

8 - CHIVA for Beginners

Felipe Faccini and Claude Franceschi

<https://doi.org/10.5281/zenodo.6491354>

Learning Approach

Why should we preserve the veins, even if varicose? Two main reasons: 1-Superficial veins elimination impairs the skin drainage that is responsible for recurrence and cosmetic secondary events (matting, bruising, telangiectasia, spider veins). 2- Great saphenous veins are eligible for vital arterial by-pass even if incompetent. As a matter of fact, varicose veins are not the cause of venous hemodynamics impairment that overloads it, they are more like a sign. Consequently, the treatment should consist of ablating the overload while preserving the low pressure physiologic draining flow (whatever its downwards or upwards direction). Thus, we may obtain proper skin drainage into the deep veins, through any superficial-deep vein connection.

The usual reactive thinking about saphenous reflux is to eliminate the “sick” portions of the venous system. Most books and papers about saphenous preservation bring us a lot of information. The reader then gets a book that starts discussing fluid mechanics and physics. The chapter about cases shows pictures of enormous collateral veins and tells that those veins are like fireman roses. They collapse after the shunt is closed (like a fire hydrant valve). The first reaction is throwing the book away.

The reader may think it is nonsense and too much trouble to learn. We disagree completely. We think, even if the reader keeps doing ablations, there are many cases in which the surgeon can avoid destroying the saphenous vein and collaterals. There is no need for a complete and fast migration to preserving procedures, one can only perform the simple cases first and then move up to the difficult cases.

The primary author of this chapter kept doing stripping and ablations for a period before performing complex CHIVA cases alone. I have performed several ablations plus flush ligation of the shunt before noticing that the saphenous vein removal/burning was unnecessary. It was difficult to shift from the paradigm of vein destruction to vein preservation, being born and raised, learning and perfecting ways to destroy a vein. The approach of dividing saphenous preserving procedures according to the complexity and potential complications came from the learning period faced. If a surgeon begins with tough cases, he or she will probably see several cases of phlebitis and will give up. Saphenous veins or collaterals left without drainage will likely thrombose. The phlebitis results from most ablation methods, so even when it happens it is not a disgrace. Although, if you aim to preserve the vein, you will be disappointed if that vein is destroyed.

Introduction

Venous hemodynamics shows us that most of these venous resections/burnings are unnecessary. They may be the source of several problems, such as recurrences, matting, telangiectasia, post-operative pain, nerve damage, skin marks and so on. The difficulty learning curve of CHIVA makes many surgeons avoid

the technique in their practice. However, most CHIVA procedures are not so difficult. Several patients present with simpler cases. For example, a patient with a few centimeters of the saphenous vein with reflux that drains to one collateral in the thigh or leg. We see such patients being offered stripping, foam or endolaser of the saphenous vein and collateral treatment. They come for a second or third opinion. We offer a procedure under local anesthesia in which we will ligate a vein connection and send them back to work. A simple flush ligation of the exit of the collateral from the saphenous vein can treat these cases under local anesthesia with immediate recovery. Most times, the saphenous vein can recover upward flow. The size of the collaterals does not matter much, and even big veins can wilt. The diameter and length of the saphenous vein with reflux are important, since long reflux portions are more difficult to treat. The Perthes maneuver with tourniquets placed at the escape points represent an easy and reliable clinical way to predict the effect of its disconnection. The definitive collapse of the varicose vein needs the time of its progressive remodeling, from some days to some weeks.

Some argue that leaving the saphenous vein with reflux may grow to recurrence (even though many of these regain upward flow). As we all know and will discuss in the recurrence chapter, the same (or worse) occurs with procedures eliminating the saphenous vein in these cases. All procedures have the recurrences that happen because of disease progression. Destructive venous eliminating procedures cause recurrences because veins create pathways to overcome the flow obstacles imputed by the procedure.

Simpler CHIVA Procedures

Procedures without saphenous-femoral or saphenous-popliteal junction involvement are not as hemodynamically demanding as those with junction reflux. The cases with only one collateral out of the saphenous vein are easier than cases with several collaterals in-and-out of the saphenous vein. Patients with short segments of a small diameter saphenous vein with reflux are much simpler to treat than those with long and large segments of vein with reflux.

The importance of the duplex ultrasound is pivotal, and we consider that the surgeon should do the examination, or at least be present to check findings. This is valid not only for saphenous preserving procedures. We have reported complications directly linked to the quality of the duplex scan and its relation to the surgical team ¹. The operator investigates reflux at the junction and collaterals that might transfer reflux to the saphenous vein. It is important to do the guideline examination with Valsalva and calf compression. We also use active maneuvers to contract calf muscles because they mimic walking better than calf compression (Parana maneuver) ².

Patients with reflux that enter the saphenous vein in its upper part (from the femoral vein or collaterals near the groin) are usually more difficult to treat. For educational purposes, we will consider them advanced cases. There are cases with reflux with multiple enters and exits to and from the saphenous vein. In our experience, these cases usually need deeper knowledge of hemodynamics and fractionating the column of pressure. The cases of reflux in the Giacomini vein are very demanding, and we

consider advanced cases. Reflux of the small saphenous vein has a great variety of anatomic details, and we will leave this vein for the advanced practitioner chapter. The cases we consider shoo-ins to a surgeon who wants to practice CHIVA are: 1) Single tributary (with or without saphenous reflux) and 2) Perforators above the knee.

The procedure

The initial evaluation comprises a duplex scan performed by the surgeon or some member of the team with active participation of the surgeon. The examination comprises reflux testing of the deep and superficial venous systems with usual Valsalva and calf compression plus a muscle contraction test. We base all the treatments reported in this chapter in active contraction of the calf muscles (if you are not familiar with dynamic reflux testing, refer to the reflux chapter). If the duplex characteristics confirm that we can perform the procedure, we mark the skin (depicted case-by-case). We use a metal probe to make a pressure mark on the skin during the duplex scan. We mark the exact point of disconnection. After drying the gel of the skin, we mark this point with a permanent marker, including some signal to show us at the operation what veins should be ligated. This is pivotal, since ligating the wrong side of a bifurcation (trifurcation) is a disaster to the technique. If we ligate the wrong vein, we might end up the operation with no improvement or a superficial thrombophlebitis. We should incise the skin with the full map in mind.

Lidocaine is the common anesthetic used in most CHIVA centers at a solution of 1% concentration without vasoconstrictor. The maximum dose is 4mg/Kg of the patient. The half-life of Lidocaine is 1.5-2h. In this 1% solution, every ml has 10 mg of the

drug. For example, a 50 kg person may use up to 200 mg of the drug, or 20 ml. For the simple CHIVA cases, this is usually more than enough. More complex cases, bilateral groin dissection for example, may need unique approaches. Using Lidocaine with vasoconstrictor increases the maximum dosis to 7 mg/Kg allowing us to increase the volume safely. The anesthesiologists avoid sedation as much as possible, and we advise patients that they may feel the touching of the skin. The team should take care with the conversation and remember that the patients are awake.

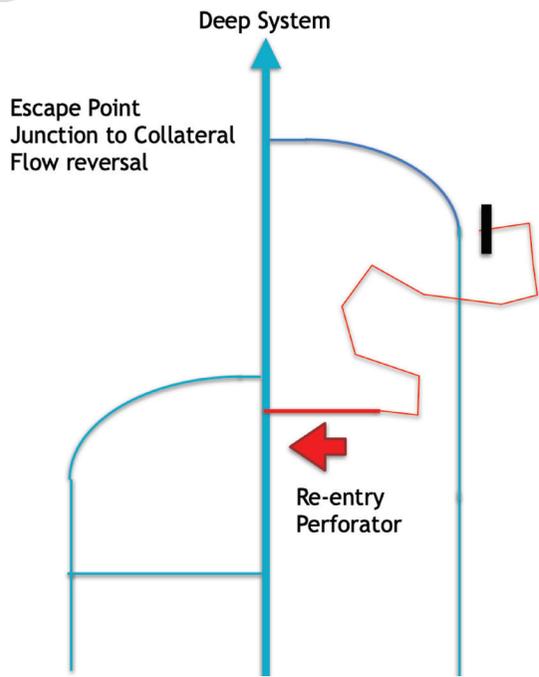
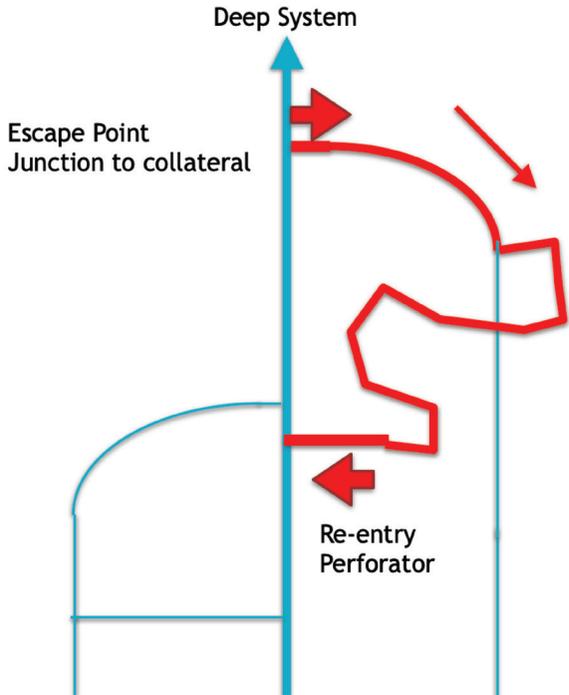
We perform the incision depending on the depth and adipose tissue in the region. In skinny patients and regions, a 3 mm incision may suffice. In the thigh of more obese patients, we may need to perform bigger incisions. We perform the ligation close to the saphenous vein; the idea is avoiding a stump that may grow with the passing years. The saphenous vein is individualized and identified with a rubber/silicone band. After careful attention to the anatomy and correlation to the preoperative map, we ligate with unabsorbable thread and cut the collateral. The revision of hemostasis follows, and nylon skin sutures.

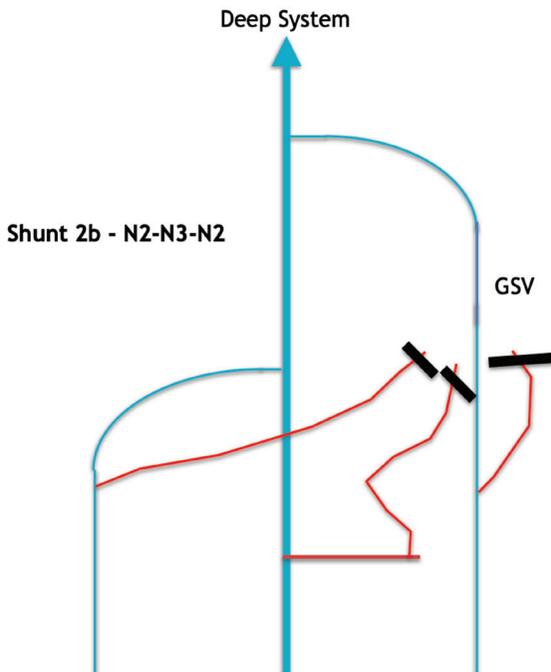
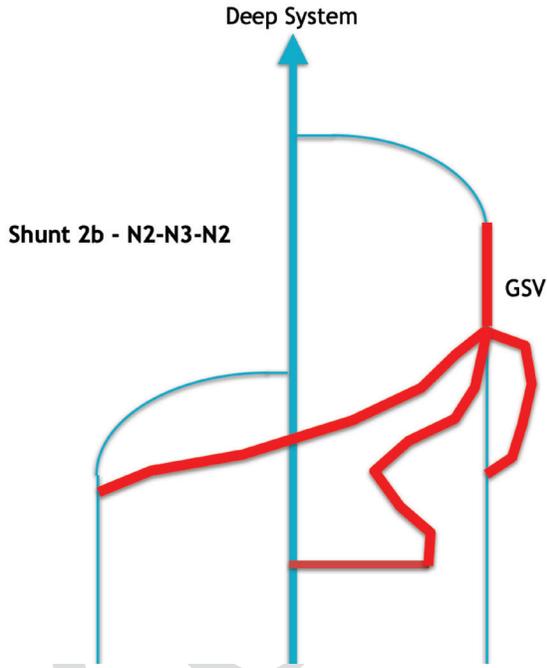
A small gauze pad or common dressing covers the sutures, and 20-30 mmHg elastic stockings are used for 7-14 days. The patient is discharged immediately after the procedure, instructed to walk 2 hours a day and have a normal life. We usually see the patient 6 days after the procedure to remove skin sutures and perform a control duplex ultrasound. Patients that come from other states or countries stay a week nearby, or we make arrangements with a doctor from the patient's region. Using deep vein thrombosis prophylaxis is debatable after varicose vein

surgery. We use 10 days of prophylaxis as a routine in our clinic (see Perioperative chapter).

Single tributary, with or without saphenous reflux.

A simple procedure can treat the cases in which a single tributary of the saphenous vein causes. We can do this in collaterals causing or not aspiration reflux to a small length of the saphenous vein with or without junction reflux. The evaluation should test reflux at the saphenous vein and collateral, with and without collateral compression. In these cases, the procedure comprises the ligation flush to the saphenous vein using unabsorbable material, excising a few centimeters of the collateral. Before proceeding to the treatment, we should test what happens with the reflux when the collateral is closed. Basically, we may have 3 results from this test. (1) Saphenous and collateral reflux disappear while closing the collateral. This is the sign that the result of the ligature will be good (remember that we are dealing with small vein and short reflux). (2) Collateral reflux resolved and no saphenous flow whatsoever. This suggests that you may be closing the saphenous vein and should repeat the test more carefully - do not close the saphenous vein with your finger, only the collateral. (3) Saphenous reflux persists while we compress the collateral. These cases usually have another source/outflow of reflux and should be treated by seasoned hemodynamic surgeons.





Disappearing Reflux Test

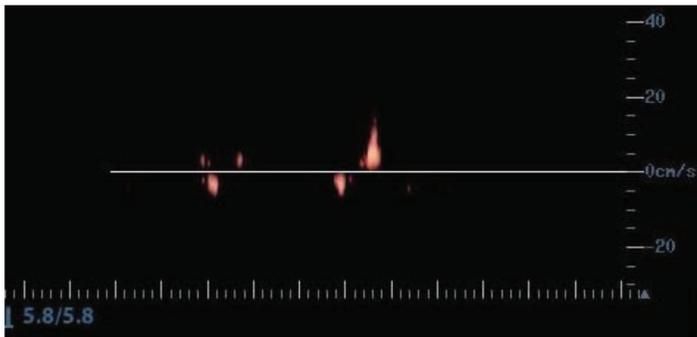
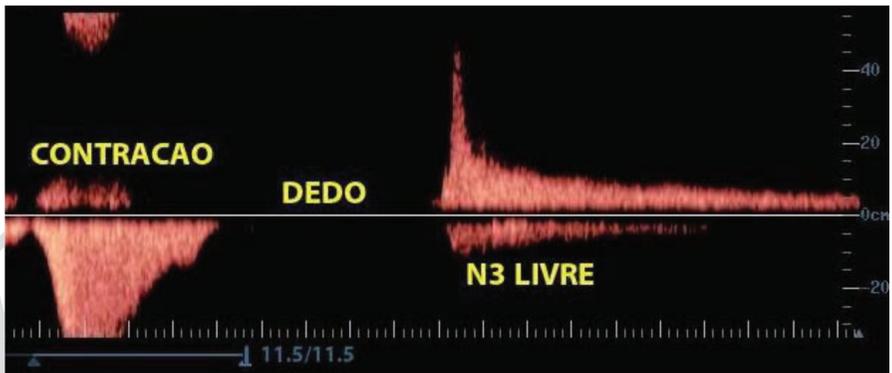
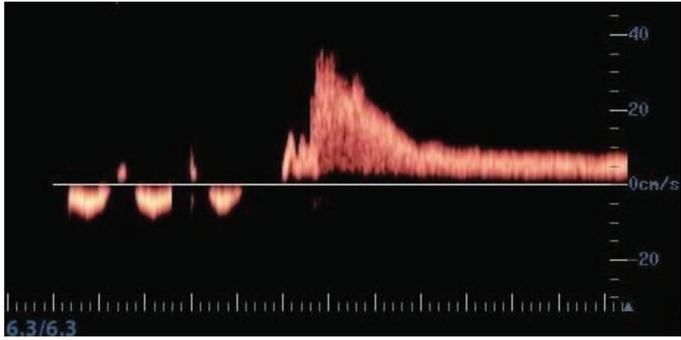
The cases with reflux of the saphenous vein from the saphenofemoral junction or saphenous axis that disappear after compression of the collateral. At this point, it is important to make in-depth analysis of the test. If you are about to ligate the saphenous junction and the reflux disappears during the close of the collateral, it is an indication of possible thrombophlebitis. On the other hand, in cases where the junction and proximal saphenous vein is untouched, the reflux disappearing is a sign that the ligation of the collateral may reverse the flow.

The test comprises a dynamic reflux test or calf compression with the probe at the proximal portion of the saphenous vein (or at the reflux site). The reflux occurs in the diastole phase (relaxation of muscles) and may disappear when we finger press the collateral. Two pivotal details should be in mind. If there is reflux at the deep system, the case becomes advanced and should not be performed by unseasoned surgeons. The test should press the collateral away from the saphenous vein, we are not testing the saphenous compression but the collaterals' If you press the saphenous vein during the test, it warrants a false result. We should consider the size and length of the saphenous vein when we perform this procedure. If the saphenous vein is too long, it diminishes the probability of flow reversal. This happens because the chance of a saphenous perforator increases, and also because the energy of the distal blood may not be enough to revert the flow. It does not mean that the patient will not improve clinically because even without flow reversal, most patients improve after transmural pressure lowering. Although, as mentioned before, cases with persistent

reflux need more advanced treatment and will be approached in another chapter.

We present 3 figures that represent one case. The first wave shows important reflux at the saphenofemoral junction of a patient with C4 class and enormous veins. The second waveform tests while we press and release the compression of the collateral. It has 3 phases, the systole centripetal flow, no reflux (during collateral compression) and the last diastolic reflux when we release the collateral. The third waveform shows the saphenous vein of the same patient soon after CHIVA ligation of the collateral.

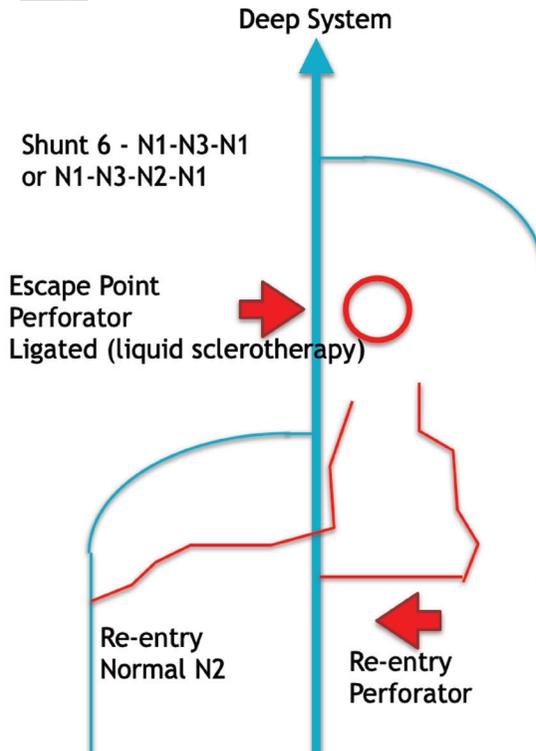
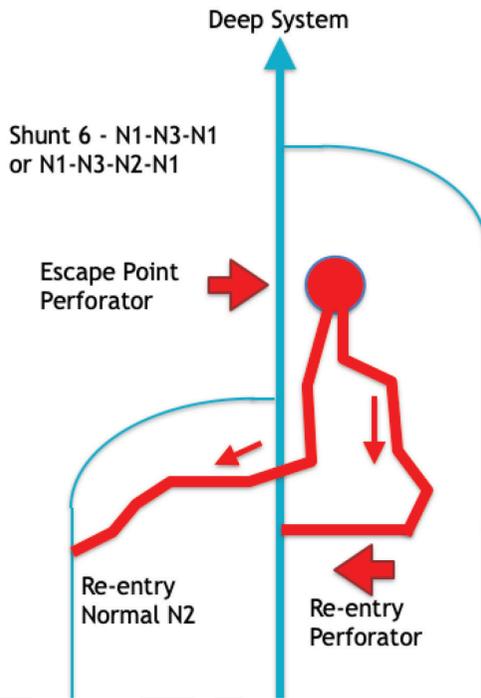
Pode diminuir e subir figuras



Thigh perforator (not applicable to leg perforators).

The deep veins in the thigh have long valveless portions, and sometimes a perforator causes reflux from the deep system to the superficial system. The duplex ultrasound of these cases should test the perforators during systole, and diastole of leg muscles. We should follow the superficial pathway of reflux and test the re-entry of blood. We should always check the deep system for signs of previous disease. Reflux with systole and diastole with outward flow is characteristic of deep problems, and needs further analysis. If the perforator has no or inward flow during systole and outward flow during diastole, we may proceed with the treatment. Please refer to the chapter about perforators for further perforator analysis.

We perform the ligation of the perforator at its closest point to the fascia using unabsorbable material. The hole in the fascia is closed with non-absorbable suture. The collateral usually wilt, but we usually excise a few centimeters of the main vein, as long as it does not create additional surgical trauma. Some surgeons use sclerotherapy at the proximal portion of the perforator if the vein has a long intramuscular pathway. There is a recent trend for ablating veins with a puncture, there is a possibility to treat this perforator with small diameter laser fibers using the endolaser technique.



How can we predict the esthetic result of CHIVA?

The Perthes test was first developed to test the function of the deep venous system. Later, Mahorner and Ochsner described the use of the Perthes test as a way to test if the patient would benefit from ligation of the long saphenous vein^{3,4}. Hemodynamic surgery uses the Perthes test as a routine. The result of a Perthes test is very predictive of the result of conservative surgery. The modern test performed in most clinics differs a little from the first tests. Implementing Duplex Ultrasound and advancing knowledge on hemodynamics made us think we do not need 5 minutes of walking to test the leg as first suggested. Today we perform a quick walk in the clinic with a rubber band in the upper thigh and re-check the veins. Sometimes, if we want to test distinct escape points, we may put the rubber in other positions. Usually, the results of the conservative procedure are close to the results of a Perthes test. The doctor should take care and remember that the rubber band closes all the veins in the circumference. For example, if the reflux comes from the accessory saphenous vein, and we see a magnificent wilt of all veins during the test, predicting a significant result after ligation. If we ligate the great saphenous vein instead of the accessory vein, the postoperative results will be terrible. We should remember that the rubber band closes all veins in the circumference, and complete duplex ultrasound will tell you what veins to ligate.

Some patients have esthetic results in Perthes tests less than ideal. These cases need additional intraoperative resection (fractionation) or sclerotherapy. Some cases have an enormous collateral that wilts less than you would like during the test. We may include another incision to fractionate this collateral or resect 1-2

cm of the vein distal to the N3 ligature. We should take care not to leave non-drained collaterals. Another option is explaining to the patient and getting Informed Consent, mentioning that if a vein remains you might need to do a sclerotherapy a few months after the procedure. The surgeon may choose the approach depending on the experience in sclerotherapy and patient expectations.



Bibliographic References

1. Faccini FP, Arendt AL, Pereira RQ, Oliveira AR de. CHIVA to spare the small and great saphenous veins after wrong-site surgery on a normal saphenous vein: a case report. *J vasc bras* [Internet]. 2019 [cited 2019 Mar 15];18. Available from: http://www.scielo.br/scielo.php?pid=S1677-54492019000100601&script=sci_arttext
2. Ermini S, Passariello F, Vasculab F. The Paraná Manoeuvre [Internet]. 2017. Available from: <http://dx.doi.org/10.24019/2017.parana>
3. Barone M. MULTIPLE PERTHES' TEST FOR SEGMENTAL OCCLUSION OF THE DEEP VEINS [Internet]. Vol. 131, *Journal of the American Medical Association*. 1946. p. 1406. Available from: <http://dx.doi.org/10.1001/jama.1946.02870340012004>
4. Mahorner HR, Ochsner A. A NEW TEST FOR EVALUATING CIRCULATION IN THE VENOUS SYSTEM OF THE LOWER EXTREMITY AFFECTED BY VARICOSITIES. *Arch Surg* [Internet]. 1936 Sep 1 [cited 2020 May 4];33(3):479-92. Available from: <https://jamanetwork.com/journals/jamasurgery/article-abstract/542869>