

## A Change of a Paradigm Under the Scope of a Cardiovascular Surgeon. Remodeling of the Great Saphenous Vein Instead of Ablation for Preservation of the Patient Anatomical Capital

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### Abstract

The presented work is an ongoing study by using a combined approach of sparing surgical techniques plus LASER 1470 nm for sparing the Great saphenous vein (GSV) at early hemodynamics stages.

Peak reflux Volume lower than 30cc by second, Total Reflux Volume (TRV) between 10 and 100 cc/s using low LASER LEED and no tumescence anesthesia for preservation of patient anatomical capital and the actual recovery value of this conduit for a future arterial bypass.

**Keywords:** *Preservation Human Anatomic Capital; Great Saphenous Sparing Methods and Remodeling; Low LEED LASER Use*

### Background

The purpose of this work into a Cardiologic Journal is to spread the relevance of the GSV as a future source of a bypass among the cardiologic universe and general physician's awareness of the urgent need to avoid indiscriminate aesthetic ablation of this conduit without accurate hemodynamic data based into solid ultrasound data.

It will explain the fundamentals of GSV preservation or sparing techniques and the actual concept of Anatomical Capital Patient preservation in a day-by-day older population.

Nowadays this concept is ignored by a current of phlebologist, dermatologist, aesthetic specialist and endovascular interventionist that only are focused in the present aesthetic demands of young patients without a proper explanation of the actual value of this conduit in vascular surgery.

The bypass with *in situ* bypass with GSV in critical limb ischemia and in coronary bypass have shown as will be described in this article that the GSV patency rate is almost similar to the internal thoracic artery (ITA) and the radial artery.

I believe that is my duty to aware the general and cardiologist medical specialist of this new vision and their commitment to alert their patients into this not explained concept contrary of the first medical objective, the patient health as first goal.

The work presents a new method adapting new Tec niches with LASER with low LEED combined with actual sparing techniques.

The Ethical Committee of the Argentine Society of Phlebology approved this research study and Lymphology (SAFYL) by June 2013.

The universe of general physicians and cardiologist must be taken in care some questions or issues that are ignored by them for ethical.

Nowadays, has relevance spare the GSV?

Is its great saphenous vein ablation the only method for treatment of venous insufficiency?

The aesthetical GSV ablation without ultrasound databased on new scientific medical evidence is ethical?

When and how we must indicate GSV Ablation?

How many phlebologists are trained in Ultrasound and know the new data, for instance total Reflux volume (TRV)?

Which is the total reflux volume that allows GSV preservation and which could be the new approach strategy?

Our hypothesis was based to reduce the area already dilated by utilizing the property of the laser 1470 nm to shrink the parietal collagen thanks to its affinity by collagen water.

The use of endovenous LASER with LEED < 24 J/cm for its water affinity's is an ideal medical tool to reach this goal reducing vein diameters by collagen shrinkage.

By doing so we preserve the GSV, all the reentering perforators and close, all reflux points in a second stage.

The saphenous-femoral junction (SFJ) is only reduced in diameter at 5 cm from the junction, no crossectomy is performed avoiding skin incisions source of neoangiogenesis.

Our hypothesis started in practice trying to reduce the dilated saphenofemoral junction (annulus) with an internal LASER valvuloplasty.

The first work was published by the Argentine Society of Phlebology in 2013 (SAFYL Journal) [1] and a modification was published in a short international article in 2013 [2,3].

Then we have added into our investigation on the Laser collagen shrinkage properties under hemodynamic concepts sparing surgical techniques to avoid the tributaries action of preload of the GSV and their inflammatory contribution releasing necrotic factors and cytokines.

Which diameter could be accepted to spare the anatomical patient capital? A vein diameter that allows greater peak reflux volume greater than 30 cc/sec, Greater than this number affects the muscle pump performance and only veins that enter in this ultrasound peak analysis could be ablated.

The studies made for Raju Md [4] showed that GSV less than 5 mm (small diameter) does not reach enough peak reflux volume. The first attempt for vein sparing plus valvuloplasty was done using radiofrequency but results showed an unacceptable number of thrombosis of the GSV as well as a high recurrence rate [5].

## **Objectives of the Study**

The first purpose of this research was to find a new non-ablative strategy avoiding the indiscriminate destruction of the patient anatomical capital under the principle of first not patient damage.

Nowadays sustained by Prof Franceschi scientific evidence based in hemodynamics and the recovery of importance of the role of GSV as a suitable bypass must be highlighted the "non-ablative concept".

The GSV patency obtained with the non-skeletonized GSV technique, for its use as a bypass in critical limb ischemia and in coronary position brings up a new paradigm; indiscriminate GSV ablation based in aesthetic demands only must be reconsidered.

The GSV is ablated today, mostly, without enough or incomplete hemodynamically data obtained by ultrasound examinations.

The consequences are a high varicose vein recurrence, bigger number of REVAS and the destruction of veins between 5 to 7 mm suitable for potential use as a bypass or venous fistulas in chronic kidney disease.

Two surgical technique are available today instead initial ablation and are sustained by the number of patients and the follow up with less recurrence.

They are CHIVA hemodynamic technique and the ASVAL technique.

The work presented here is a research study in progress looking for a third sparing strategy, exclusively for the GSV preservation combining concepts of the two methods mentioned before adding the LASER EV with low LEED below 24 Joules/cm. for recovery of vein diameter the key stone of the Total Reflux Volume.

As mentioned, is an ongoing work updating old concepts based in new data based in ultrasound (US) data and spreading non-ablative approaches for the treatment of Chronic Venous Insufficiency.

Great saphenous vein ablation is based only in reflux time evaluated by US and without complete knowledge of physics laws, pathophysiological concepts and a real number of recurrence after ablation by any method, surgery, RF or LASER [6-10].

The submitted work is based on the actual medical evidence presented at the Hemodynamic Rome Consensus 2016 that have evidenced that area and not time is the most important factor in the physiopathology of CVI.

The Hemodynamic Rome Consensus directed by Lee MD have modified old concepts of an unique origin of CVI based in an update of hemodynamically data provided by the evolution of Ultrasound researchers worldwide from Trendelenburg up to date [11].

The “descendent theory” considered as the main responsible for CVI during decades, ergo the gravitational Pressure, explained by Newton law is today only a partial comprehension of CVI physiopathology [12,13].

This theory only explained almost only less than a half of its physiopathology.

New discoveries considers others factors as the “inflammatory theory” caused by leucocyte activation and enzymatic mediators, such as the increase of Inhibitory enzymes anti-MMP, leukotrienes liberation, cytokines and necrotizing factors [6-10] released by microvascular tributaries of 5<sup>th</sup> order as the beginners of parietal vein wall damage [14,15].

An important role is the lack of fascial support of the extra fascial tributaries because they are more prepensely to dilation by action of the shear stress and the less circulatory speed (9 cm/sec) one of the triggers of leucocyte activation and inflammatory cascade [16].

These factors provide leucocyte relenting and their activation, acting as releasers of enzymes that affects the valves of the veins.

Extra fascial tributaries plays other function as increase of volume and pressure acting as a real preload over the GSV.

As mentioned physics and his, hemodynamically consequences have a crucial role in this new paradigm and they are the, Bernoulli principle, Laplace, Castelli and Pouissele laws.

The Bernoulli equation explain the origin of shear stress and the transformation of potential Energy into kinetic one. This energy is released by the amount of volume and pressure given by the tributaries acting as a preload of the GSV that produce parietal vein wall damage.

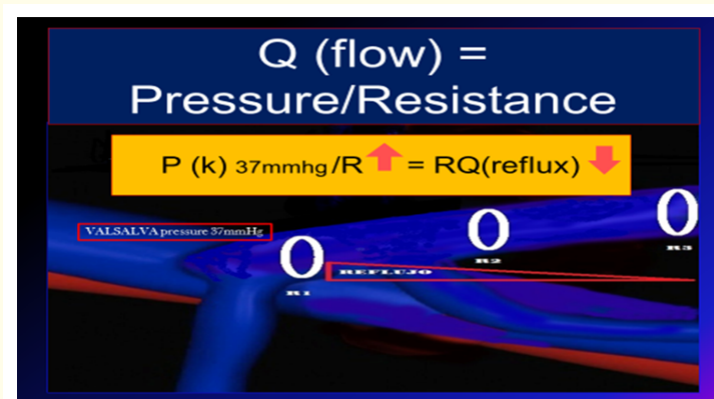
The inflammatory enzyme action and the shear stress injures the GSV parietal wall collagen and destroy the tiny valve leaflets.

This receive the name of ascending theory and describe the origin of CVI [17-19] starting to an infrapatellar extra fascial level, not unifocal as was described by the descending theory; its origin is a multifocal one.

For the mentioned reasons all are guilty of venous dilation and should be treated as soon as possible in a multiple action joined in a new strategy as follows.

The inflammatory enzyme reaction must be eliminated by decreasing the shear stress freed by tributaries counteracting in this way the factors that produces parietal dilation and leaflets valves damage [20].

The stab avulsion of tributaries will remove the enzymatic factors and will reduce the preload energy over the GSV explained by Laplace law: Energy = Pressure x Volume.



**Figure 1:** Flow formula.

Removal of preload and annulation of the enzymes factors must be the key stone in this strategy based on new concepts based on physics and hemodynamic.

Ablation of the venous system is anti-physiologic concept, his function is to return blood to the right heart. We must look for another method based in hemodynamics for it function restoration.

The submitted concept is contrary to commercial interest looking for new ablation methods that don t care about the future of an older day-by-day world population.

The hypothesis presented at your concern will try to remodeling vein dilated areas [21] acting as resistors (Laplace flow law). Area and not time is the most important factor described by the Hemodynamic Rome Consensus. Ablation based in time is a hemodynamic mistake concept.

The desired goal will be consumption the Valsalva pressure front line with an increase in resistance and decrease the flow volume towards distal.

The medical tool for achieve this proposal is the use of endovascular LASER 1470 nm with a LEED < 24 J/cm. This amount of energy only produce collagen shrinkage over the selected dilated areas without damage of the endothelium, the media and adventitial layer, noting that the half reduction of the area increase 4 times the resistance to flow by Laplace law.

The Valsalva pressure and the distal decrease in flow obtained by remodeling of the area counteract the hydrostatic phenomenon of the descendent theory. As the CHIVA method describes the reentry perforators is always preserved. All the reflux points are closed with exception of the reduced saphenofemoral junction (SFJ) Area that remains open during calf systole allowing a proper ascendant drainage. Crossectomy at this point is not performed, only SFJ remodeling.

### **Material and Methods**

The study was done under signed informed consent by all the patients studied. The Argentine Health legislation only accepts vein surgical procedures performed at the surgical room.

The initial development research study started in 2011 and recruit up to date 38 patients only (29 women and 9 men, CEAP 2-5 classification) for the lack of economic support. The study was done without any reimbursement and was t free of payment.

It was made divided in two phases.

The first goal was try to reproduce our hypothesize in a patient. This was obtained in one REVAS with a residual GSV at the thigh reducing the diameter with LASER low LEED below 24 j/cm under US vision without occlusion. The result was a reduction in area by collagen shrinkage.

The second phase was done by area reduction with the same parameters using US to analyze pre and post peak reflux and Total Reflux Volume TRV.

As explained the area reduction at GSV dilation acts as serial resistors by reducing flow according the Laplace law; in case of the venous system the venous reflux.

The hemodynamic consensus redacted concluded that the area is more important cause of reflux than Reflux Time (RT) as previously expressed.

Reflux Time is only a qualitative index without a quantitative value of the amount of total reflux volume (TRV).

The time of reflux more than 0,5 seconds is a qualitative index and lacks value to indicate an ablation because does not measure the amount of volume Reflux, the cause of evolution severity by alteration of parietal, intravascular pressures and fluids filtration cause of skin deterioration.

We therefore rely on the current concept of Prof. Takashi Yamaki who evaluated quantitative reflux indexes and Total reflux volume as index of future severity Total reflux volume is the most important index of venous reflux because is a quantitative index of disease severity. His formula measures Peak reflux volume, TRV and its correlation with IVC severity score [22-24]. The Prof Takashi Yamaki formula expressed;  $TRV = \text{Mean reflux peak} \times \text{Area} (r^2) \times \text{reflux time}$ .

The preoperative mapping is done by the surgeon the day before remodeling. Volume index, maximum peak reflux volume, median reflux volume, time and area are registered. Two measurements in dorsal decubitus (surgical position for remodeling) are taken under Valsalva maneuver 40 mmgh each.

Remodeling with LASER 1470 nm with low LEED only requires sedation under control by an Anesthesiologist. Tumescence are not used for the ultrasound images distortion. The puncture for fiber introduction is done under local anesthesia by Seldinger technique.

The protocol used required prophylaxis with low weight heparin according with the requirements for TEP prophylaxis (3000 IU SC) of the Medical Institution where the study was done.

A radial mini-slim fiber is used under US control in all patients studied.

Our aim was to apply the endovenous LASER with LEED < 24 J/cm to reduce the area already dilated by utilizing the property of the 1470 nm emission to shrink the parietal collagen as previously was mentioned. All the reentering perforators are respected and perforators reflux points closed.

The technique to be used will depend on whether the venous dilation is segmentary, as is the case in almost 58% of cases as Głowiczki Md mentioned Engelhorn Md work at the International Vein Congress 2106 or multisegmentary [25].

The sustained hypothesis is based on the physical principle that express that the reduction of the radius by the half, produces a reduction of the distal flow with a factor 8 times of its initial value.

This diameter reduction (Area remodeling) is the key to obtain a hydrostatic column fractioning with LASER Resistances instead of ligatures.

The Valsalva reflux is consumed when passes the area reduction because Flow is inversely proportional to resistance. The reduction of dilated areas counteracts the Valsalva Pressure front line by decreasing diameters thanks to collagen shrinkage.

As the reader of this work can see some concepts of the CHIVA technique are used as the closure of all refluxing points and preservation of reentry perforators.

The reentry points to the N1 system allows reverse flow to the N1 trough the reentry perforators and physiologic systolic return trough the GSV junction.

At the end of LASER Remodeling all the extra fascial tributaries (GSV preload) are resected by mini phlebectomy accordingly with the Bernoulli equation;  $E = \text{pressure} \times \text{volume}$ .

This reduction of energy is equal as a reduction of shear stress over the GSV.

Once the sheath was introduced the fiber is advanced to reach the first selected point for LASER remodeling with a LEED of 24 joules/cm during 6 seconds, over a distance of one centimeter. The LASER effect on the vein wall is a white ring (collagen shrinkage) and an AREA reduction.

The surgeon could repeat LASER emission until the desired Area reduction is obtained by US measurements mostly the half of the original value.

Thermal relaxation time should be respected to avoid the sum of temperature at parietal level that could lead to endothelial damage by caloric recruitment.

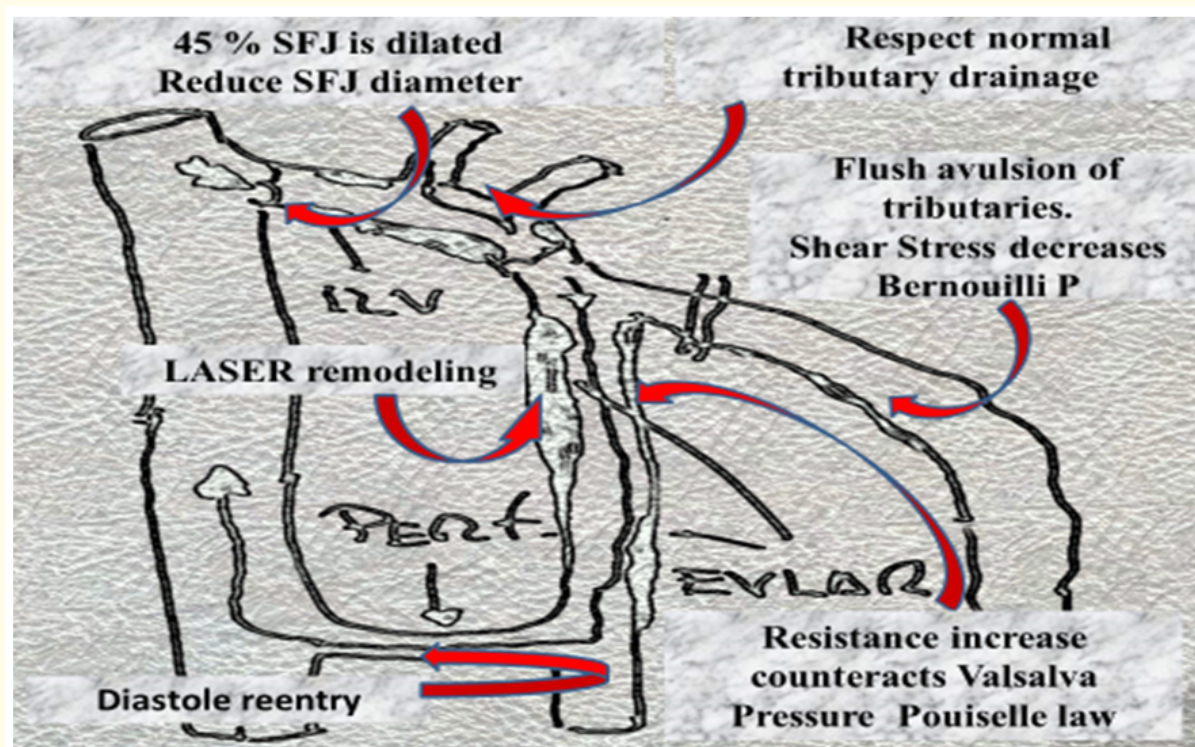
If they are multiple segments dilated fragmentation of the hydrostatic column is done by area reduction at 5, 10, 15, 20 and 25 cm of the Sapheno-femoral Junction or only at the dilated site if it is segmentary. The diameter saphenous-femoral junction (SFJ) is only reduced at 5cm from the junction, no crossectomy is performed avoiding skin incisions and neo angiogenesis



The entire vein is never treated.

As expressed the goal is the reduction of reflux by reduction of dilated vein areas without venous occlusion.

Once the previously selected areas by US mapping are treated the LASER procedure is complete. We indicate elastic bandage and early wandering with ultrasound control under Valsalva in the operating room in supine decubitus.



*Figure 2: Diagram of the technique.*

## Results

The results obtained were tabulated and an algorithm was prepared. It divided into three stages based in ultrasound considerations obtained.

The statistical analysis showed a statistically significant reduction in the reduction in diameter as well as in the Total Reflux Volume of reflux.

The differences obtained pre endovascular LASER Remodeling (EVLAR) and post EVLAR showed a median of 0.2 with a p value of < 0.0001.

The statistical difference of the median yielded a value of -190 ( $p < 0.0001$ ). The area's reduction was 43.2% with a reflux reduction of 97.9%.

Ultrasound considerations			
	First stage	Second stage	Third stage
Great saphenous vein diameter	< 5mm	> 5 - < 8mm	> 8 mm
Peak Reflux Speed	< 30 cc/sec	< /= 30 cc/sec	> 30 cc/sec
Total Reflux volume	< 10 cc/sec	10/100 cc/sec	> 100 cc/sec
EVLAR plus tributary avulsion	+	+	
Internal Laser Valvuloplasty		+	
Ablation			+

Figure 3: Ultrasound considerations.

Clinical improvement of patients changed to class CEAP 1.

Accordingly with Parikow MD [26], the results depend of the amount of energy used LEED Joules/cm. Over 70 joules/cm the damage of the vein walls begin increasing at higher LEED usage.

The use of a low LEED < 24 j/cm. does not produce irreversible damage of the vein layers and the endothelium is not damaged as have evidence by the re-endowment post-angioplasty damage [27].

The endothelium at this LEED revealed its capacity to self-regeneration thanks to the activity of the of media layer blastemal cells.

Routine Ultrasound monitoring is performed on the third day in external offices by the surgeon.

The obtained from low LEED non damage of the vein wall was put in evidence by the histopathological study performed and does not cause complications in follow-up or intraoperative.

One *in vivo* histopathological study was performed in a section of an accessory anterior vein, 9 mm, previously of an ablation of one GSV more than 16 mm and incompetent AAGSV.

No endothelium damage was put in evidence, only was observed redirection of collagen fibers by shrinkage shortening and vacuolization. No venous thrombosis was shown.

During the follow up were registered four occlusions of the remodeled GSV but two of them showed spontaneous recanalization.

The physiopathological explanation of this spontaneous recanalization is that the blastemal lay of myogenic cells was not damaged.





**Figure 4:** Histopathology.

One occlusion was registered in a patient with a great vasospastic component. The preoperative diameter was 7,5 mm and only by fiber contact, it contracted to 4 mm.

In our concept the two occlusions explanation were the first; a 32 years young woman had a preoperative US a diameter of 7,5 mm, during the procedure diameter reduces spontaneously to 3 mm. In young women, the collagen is more reactive and this could be a possible explanation of vein spasm [28].

The second failure was too a young lady with higher wall reactivity for stress and the combination of a radial fiber thicker than the radial mini-slim and which is nearness of the vein wall. It could delivered greater fluency and destroy the medium layer. It is normally founded in stripping specimens CEAP 4 - 6, a thicker wall that is usually less reactive.

## **Discussion**

In the XXI century thanks to the advent of new concepts given by US, we are attending a new paradigm, the preservation of patient s anatomical capital instead the ephemeral success of ablative strategies.

It is remarkable the current concepts about the physiopathology of venous chronic Insufficiency (CVI) to treat each factor that are responsible.

I will emphasize the origins that begins affecting the SVS expression today by two theories.

The first one referred by Trendelenburg as a gravitational disease, the descending theory, sustained by The Newton law.

The alteration of thoraco-abdominal pressures, the gravity law over the hydrostatic pressure column and in the few casas the common femoral vein insufficiency.

The newer one explains its origin in the inflammatory process by releasing of enzymes, alteration of metalloprotease-antimetalloproteases balance, liberation of necrotizing factors and leukotrienes.

This receive the name of inflammatory or ascending theory originated by leukocyte activation at the fifth order epifascial tributaries.

Should be take in mind that the speed into the extra fascial system is the lower of the three systems, 8 cm by second which explains the remora and relenting flow with leukocyte activation.

The inflammatory factors acting in conjunction with physics factors as Shear stress caused by the energy liberated by the product of volume and pressure of tributaries, damage the superficial system  $N_2$  acting as venous preload, generates valvar leaflets damage, wall vein lesions and imbalance of parietal vein collagen.

All above mentioned, causes recruitment of new tributaries at distal point by valvar unidirectional flow, generating a re-entry circuit and damage of remaining normal valves distally and progression disease.

Under the new paradigm about protection of patient anatomical capital and the ultrasound data, we will draw strict limits to ablation as peak reflux volume (greater than 30cc by second and area).

This value was revealed by Raju Md investigations and light up the ultrasound values that affects the calf muscle pump.

The peak reflux volume is the index that affects the triceps solar muscle contraction.

Greater values than previously mentioned, produce an alteration in the Ejection fraction (Starling law), by separation of actin myosin proteins, increase the intravolume pressures and compliance disturbance conducting to muscle failure contraction.

The physiopathological cascade is an increase in residual volume, compliance restriction.

The intramural pressures increases and generate a calf muscle ejection fraction decrease, when peak reflux achieves more than 30 cc/second.

As explained, today that the reflux time is not an index of ablation and much less if the vein is lesser than 6 mm because they cannot achieve that maximum peak of Reflux.

The hemodynamics studies done by Zamboni Md demonstrated that the insufficient reflux annulment would allow the preservation of the GSV without sapheno-femoral disconnection based on the RET maneuver (reflux elimination test with duplex ultrasound) [29].

The single resection of preload tributaries flow showed a reduction into the GSV diameters during the screening of US follow up [29].

After a surgical ablation, hemodynamic conditions return to normal status; however, a short time later, as the conditions of deep systolic calf.

Hypertension remain present, a recurrence of varicose veins are the final result, which is called "paradoxical phenomenon" [30].

I emphasize this "corner stone "concept; Cochrane Database System study [31,32] put in evidence that the risk ratio is greater with ablative methods 0,63% vs 0,78%.

International bibliography review revealed few three years follow up post-ablation recanalization rate. Two remarkable works were submitted, the first done by Pannier MD [33] the asymptomatic registered percentage was 11.9% into the study the Van den Bos MD meta-analysis and the IRWIG Study [34,35].

The first showed up that the GSV remains open without reflux or minimum one (Time Reflux) and asymptomatic patients class 1.

Similar finds, not reported bibliographically, only obtained by oral medical exchange with colleagues revealed similar data after LASER ablation, RF and FOAM. These data were considered "failures under the scope of industrial objectives; ergo Occlusion rates; but we must reconsidered if they are not the ideal for patients, symptomatic improvement and preservation of the GSV human anatomical capital.

The initial results of the endovascular laser showed a 4% saphenous vein recanalization rate. Under our modest point of view, it was as a "success" for the patient, because it is mandatory in medicine to restore function, not just to remove the organ.

What would be the mechanism that would explain as a rechanneled vein with minimal reflux measured by time to improve to class 1, asymptomatic to the patient with post-ablation recanalization by LASER; FOAM OR RF?

The answer is on a physics, the reaction over the Vein wall would causes an Area reduction by collagen contraction.

As the TRV depends on the area its reduction would, as happen in the submitted research about LASER remodeling, a consumption of the reflux front line generated by the Laplace law; Flow is proportional direct to pressure and inversely proportional to resistance.

The results will be patient asymptomatic improvement by reduction the peak reflux volume below 30cc by second and TRV reduction because this is an severity index that explain dermatosclerosis and the final venous ulcer.

Evidently, these results did not meet the industry's ablation occlusion target.

Regardless the results of patient symptomatic improvement by reflux reduction, few tried to explain which was the cause of symptomatic patient improvement, with the vein rechanneled and reflux present, after heat induced ablative methods.

The objective of ablation theory was try to obtain a definitive vein occlusion (100%) or the longest it can without REVAS.

Therefore, the industry paying attention only in occlusion rates considered their initial results as a failure evaluating occlusion as the ending point they do not take in mind the symptomatic improvement of the patient by area reduction and TRV reduction for a lack of Hemodynamics and physics laws knowledge.

This work was developed according to the new concepts of post laser asymptomatic rechanneling after emissions with low LEED and the misconception of failure IN THE LASER follow up obtained with the REVATA study that warns about recanalization in asymptomatic patients with low volume Reflux and diameter reduction [36].

Today a new concept is emerging; this newer concept is the use of non-ablative techniques that can use LASER as a remodeling tool for symptomatic improvement, respecting the anatomical capital of the patient.

An ethical medical behavior must be adopted because is our commitment preserve this source of bypass in revascularization arterial surgery in a day by day elderly world population The Ablation of the GSV must not be indicated without a proper explanation to the patient about the actual value of this conduit.

This point of view is not take in mind by phlebologist many without experience into ultrasound and arterial disease.

We must share this point of view with cardiologist and general physicians as showed by Tracci MD [37].

At every surgical revascularization, the vascular surgeon must obtained a suitable venous graft and chooses sections of GSV of caliber suitable to make one bypass, eliminating sectors with gulfs or very dilated. This can only be done if there if the GSV is still present.

The collagen shrinkage post electromagnetic radiation (LASER or RF) reduces the venous diameter only at selected vein points and can obtained suitable segments for revascularization.

The basis of preservation of anatomical capital in favor of ethical commitment to the patient is described into this work, especially young patients who consult many of them “only” for aesthetics reasons and not receive complete information, especially those with vascular risk factors, diabetes and dyslipidemia.

Application scenarios of this strategy for anatomical preservation (sparing concept) could be: (I) reflux of the saphenous vein with continent femoral valve (ideal saphenous veins diameters to apply this strategy are veins greater than 5 mm and less to 9 mm); (ii) patients with insufficiency triggered by tributaries and secondary dysfunction of the terminal, preterminal or saphenous-ostial valve; (iii) segmental venous dilatation; (iv) young patients and patients with arteriosclerotic risk factors or juvenile diabetics Saphenous ducts preservation, even with reflux below 30 cc/sec, for future revascularization surgery of lower limbs critical ischemia must be emphasized.

With this strategy of sparing surgical principles adding LASER use as a surgical instrument for remodeling the dilated GSV areas, three years follow up reveals GSV open with Area reduction and invers flow during diastolic muscle relaxation.

Ultrasound analysis revealed that the venous flow was during the muscle systole towards upstream and in diastole towards downstream looking for the re-entry perforator. This was improperly called venous reflux; Franceschi MD described it “inverted flow”.

The follow up showed two dilations with minimal total Reflux Volume. The first was by new Hunterian perforator, the most common physiologic cause of REVAS, the second one a saphenous femoral dilation and a common femoral vein insufficiency due to disease evolution due to overweight, sedentary and obesity.

These data are similar to the few studies at three years post ablation or FOAM because the natural evolution of venous disease is 21% of new veins.

The theory of Prof Recek showed symptomatic improvement after GSV ablation but only by short time because the hemodynamic conditions remains after surgery and worsen by deep venous hypertension because the disease origin are not changed only postponed.

The Recek’s Paradoxical Phenomenon has not been evaluated properly as showed by the lack of multicentric analysis to evaluate the post ablation REVAS, the hemodynamic consequences of privation of the anatomic capital and the deviation of systolic flow to epifascial veins.

As was perfectly described the N1 system is anatomic interconnected with the N3 system causing recurrence by flow systolic deviation to the N3 extra fascial network.

This is the cause of opening closed embryological epifascial veins not protected by fascial and the cause of recurrence.

The bibliographic research about recanalization after any method only mention the treatment of choice, mostly FOAM.

A great pitfall is the lack of actual methods of evaluation of Reflux, only time Reflux is mentioned maybe not presented in the literature for the lack of proper knowledge.

A turning point and fundamental stone to restart and evaluate the hemodynamic-based ablative methods that sustain them was the Cochrane database System. This study have demonstrated that the risk ratio of ablative surgical techniques has a risk ratio greater than the sparing techniques (non-ablative methods RR 0.63%, ablative RR 0.78%).

This data has not being shared into international meetings and the question is why?

Therefore, day by day, has greater importance the hemodynamic based approach described by Prof Franceschi; CHIVA; which is in a full growth up in China and Latin America because it reach two goals; correct the vein dilation and the hemodynamic status and most important, preserves the Great saphenous vein with calibers suitable for an arterial Bypass.

Other spring technique is the method developed by Chastanet and Pittaluga, the ASVAL method. It has a limitation due to the diameter of the GSV, it can be done only in veins no greater than don't exceeds 10 mm.

Under the point of view of professor Jawien the gold standard should be counteract both mechanism of valvar damage, counteraction against inflammatory process and avoidance of pressure increase by tributaries, GSV preload.

Our hypothesis was to reduce the saphenous reflux by combining the sparing preservation techniques for GSV and the reduction of the saphenous area by endovascular LASER remodeling (EVLAR).

If we increase the vein resistance to the Valsalva pressure front line, by non-occlusive vein diameter reduction, it consumes the front-line pressure.

All three described methods and strategies obtains same goals, reduction of GSV diameter, spare the GSV, obtain symptomatic patient s improvement and preserve this important bypass resource of human anatomic capital.

The ablation techniques does not allow the use of GSV because they destroyed veins with diameters suitable for this important purpose.

The sparing methods are usefulness and must be used at initial stages of the IVC according to hemodynamic parameters obtained by ultrasound; peak of less than 30 cc/sec and a diameter less than 10 mm.

The reason that explain the flourishment of ablation methods of the GSV was due to an improper surgical extraction during the bypass surgery. The vein extraction used in cardiac surgery was implemented by Favalaro MD for coronary revascularization at the Cleveland Clinic and open the respect of the GSV.

Cardiac surgeons obtains suitable GSV segments and avoid others dilated or of big diameter.

However, we have done a big mistake, the GSV skeletonization destroy it wall nutrition, vasa vasorum destruction, transforming a vital vein into an ischemic one. The poor patency rates were based on the negative influence on the vessels nutrition done by the surgeon during extraction of the vein.

This lack of nutrition produces a very low patency at 7 years.

This pitfall have replaced the GSV for arterial conduits; radial and internal mammary artery.

The respect for GSV preservation disappeared for this lack of patency and stripping have expanded in number worldwide mainly for aesthetical reasons.

Nevertheless, sunshine always arises and the GSV recover its importance as a suitable bypass mainly in critical distal limb ischemia.

"The non-touching the great saphenous vein technique", created by Dreifalt And Souza, without vein skeletonization, was a great step because the GSV showed similar patency to radial artery and ITA [38] and preservation started again.

The new paradigm recommends change the GSV extraction, not allow indiscriminate ablation of GSV and based ultrasound strictly evaluation.

This conservative change of view by sparing under hemodynamic conditions, by remodeling the GSV or only the ablation of tributaries as ASVAL does, allows us to sparing the classical conduit for coronary position bypass [39,40] critical limb ischemia [41-43].

As a scientific support of this concept the Hemodynamic Rome Consensus have showed up that is not correct the Reflux time as ablative index, is the total Reflux Volume that depends on the peak Reflux Volume and Area as the boundaries between sparing or ablation.

## **Conclusion**

The submitted work is just an ongoing development research based on physics, capital patient anatomic capital, sparing concepts techniques adding new use of LASER emission.

Follow-up showed a reduction in area and total reflux volume with asymptomatic patient and open GSV.

In the immediate postoperative is stabilized a reversal flow that some catalog as reflux, being in fact as in the CHIVA technique, the drainage in diastole as inverse low pressure inverse flow through the infrapatellar re-entry perforators.

The curve in Doppler color mode shows bidirectional flow; towards the saphenofemoral junction during calf systole contraction, because it is not closed and in diastole towards the re-entry perforator.

This ensures double systodiastolic venous drainage avoiding the phenomenon of deep hypertension; Recek Paradoxical Phenomenon.

Not doing crosssectomy avoids paradoxical phenomenon and guarantees a doubly drained system, both systolic and diastolic. The unnecessary ablation of sufficient tributaries, during classic crosssectomy, avoids poorly drained ducts.

It is known that PER SE venous pathology has its own recurrence rate of 21% so it is not a magic strategy, only is just another way to be take in consideration into the surgical approaches using, up to date, new ablation methods (LASER) as a preservation tool.

In our case, post procedure two years follow up, GSV insufficiency were recorded, feed at the thigh by Hunter reflux perforators, which support the largest systolic soleo-gemelar pressures described by Prof Raju and in the other case an extension of the saphenous femoral junction by development of common femoral insufficiency.

To ending this work, the presented strategy is the sum of physics laws applied to venous hemodynamic and sparing concepts to reach the goal of elimination each factor that are guilty to GSV dilation and SVI.

This strategy supported by hemodynamic principles as Bernoulli equation, endovascular hydrodynamic endovenous and perivenous pressure, flow formula, shear stress concept, is very easy to implement for all vascular surgeons.

Currently, the GSV has recovered its importance as an arterial source of bypass conduit.

Anatomical capital, thugs should not be ablated without warning patients that GSV ablation, very frequent only by aesthetical reasons and small diameters will deprive them of an conduit that may be vital as a peripheral distal bypass.

The aim of this submitted work pretends share into the medical community to avoid indiscriminate destruction of patient anatomical capital without in many case without a proper explanation of its futures consequences.

It must will requires be corroborate by more experience, bigger number of patients and repeated by other colleagues because it will have validation only other researchers and further publications can reproduce it.

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### **Conflict of Interest**

No potential conflict of interest reported.

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