

# Mininvasive laser approach CHIVA 2 in type 3 shunt chronic venous insufficiency in bariatric patients

Domenico Parmeggiani<sup>1</sup>, Ignazio Verde<sup>2</sup>, Giancarlo Moccia<sup>1</sup>, Francesco Torelli<sup>1</sup>, Francesco Miele<sup>1</sup>, Pasquale Luongo<sup>1</sup>, Pasquale Sperlongano<sup>1</sup>, Alfredo Allaria<sup>1</sup>, Antonella Sciarra<sup>1</sup>, Nadia De Falco<sup>1</sup>, Maddalena Donnarumma<sup>1</sup>, Chiara Colonnese<sup>1</sup>, Paola Bassi<sup>1</sup>, Ludovico Docimo<sup>2</sup>, Massimo Agresti<sup>1</sup>

<sup>1</sup> Integrated Activity Department of Surgery, Orthopedics and Hepatogastroenterology, University of Study of Campania "Luigi Vanvitelli" Naples, Italy

<sup>2</sup> Highly Specialized Medical-Surgical Department of the University of Campania Hospital "Luigi Vanvitelli" Naples, Italy

## ABSTRACT

The authors report their experience on the use of Endo-Vascular Laser Treatment modified type 2 CHIVA (Conservatrice et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire) in patients with Chronic Venous insufficiency with a type 3 Shunts in patients with severe obesity (BMI>40). The authors affirm that Laser type 2 CHIVA in type 3 shunts still offers several advantages, for the echo guided localization of the vein in bariatric patients, resulting a time saving procedure with better compliance and lower rate of mayor complications. Since January 2021 to December 2022, we have treated 30 patients, all of them with a confirmed echography diagnosis of Chronic Venous Insufficiency-type 3 shunt, m.a. 45.2 years old, with a medium BMI of 42.3 with a medium follow up of 52.2 months. We selected patients with pathological obesity and chronic venous insufficiency who presented a type 3 SHUNT on the hemodynamic examination with echo-color-Doppler. It has been observed varicose vein recurrence only in 5 patients after six months 16.6% and in 9 patients two years later 30%. Bruises was the prevalent side effect observed in 14 patients 46.6%, we didn't observe any limb infections, no superficial vein thrombosis and of course no nerve damages. The procedure was less invasive than surgical preparation in bariatric patients. 18 patients received a laparoscopic sleeve gastrectomy in the 2 years from our treatment and in none of them we have observed any complication related to chronic venous insufficiency. It's well known the advantages of CHIVA vs. Traditional Stripping in term of recurrence, side effects like bruises and especially nerve damages; the Endo-Vascular Laser Treatment in this kind of modified type 2 CHIVA seems to improve limb infections incidence, especially in bariatric patients, reducing for this complication the gap versus stripping and of course improving the traditional EVLT (Endovenous Laser Ablation Therapy) with the Hemodynamic principles of CHIVA treatment. We suggest this type of technique especially in patients with severe obesity, where the clinical and metabolic condition added to local more complicated conditions, and due especially to the enormous fat panicle, make difficult any surgical approach.

**Keywords:** CHIVA (Conservatrice et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire), EVLT (Endo Vascular Laser Treatment), CVI (Chronic Venous Insufficiency), bariatric

## Address for correspondence:

Domenico Parmeggiani, MD, PhD, Associate Professor

Integrated Activity Department of Surgery, Orthopedics and Hepatogastroenterology, University of Study of Campania "Luigi Vanvitelli" Naples, Italy

E-mail: domenico.parmeggiani@unicampania.it

**Word count:** 2919 **Tables:** 00 **Figures:** 02 **References:** 18

**Received:** 24 April, 2024, Manuscript No. OAR-24-132764

**Editor Assigned:** 15 May, 2024, Pre-QC No. OAR-24-132764(PQ)

**Reviewed:** 18 June, 2024, QC No. OAR-24-132764(Q)

**Revised:** 29 June, 2024, Manuscript No. OAR-24-132764(R)

**Published:** 17 July, 2024, Invoice No. J- OAR-24-132764

## INTRODUCTION

For over ten years, an alternative technique to the stripping and his variations has been introduced in the surgery of varicose veins. This technique was set up by the neurologist Claude Franceschi, well known as velocimetry Doppler pioneer and for this reason homodynamic expert, and was called CHIVA, which stands for Conservatrice et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire [1].

It is remarkable to remember that CHIVA technique is based on two essential considerations of physio-pathological interest [2]:

- In a vein with functional valves apparatus, the pressure tends to diminish in a varicose vein during the flow; in a situation of compromised valves apparatus, it tends to grow, compromising by far the interested vein directly and the other ones in which the pressure tends to go down.
- From deep vein circle and the other safena circles, several communications exist between the cross afflux of safena into the femoral vein and the perforants present at central leg level, particularly in the whole leg. All these communication pathways are afflux ways where the valves allow, in normal conditions, the superficial circle flow of safena vein into the deep one; but under pathological conditions of valves insufficiency, the blood that should go from deep circle to the top, goes in the superficial circle instead, especially in bariatric patients [3].

So, CHIVA can propose:

- To fractionate the hematic column in the safena interrupting it in some segments, in order to diminish the hydrostatic pressure.
- To interrupt the communication points between superficial and deep circle, where there is the inverted flow responsible of pressure building in the superficial circle and, whenever possible, to act as interruption through the superficial circle in order to modify the pressure for restoring the right way of the flow in the communication point [4].
- Traditionally we consider Tirpitz Shunts Classification proposed by CHIVA Group (Figure1).

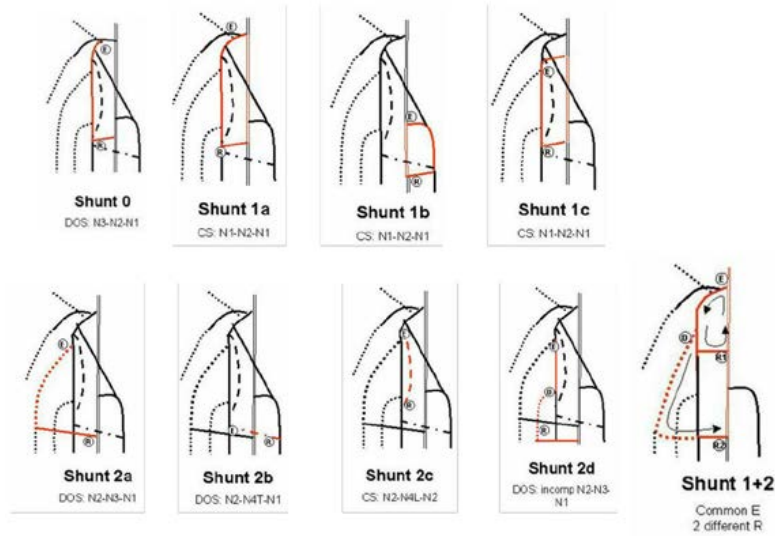


Fig. 1. Type 3 Tirpitz shunt classification proposed by CHIVA group

## MATERIALS AND METHODS

Since January 2021 to December 2022, we have treated 30 patients, all of them with a confirmed echography diagnosis of chronic venous insufficiency-type 3 shunt, m.a. 45.2 years old (range 35 years-58 years), with a medium BMI of 42.3 (range 40-48), with at least 3 echography controls and with a medium follow up of 52.2 months range (48 months-60 months), with no patients lost in the follow up. In all patients we performed an accurate study of vein hemodynamic in order to allow a sufficient understanding of physio-pathological process that has given the varicose vein as

result, and which can hold the worst conditions and the precise individuation of the focal point where to intervene to modify the hemodynamic waves in order to restore pressure values to lower levels. A vascular ultrasonography echo Doppler to have a "map" of superficial vein system was required.

In our study we used a 1470 nm diode laser with the latest generation of radial ring fiber. We selected patients with pathological obesity and chronic venous insufficiency who presented a type 3 shunt on the hemodynamic examination with echocolordoppler (Figure 2).

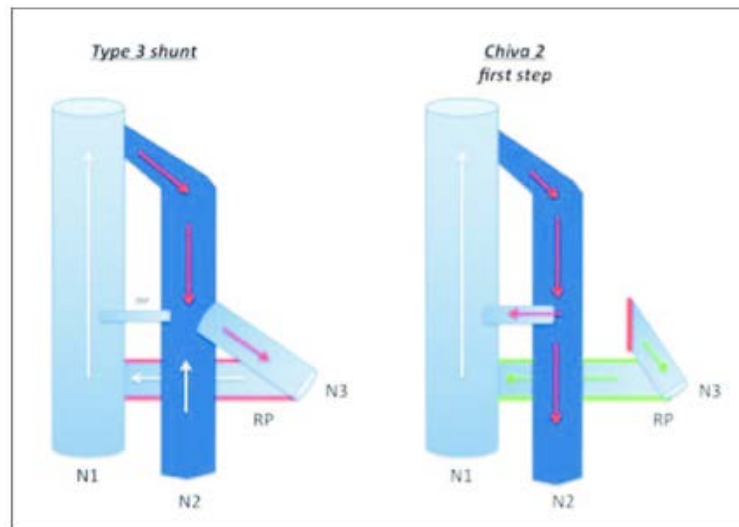


Fig. 2. Chronic venous insufficiency with type 3 shunts and CHIVA 2 hemodynamic correction

In particular, under percutaneously ultrasound guidance, the collateral was cannulated in R3 above and the optical fiber was placed in the vicinity about 1 cm of its confluence in the vein "great saphena". Finally, the initial protocol is completed by the perivenous injection of a cold physiological solution associated with local anesthetic which is designed to facilitate the reduction of diameter of the vein to be treated and its own, therefore, better acceptance to optical fiber intumescence. The laser energy is then spread radially within the collateral for a segment of about 2 cm by slowly retreating the fiber in the cranio-caudal sense. In this way, the laser light, selectively absorbed by the water molecules present in the venous wall, determined the occlusion/obliteration of the segment of the

treated vein. This method allows to further reduce the operating time by not providing for the surgical time of micro-incisions and therefore any complications associated with them [5-8]. The patients were all dismisses few hours after EVLT modified CHIVA.

## RESULTS

It has been observed varicose vein recurrence only in 5 patients after six months 16.6% and in 9 patients two years later 30%. Approximately 8 of these patients 26.6% have needed a hospital care for a surgical correction that, provided hemodynamic studies, was completed with a maximum of two or three vein binding. Bruises

was the prevalent side effect observed in 14 patients 46.6%, we didn't observe any limb infections, no superficial vein thrombosis and of course no nerve damages. The procedure was absolutely less invasive than surgical preparation in bariatric patients. 18 patients received a laparoscopic sleeve gastrectomy in the 2 years from our treatment and in none of them we have observed any complication related to chronic venous insufficiency. The overall satisfaction rate of the procedure was very high in 5 levels scale medium 4.5 ranging from good to very good.

## DISCUSSION

In the beginning the varicose vein surgery following CHIVA technique has encountered enthusiasm, but later it has been subjected to severe critiques for the easy side effects registered, as far as in many surgical schools they prefer to choose the former stripping technique though, very often, providing some present-time variations. We can support CHIVA technique for varicose vein treatment, because of the good results obtained immediately and checked in the follow-up, even if we cannot deny the recurrence incidence. The surgeon who doesn't get receive in the surgery of varicose vein is someone who hasn't made a surgical operation at all Sellers. Considered the overall recurrences arisen using other techniques and compared to the CHIVA, we would encourage it because the success of it is mainly due to the preliminarily hemodynamic studies their relevant maps [9, 10]. These procedures are still not standardized and, further on, strongly depend on the available equipment quality and the experience/capacity of the operator who perform the "Pre-CHIVA mapping". In our modified approach to CHIVA technique we have noticed, since the first EVLT approach of a varicose patient with a type 3 Shunts the necessity in patients who experienced a recurrence, to tie and section safena arch because we were considering insufficient the hemodynamic modification induced by CHIVA to take down the observed pressure level [11]. As another important consideration, we remark how obese patients have higher risks when a generic anesthesia is performed, making this reported technique preferable even for the possibility to avoid such risks [12]. In addition, the induced hemodynamic modifications reduce the pressure inside the vein, but to restore the tone of the vascular wall can take long time; therefore, leaving the high safenic segment ectasic and full of blood makes easy with time [13].

The arise of ectasia of other collateral ways can occur considering these patients affected by varicose disease, and globally predisposed to develop varicose veins. Pathological Obesity, due to severe alteration of the metabolism, makes any procedure more difficult: the preoperative preparation for local disease of legs and for associated metabolic and clinic pathology diabetes, cardio vascular pathology, etc. surgical or EVLT for the difficult condition to identify the vascular targets and finally postoperative complications, considering that many of those patients were already enrolled for bariatric surgery. The CHIVA has already proven to be a treatment with lower rate of recurrence and complications like bruises and nerve damages [14-17].

The recurrence rate is another advantage of this technique comparing to Traditional Stripping. Considered the current literature, recent papers reported a failure rate of 31.1% for the CHIVA group versus a failure rate from 47.9% to 52.7% for the traditional stripping procedure with a follow up of 5 years [18]. Considering our results at 2 years of follow up, the recurrence rate at 5 years will

be higher than the expected one in literature but this bias could be linked with the obese condition of our study population; we can't be sure of this affirmation because of the poor literature about the CHIVA procedure on obese patients. The results obtained with this "modified CHIVA" have been so positive confirming the known advantages and improving it with a better rate of limb infections to extend the type of treatment even to patient suffering of higher grade of varicosity or to bariatric patients with lower BMI >35, but with a comorbidity with preliminary interesting results.

## CONCLUSION

The intellectual modesty that we would like to underline distinguishes our surgical school, as already above mentioned, and induces to have respect for all of the ones who have not tried CHIVA technique or who abandon it, considering other techniques more successful. Moreover, in the surgery of varicose vein with a type 3 shunts, the various advantages of the technique have more significance higher is the BMI of the patient, as far as to allow us to say:

- It requires the anesthesia as local infiltration and with a very low amount limited in the use to very rare cases; in such a way the general side effects due to the treatment, frequently occurring in the bariatric patients who often must avoid, whenever possible, a total anesthesia or spinal cord infiltration, are abolished.
- Technical intervention is less invasive and the investigation, against the other techniques, doesn't need any skin incision thanks to practice on maps skin previously mentioned, which can indicate with extreme precision the exact point to cannulate the vein to treat. Of course, the whole process is better tolerated from an obese person.
- Execution speed due to precise maps and the relevant necessity of mini-invasive approach act avoid all side effects related to the duration of intervention, making easier the patient health care.
- The hospital care can be extremely limited, depending on type of intervention, in day hospital, that requires few hours. The rapid patient mobilization avoids psychic complications which are more frequent and serious higher is the BMI of the patient.

## ACKNOWLEDGEMENT

Apperti M., founder of the Italian School of Phlebology, Unit of Vascular Surgery – University of Study of Campania “Luigi Vanvitelli” Naples, Italy: he has participated substantially in conception, design of the study and with his clinical, surgical and professional experience has guided all of us.

## FUNDING

This article did not receive sponsorship for publication.

## CONFLICT OF INTEREST

The authors declare that they have no competing interests.

## ETHICAL DECLARATION

This study followed the ethical principles of the declaration of Helsinki. Participation in the study was voluntary. Before inclusion in the study, surgical staff explained the purpose of the procedure and informed consent form was secured from each participant.

## AUTHORS CONTRIBUTION

All authors contributed significantly to the present research and reviewed the entire manuscript.

Domenico Parmeggiani, Ignazio Verde, Giancarlo Moccia, Francesco Torelli, Paola Bassi, Ludovico Docimo; participated sub-

stantially in conception, design, and execution of the study and in the analysis and interpretation of the data; also participated substantially in the drafting and editing of the manuscript.

Francesco Miele, Pasquale Luongo, Pasquale Sperlongano, Alfredo Allaria, Antonella Sciarra, Nadia De Falco, Maddalena Donnarumma, Massimo Agresti Chiara Colonnese; participated substantially in conception, design, and execution of the study and in the analysis and interpretation of the data.

## DATA AVAILABILITY

If apply to your research data is available on request.

## REFERENCES

1. Bahnini A, Bailly M, Chiche L, Franceschi C. Ambulatory conservative hemodynamic correction of venous insufficiency. Technique, results. In *Anales Chir.* 1997;51:749-760.
2. Bernardini E, De Rango P, Piccioli R, Bisacci C, Pagliuca V, et al. Development of primary superficial venous insufficiency: the ascending theory. Observational and hemodynamic data from a 9-year experience. *Ann Vasc Surg.* 2010;24:709-720.
3. Bjordal R. Simultaneous pressure and flow recordings in varicose veins of the lower extremity. A haemodynamic study of venous dysfunction. *Acta Chir Scand.* 1970;136:309-317.
4. Zamboni P, Franceschi C. Principles of venous haemodynamics. Nova Biomedical. 2009.
5. Franceschi C, Cappelli M, Ermini S, Giancesini S, Mendoza E, et al: hemodynamic concept, strategy and results. *Int Angiol.* 2016;35:8-30.
6. De Franciscis S, Gasbarro V, Amato B, Buffone G, Grande R, et al. Hemodynamic surgery versus conventional surgery in chronic venous disease: a multicenter retrospective study. *Acta Phleb.* 2013;14:109-114.
7. Carradice D, Mekako AI, Mazari FA, Samuel N, Hatfield J, et al. Randomized clinical trial of endovenous laser ablation compared with conventional surgery for great saphenous varicose veins. *J Br Surg.* 2011;98:501-510.
8. Gubitosi A, Ruggiero R, Ortolani R, Podzemny V, Parmeggiani D, et al. Ambulatory laser-assisted surgery: a multicenter application and experience. *Ann Ital Chir.* 2012;83:515-521.
9. Parés JO, Juan J, Tellez R, Mata A, Moreno C, et al. Varicose vein surgery: stripping versus the CHIVA method: a randomized controlled trial. *Ann Surg.* 2010;251:624-631.
10. Bellmunt-Montoya S, Escribano JM, Dilme J, Martinez-Zapata MJ. CHIVA method for the treatment of chronic venous insufficiency. *Cochrane Database Syst Rev.* 2013;
11. Zamboni P, Giancesini S, Menegatti E, Tacconi G, Palazzo A, et al. Great saphenous varicose vein surgery without saphenofemoral junction disconnection. *J Br Surg.* 2010;97: 820-825.
12. Kartheuser AH, Leonard DF, Penninckx F, Paterson HM, Brandt D, et al; Waist Circumference Study Group. Waist circumference and waist/hip ratio are better predictive risk factors for mortality and morbidity after colorectal surgery than body mass index and body surface area. *Ann Surg.* 2013;258:722-730.
13. Faccini FP, Ermini S, Franceschi C. CHIVA to treat saphenous vein insufficiency in chronic venous disease: characteristics and results. *J Vasc Bras.* 2019;18.
14. Alfano C, Mordente S, Broscritto S. Le complicanze nella chirurgia delle varici degli arti inferiori - *Ant Medica Italiana* 1985
15. Zamboni P1, Cisno C, Marchetti F, Mazza P, Fogato L, et al. Minimally invasive surgical management of primary venous ulcers vs. compression treatment: a randomized clinical trial. *Eur J Vasc Endovasc Surg.* 2003;25:313-318.
16. Canero A, Parmeggiani D, Avenia N, Atelli PF, Goffredi L, et al. Thromboembolic tendency (TE) in IBD (Inflammatory bowel disease) patients. *Ann Ital Chir.* 2012;83:313-318.
17. Mura S, De Biasio F, Zingaretti N, Scalise A, Parodi PC. Common peroneal nerve injury related to small saphenous vein surgery: report of 2 cases and review of the literature. *Case Rep Neurol.* 2021;13:24-30.
18. Parés JO, Juan J, Tellez R, Mata A, Moreno C, et al. Varicose vein surgery: stripping versus the CHIVA method: a randomized controlled trial. *Ann Surg.* 2010;251:624-631.