

Durability of Reflux-elimination by a Minimal Invasive CHIVA Procedure on Patients with Varicose Veins. A 3-year Prospective Case Study

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Objectives: to assess the outcome of a conservative and haemodynamic method for insufficient veins on an ambulatory basis (French acronym, "CHIVA") with preservation of the greater saphenous vein (GSV) for treatment of primary varicose veins.

Methods: duplex incompetence of the sapheno-femoral junction (SFJ) and the GSV trunk, with the re-entry perforating point located on a GSV tributary was demonstrated in 58 patients with varices (58 limbs). The re-entry point was defined as the perforator, whose compression of the superficial vein above its opening eliminates reflux in the GSV. Duplex scanning was performed preoperatively and at 7 days, and patients were followed prospectively at 1, 3, 6, 12, 24, and 36 months after CHIVA. Operation consisted in flush ligation and division from the GSV of the tributary containing the re-entry perforating vein (no additional high ligation is included). If reflux returned, SFJ interruption was performed in a second surgical procedure.

Results: the GSV diameter showed an average reduction from 6.6 to 3.9 mm 36 months after surgery. Reflux in the GSV system was demonstrated in all but five (8%) patients. Of the 53 patients with recurrent reflux, 46 underwent SFJ interruption.

Conclusions: elimination of reflux in the GSV after the interruption of insufficient collaterals is only temporary.

Key Words: Primary varicose veins; CHIVA; Duplex ultrasounds; Venous reflux; Saphenous vein; Varicose veins surgery.

Introduction

Primary varicose vein disease is a widely prevalent condition. In addition to pain, oedema, or superficial phlebitis, varicose veins can cause chronic venous insufficiency. Proper treatment, based on sound haemodynamic principles, is imperative if the problem is to be permanently eradicated. High ligation of the greater saphenous vein (GSV) with or without stab avulsion phlebectomy has become a commonly performed treatment for varicose veins.¹⁻⁴ However, the need for concomitant stripping of the GSV remains controversial.^{1,5,6} Proponents of thigh saphenectomy contend that there will be fewer recurrences and improved haemodynamic and cosmetic results if thigh saphenectomy is added to high ligation and phlebectomy.^{7,8} During the past decade, there has been a renewed interest in minimally-invasive treatment and cost-effective as possible, consistent with extended relief and an acceptable cosmetic result.⁹⁻¹⁵

On the other hand, thigh saphenectomy removes a potentially important conduit for subsequent aorto-coronary bypass or lower extremity arterial reconstruction. The stripping technique has also been associated with appearance of telangiectasia and a disturbing incidence of saphenous neuropathy.^{9,12,14}

In 1988, Franceschi¹³ described conservative haemodynamic cure of venous insufficiency, known by the French acronym "CHIVA". CHIVA was designed to allow treatment of varicose veins without sacrificing the superficial vein network, and consists of minimally invasive surgical procedures under local anaesthesia that are based on findings of careful haemodynamic analysis of the venous network of the lower limb using duplex imaging. CHIVA is based on the fact that, even though varicose disease is associated with weakness of the vein wall, clinical manifestations occur only under certain orthostatic haemodynamic conditions.^{9,12,15} If these haemodynamic abnormalities are corrected by breaking the pressure column and suppressing venovenous shunting, manifestations disappear while preserving runoff from superficial tissue via the superficial vein

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network. Therefore, the goal of CHIVA for superficial venous insufficiency is to relieve the hydrostatic pressure column by stopping venovenous shunts of the saphenous vein or disruption of drainage of superficial tissue.

This prospective study was designed to assess the durability of CHIVA procedure and to study the effect of this procedure on local haemodynamics by Duplex scanning over a follow-up period of 3 years.

Patients and Methods

A total of 134 patients (134 limbs) with primary varicose veins presenting from January to December 1998, underwent this clinical examination and duplex scanning. Those with incompetence of the SFJ and reflux in the GSV, with the re-entry point located on a GSV tributary¹⁸ were considered candidates for CHIVA. Patients with preoperative diameter of the GSV >9.5 mm, at a distance of 15 cm below the junction with femoral veins were excluded.

Duplex ultrasonographic examinations were performed by two experienced staff members of the vascular laboratory directly involved in the study (J.M.E., J.J.) with the Philips P-700 Ultrasound System using a 7.5-MHz probe. Patients underwent Duplex examination in standing position. Reflux at the SFJ was tested by the Valsalva and the Parana manoeuvres, and successive levels of the superficial and deep venous system were tested by the Parana manoeuvre.¹¹ Briefly, in this type of stress test, changes of venous flow during isometric reflex contractions of the lower limbs in stationary standing position are measured when the examiner slightly pushes the patient's waist forward to induce disequilibrium.¹¹ The Parana manoeuvre has three advantages: it is easy to perform, has good reproducibility, and the stress test is hemodynamically similar to the real situation reproducing hemodynamic conditions controlling deep vein function when walking. Reflux was defined as a reverse flow for longer than 0.5 s.

A preoperative skin map was obtained by Duplex to determine the anatomic and functional status of the superficial and deep vein networks and allow flow mapping for planning of surgical strategy as described by Franceschi.^{11,12} Different venovenous shunts that may be observed during duplex examination are shown in Fig. 1. All CHIVA operations were performed under local anaesthesia and consisted in the disconnection of the origin of the insufficient collateral of the GSV containing the re-entry perforating vein. Interruption of the SFJ was considered in case of recurrent GSV reflux at follow-up (Fig. 2).

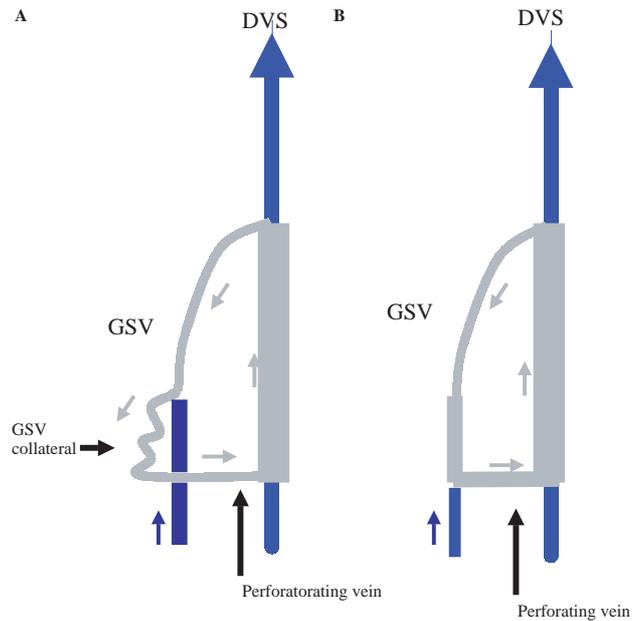


Fig. 1. Different types of venovenous shunts. Greater saphenous vein (GSV) drained by a perforating vein located in an insufficient collateral (inclusion criteria for CHIVA in the present study) (1A) compared to GSV drained by a perforating vein located in the GSV trajectory (ultrasound finding in most of our patients at 6 months after CHIVA) (1B).

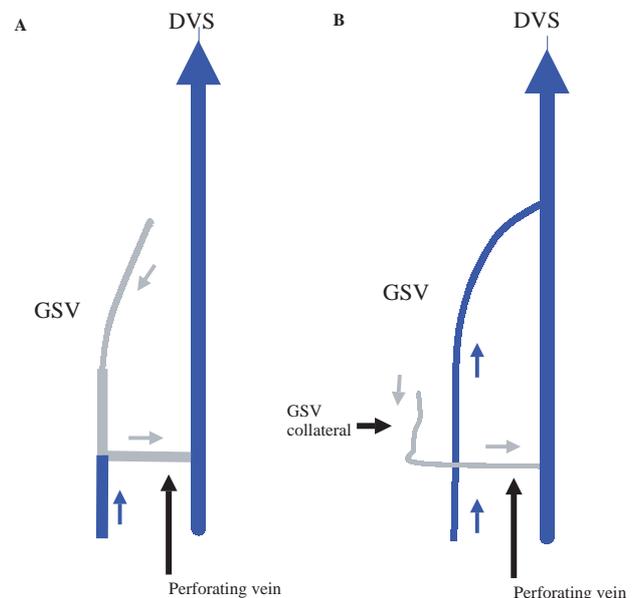


Fig. 2. Treatment strategies according to the type of venovenous shunting. Interruption of the sapheno-femoral junction (SFJ) corresponding to the second surgical procedure performed in patients with recurrent reflux (2A) compared to initial operation, i.e., interruption of the GSV tributary containing the re-entry perforating vein (2B).

Possible SFJ disconnection was indicated when the area of reflux was greater than the forward flow measured in the pulsed Doppler spectral analysis during a Parana manoeuvre. This indicates neoformation of the re-entry perforating vein. Preservation of entry perforating veins (re-entry points) will allow to maintain the patency in the venous column proximal to the fragmentation point.

Patients were allowed to walk immediately after the procedure and were encouraged to return to normal daily activity. Elastic stockings exerting 20–30 mmHg at the ankle were maintained for 7 days.

All patients were asked to return for clinical examination and Duplex scanning after 1 week and at 1, 3, 6, 12, 24, and 36 months after CHIVA. Duplex tests were done to demonstrate patency, diameter and flow at the GSV, and presence of correct interruption of venovenous shunting. The GSV diameter was measured at each Duplex control. Clinical examination was performed by an independent physician not involved in treatment. Clinical findings were classified using the classification proposed by Hobbs²² as cure (no varices or symptoms), improvement (minor residual varices and/or minor symptoms), or failure (no improvement or worsening of varices or symptoms compared to preoperative findings). Results according to complaints and cosmetic results were assessed by the patients as "good" (excellent or fair cosmesis, or absence of complaints) or "bad" (cosmetic assessment poor, or complaints unchanged or worse).

Differences in the average GSV diameter between patients without recurrent reflux at follow-up and patients with recurrent reflux undergoing SFJ disconnection in a second surgical time were assessed with the Student's *t* test. Statistical significance was set at $p < 0.05$.

Results

Seventy (52%) of the 134 patients with demonstrated Duplex incompetence of the SFV and reflux in the GSV with the re-entry point located on a GSV tributary were considered candidates for CHIVA. Six patients, however, were excluded because of preoperative diameter of the GSV >9.5 mm. Therefore, 64 patients (64 limbs) underwent CHIVA and entered the prospective study but six were lost to follow-up because of missing control visits in three, pregnancy shortly after CHIVA in two, and death due to breast cancer in one.

The study population consisted of 58 patients (58 limbs) (36 women and 22 men, mean age 51 years). The distribution of patients according to

the CEAP classification¹⁶ was as follows: C2 (simple varicose veins) 41, C3 (with oedema) 12, and C4 (with lipodermatosis and/or other skin changes) five. The selected population was described by the algorithm C2–4, As, Pr.

Patency of the GSV was demonstrated in all 58 limbs. The GSV diameter showed an average reduction from 6.6 to 3.9 mm 36 months after surgery. However, reflux in the GSV system was shown in 53 (91%) of 58 limbs. As shown in Fig. 3, reflux recurred in the great majority of limbs (88%) quite early (within 6 months after CHIVA). In the 51 limbs in which GSV reflux was documented at 6 months, the re-entry point was found in a perforating vein located on the GSV system compared to preoperative findings of the re-entry point on a GSV tributary.

Of the 53 patients in which reflux returned, high ligation of the SFJ was performed in 46 (87%). In two cases, however, recurrent SFJ reflux was documented between 12 and 24 months of follow-up. These two patients were re-operated after being observed an increase in the GSV diameter. A relationship between preoperative GSV diameter and subsequent SFJ interruption was observed, so that when preoperative GSV diameter was categorised into four groups as <5 mm, 5.1–6 mm, 6.1–7 mm, and ≥ 7.1 mm, indication of SFJ interruption was not established in 37% patients of the first category, 23% of the second, 22% of the third, and in 0% of the fourth.

In the 53 patients with recurrent reflux, the GSV diameter showed an average reduction from 7 mm before SFJ interruption to 4.3 mm in the last follow-up assessment at 36 months. In the group of five patients without recurrent reflux, the GSV diameter showed an average reduction from 5.8 to 3.7 mm at the last follow-up assessment. Differences between both groups in reduction of the GSV diameter at 3 years were statistically significant (*t*-test, $p = 0.003$).

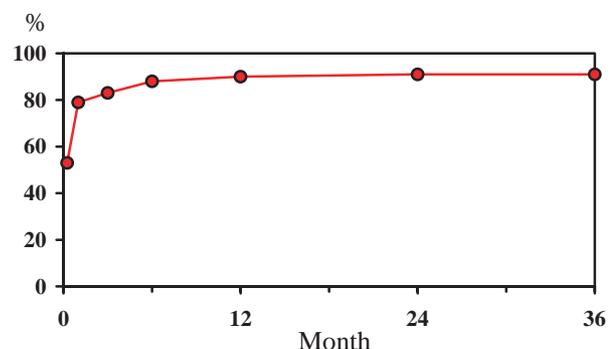


Fig. 3. Results of Duplex investigation during the 3-year follow-up study.

Table 1. Clinical results in 58 patients (58 limbs) undergoing CHIVA operation.

| Clinical findings* | When recurrent reflux was documented | At the time of SFJ interruption | Last follow-up assessment (36 months) |
|--------------------|--------------------------------------|---------------------------------|---------------------------------------|
| Cure | 52 (89.6) | 46 (79.3) | 52 (89.6) |
| Improvement | 6 (10.3) | 12 (20.6) | 6 (10.3) |
| Failure | 0 | 0 | 0 |

Percentages in parentheses.

*According to the classification proposed by Hobbs.²²

Clinical findings at the time of recurrent reflux, SFJ interruption, and the final follow-up assessment are shown in Table 1. According to the classification proposed by Hobbs,²² 89% of patients were classified as cure, 10% as improvement, and no case was included in the failure category. On the other hand, 53 (91.3%) patients rated clinical results as good and five (8.6%) as improvement. None of the patients considered that clinical results were bad.

There were three (5%) cases of neuropathy secondary to saphenous nerve lesion, but normal work activities were not limited.

Discussion

In accordance with the findings of Zamboni *et al.*,¹⁵ the interruption of the re-entry point according to the CHIVA procedure initially eliminates the reflux in the GSV. In the present study, however, elimination of reflux after interruption of insufficient collaterals was only temporary. Zamboni *et al.*¹⁵ reported reflux disappearance in the GSV in 100% and 85% of the cases (40 limbs) after 1 and 6 months, respectively. The corresponding figures in our study were only 21 and 12% respectively. Greater preoperative GSV diameters in our patients may account for the marked differences in short-term outcome. However, in the study of Cappelli *et al.*¹⁹ quality of drainage from the GSV vein was the only predictor of outcome. In our series, a new re-entry perforating vein develops in most of them, which in this case was located on the GSV. If we let the system evolve, the newly developed venovenous shunt will show varicose changes. This has been seen in the patients who, had delayed the interruption of the SFJ, once the re-entry perforating vein had developed. New insufficient collaterals were found in a third of these cases. During the second surgical time of the SFJ interruption, ligation of these veins was also performed.

We consider the interruption of the saphenous insufficient collaterals like a first preparatory time.

When flow direction reverses in the GSV and the Cappelli sign is positive,¹⁹ it indicates the necessity of interrupting the new venovenous shunt, now operating over the SFJ (escape point). It is only then, when we have obtained a drained and stable system.

An important disadvantage of this strategy is the high cost that the consecutive follow-ups with duplex scanning involve. These are needed to indicate the precise moment of the possible need to interrupt the SFJ. Nowadays, the limitations that we consider for the prescription of this strategy would include a place of residence far away from the hospital which would make difficult a frequent hospital visits, particularly in patients with advanced age, and preoperative GSV has a diameter larger than 9.5 mm because of the risk of thrombophlebitis with an open SFJ.

On the other hand, several authors have already considered that the presence of a reflux over a segment of the GSV after the interruption of the SFJ could be, itself, pathological.^{8,23-29} These authors find a reflux in the GSV in up to half of the operated cases, including those cases which were operated by the partial stripping technique. After the interruption of the SFJ, as the authors have reported, all the saphenous veins that have been kept patent, will display some reversed segment (probably the same than before the operation, if this has not developed any thrombosis) because it is not possible to drain in anterograde direction through an interrupted SFJ. We believe that the interruption of the venovenous shunt would make disappear the high blood pressure condition associated with it. Accordingly, a reduction in the GSV diameter was documented with Duplex scanning during the follow-up visits both in the present and other studies.¹⁹ Thus, although a saphenous segment keeps reversed flow, the interrupted global venovenous shunt would keep the cardiopet flow.

Despite the fact that encouraging results were anticipated for patients with primary varicose veins who are candidates to the CHIVA procedure,^{9,15,17,29} elimination of reflux in the GSV after interruption of insufficient collaterals is only temporary. In this respect, the present findings corroborate the need to supplement the CHIVA procedure with at least a high ligation of the SFJ,¹² to get a reasonably durable result. However, data obtained from randomised controlled trials (CHIVA versus stripping) are necessary to establish clearly that CHIVA is not worthwhile.

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