids forced re-modeling of veins after surgery and makes recurrence less erratic.*

**Claudia Sathler** (Discussant) underlined several points of interest, listed schematically as below:

### *Questions and answers*

1. **Duplex Scan (DUS): What's the post-test predictive value?** *In the 1980's, Dr. Franceschi was mastering the DUS knowledge. Currently, we have seen this technology losing its significance. Sometimes, DUS use is just for detection of any amount of reflux in the Great Saphenous Vein (GSV) to justify its inclement ablation.*
2. **To whom belongs the "Onus Probandi"?** *If I am recommending to spare the GSV, I have to give less probation than if I wanted to ablate it. This kind of mentality has to be affirmed, nowadays.*

3. **As for me,** *I have seen many patients in which the GSV was eliminated worsening in the **short term**.*

4. **OUTCOME** *What is the outcome to be expected after treating Chronic Venous Disease? The 93% probability of having his/her GSV occluded in the first year? Not at all! The real Outcome is to give them a better quality of life, to reduce or abolish the specific venous symptoms and the greater time possible free of varicose veins.*

5. **Meaning of the term "reflux"** *This term "reflux" is losing its relevance... It's meaning is fading in the actual scenario because it has been trivialized. It would be more effective to think about "Leak&Anarchy". The most significant points of reflux related to vein enlargement.*

6. **"The minimal invasive fallacy"** *The most important aspect is not to ablate with few trauma but to NOT ABLATE the GSV, if it is possible and effective to do.*

7. **Take home message:** *In young people (<45 yo), CEAP C1-C2, the first thinking is to spare the GSV. We need more randomized controlled trials to reduce the uncertainty of this issue.*

Finally, I thank Claude for his teaching mission and Felipe, Claudia for their passionate comments.

**Angelo Scuderi**

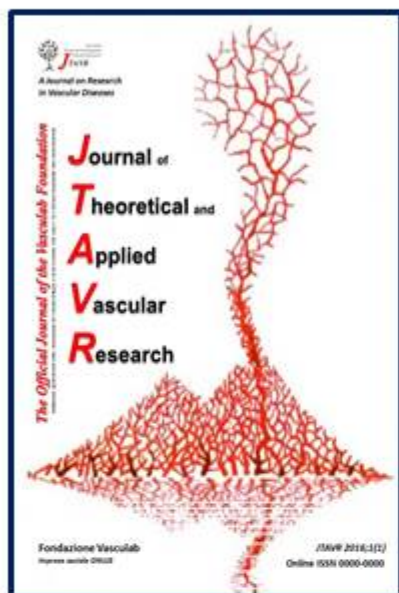
*President of the Brazilian Association of Phlebology and Lymphology. Past President and Emeritus President of the Union Internationale de Phlebologie (UIP)*



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# **HEMODYNAMIC SAPHENOUS PRESERVING PROCEDURES IN CHRONIC VENOUS DISEASE**

**CAN, AND SHOULD, WE PRESERVE THE SAPHENOUS VEIN?**

**EDITORS:**

**FELIPE PURICELLI FACCINI**

**CLAUDE FRANCESCHI**

**STEFANO ERMINI**





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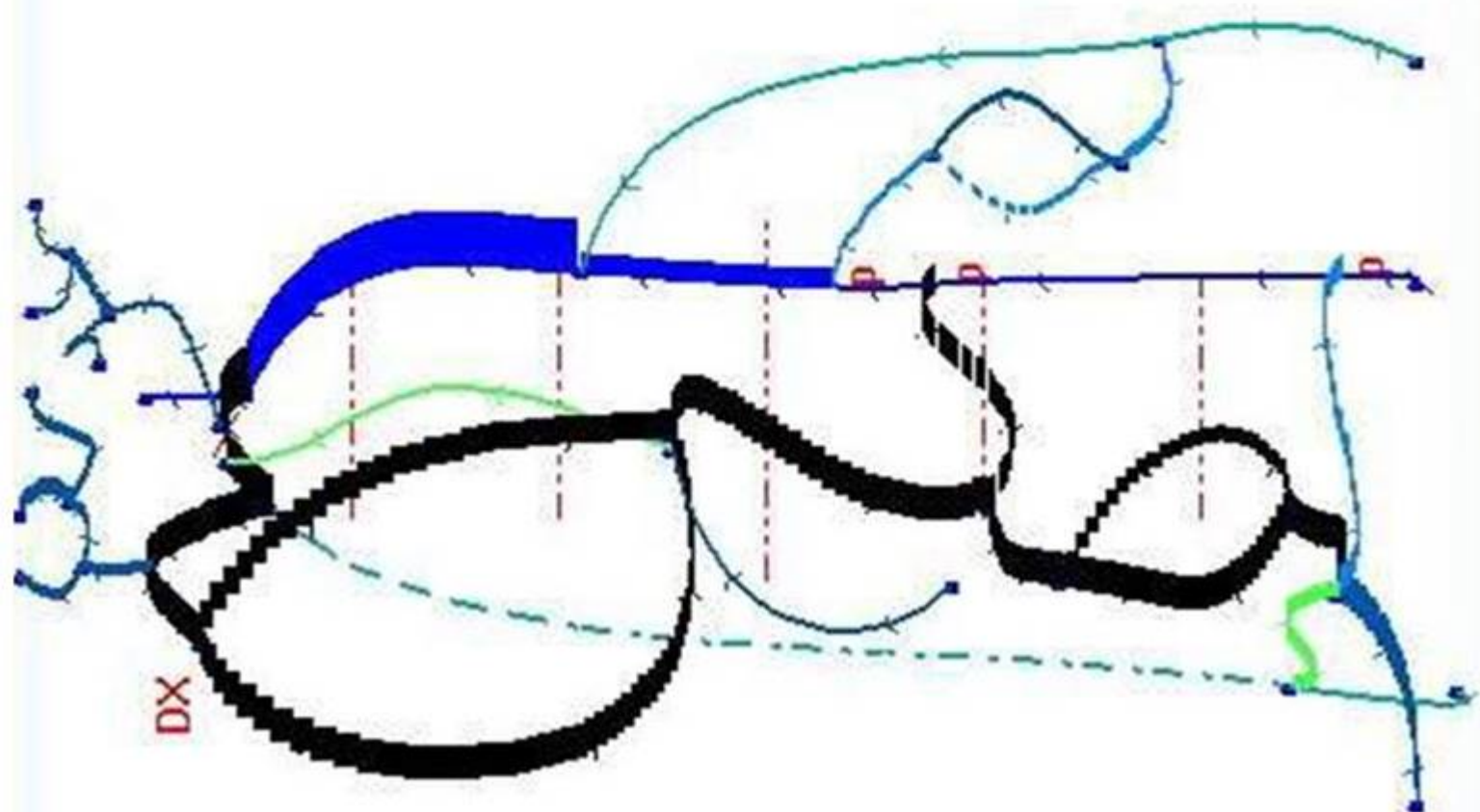
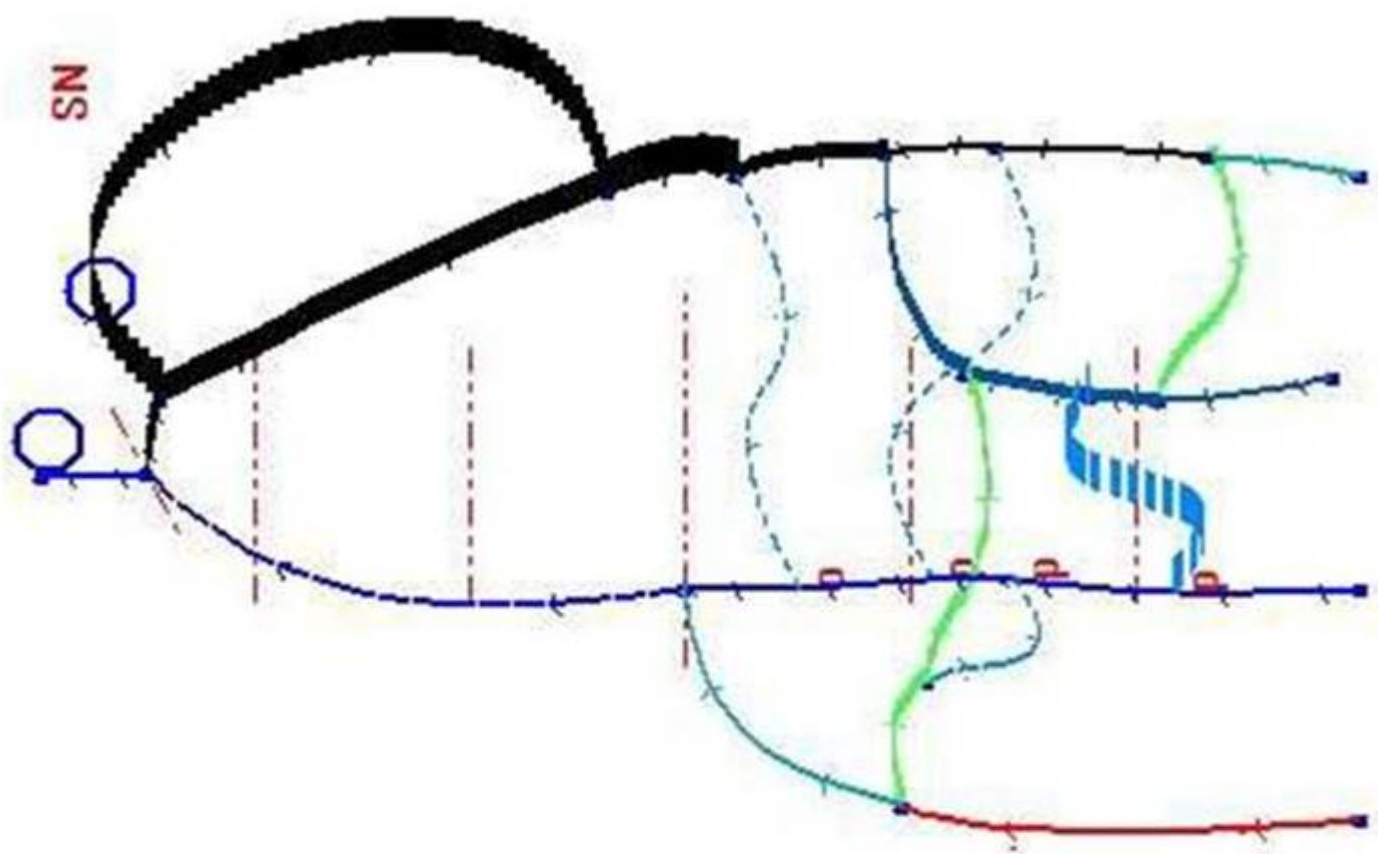
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3) Accepted members, mainly people of several professions involved in the management of vascular diseases, must respect generic "Netiquette" rules (Net Etiquette), as also the specific rules and the discussion topics listed in the first message they receive from the List.

4) Topics are many, but they all are scientific ones.

5) Direct consultation with patients is not allowed.

6) Drugs or medical devices promotion is forbidden inside the messages (as also hidden in messages, e.g. mail address of companies and their web sites).

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# Journal of Theoretical and Applied Vascular Research

## The Official Journal of the Vasculab Foundation

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