

# Comparative study among the physical examination, echo-color Doppler mapping and operative approaching in the recurrent lower extremity varicose veins from the saphenofemoral junction

*Estudo comparativo entre os achados do exame físico, do mapeamento com eco-Doppler colorido e da exploração cirúrgica na recidiva das varizes de membros inferiores a partir da junção safeno-femoral*

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## Abstract

**Background:** Recurrent varicose veins of the lower limbs are a frequent complication of saphenous vein stripping and their incidence may reach 80% of the cases.

**Objective:** To evaluate the sensitivity of physical examination and color-Doppler flow mapping for the diagnosis of insufficiency in the greater saphenous vein stump in patients who had previously undergone saphenous vein stripping, comparing the results with the findings at reoperation of the saphenofemoral junction.

**Methods:** This prospective study included 37 limbs of 30 patients who had been previously submitted to saphenous vein stripping to treat varicose veins. Color-Doppler flow mapping was performed in all patients. Results were compared with findings at reoperation of the saphenofemoral junction.

**Results:** The sensitivity of color-Doppler flow mapping was 70.3% (26 limbs out of 37 limbs) and false negative results occurred in 11 (29.7%) limbs ( $p=0.03$ ). The sensitivity of finding varicose veins in the groin and/or in the anteromedial aspect of the upper thigh was 100% (37 limbs out of 37 limbs), without false-negatives.

**Conclusions:** In patients previously submitted to saphenous vein stripping, recurrent varicose veins found in the groin or anteromedial aspect of the upper thigh at physical examination are suggestive of greater saphenous vein stump insufficiency. Color-Doppler flow mapping should be performed for an adequate saphenofemoral junction reoperation.

**Keywords:** saphenous vein; varicose veins; recurrence; ultrasonography; Doppler, color

## Resumo

**Contexto:** A recidiva de varizes em membros inferiores é complicação frequente da safenectomia e sua incidência atinge até 80% dos casos.

**Objetivo:** Avaliar a sensibilidade do exame físico e do mapeamento com eco-color Doppler no diagnóstico da insuficiência do coto da veia safena magna, em doentes previamente operados, comparando-os com os achados da exploração operatória da junção safeno-femoral.

**Métodos:** Foram estudados prospectivamente 30 doentes envolvendo 37 membros submetidos previamente à safenectomia magna para tratamento de varizes e que foram reoperados por recidiva de varizes na região inguinal ou em face anterossuperior da coxa. Todos os doentes foram submetidos ao mapeamento com eco-color Doppler. Os dados foram comparados com os achados da exploração da cossa da veia safena magna na reoperação.

**Resultados:** A sensibilidade do mapeamento com eco-color Doppler para a presença de insuficiência do coto da veia safena magna foi de 70,3% (26 concordâncias dentre os 37 membros) e resultados falsos negativos ocorreram em 29,7% (11) membros avaliados ( $p=0,03$ ). A sensibilidade do achado de varizes na região inguinal e na face anteromedial da coxa com a presença de insuficiência do coto da veia safena magna foi de 100% (37

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concordâncias dentre os 37 membros) e não houve resultados falsos negativos.

**Conclusões:** No doente já submetido à safenectomia magna, a presença no exame físico de varizes recidivadas em região inguinal e na face anteromedial da coxa é sugestivo de insuficiência do coto da veia safena magna, devendo-se realizar o mapeamento com eco color Doppler para o adequado planejamento da reexploração da crossa da veia safena magna.

**Palavras-chave:** veia safena; varizes; recidiva; ultrassonografia; ultrassonografia Doppler em cores.

## Introduction

Recurrence of varicose veins in the lower extremities is a frequent late postoperative complication. It is commonly associated with inadequate initial operation, although it may also occur as a result of disease progression. Recurrence may occur in up to 80% of patients within 5 to 20 years after the initial operation<sup>1</sup>. Sarin, Scurr, Coleridge Smith<sup>2</sup> and Bradbury et al.<sup>3</sup> showed that 20% of the patients subjected to operations for varicose veins presented recurrence. The *Recurrent Varices After Surgery* (REVAS) consensus document<sup>4</sup> defined this complication as “presence of varicose veins in lower limbs previously operated upon for varices”.

According to De Maeseneer et al.<sup>5</sup>, the determining factors for recurrent varicose veins are insufficient preoperative evaluation and inadequate initial operation. Those authors state that the leading cause of recurrence of varicose veins is ligation of the proximal saphenous vein too superficial or too far from the saphenofemoral junction, leaving untreated local tributary veins in the groin. An incompetent saphenofemoral valve may cause reflux into the saphenous vein stump and thus new varicose veins. Luccas, Menezes e Barel<sup>6</sup> stated that this complication is inevitable after the operation. Franco et al.<sup>7</sup> showed that 95% of cases of groin recurrence are caused by inadequate handling of the saphenofemoral junction. Rivlin<sup>8</sup> e Negus<sup>9</sup> published two papers (in 1975 and in 1993), emphasizing the relevance of this subject.

In a multicenter study, Geier et al.<sup>10</sup> confirmed the importance of an adequate treatment of the greater saphenous vein in the groin.

Neovascularization is another factor regarded as a direct cause of varicose vein recurrence on the saphenofemoral junction<sup>11-13</sup>. Some authors<sup>14,15</sup>, however, argue that angiogenesis alone is enough to cause recurrence of varicose veins.

Ecocolor Doppler mapping is regarded as a mandatory exam in the investigation of varicose vein recurrence<sup>4,9,16-21</sup>. This exam, however, is dependent on the examiner's proficiency and, to date, there is no stan-

dardization of eco-color Doppler in the evaluation of recurrent varicose veins<sup>22,23</sup>.

The objective of the present study is to evaluate the sensitivity of clinical examination and ecocolor Doppler mapping in the diagnosis of saphenofemoral junction insufficiency in patients with recurrent varicose veins in the groin and upper thigh who had previously undergone saphenous vein stripping and to compare the results with the findings at reoperation.

## Methods

The research project was approved by the Ethics Committee of *Faculdade de Medicina do ABC*, protocol number 088/03. This prospective observational descriptive study was carried out in patients of a private clinic in Santo André (SP) from February 2004 through November 2006.

The inclusion criteria were: adult of both sexes with recurrent varicose vein of the lower limbs with CEAP classification 2 and 3 located at the inguinal and anteromedial regions of the upper thigh<sup>24</sup>. The exclusion criteria were extrinsic compression and/or pelvic varicose veins.

Out of 312 patients who had undergone saphenous vein stripping, 89 (28.5%) were reoperated for recurrence. Thirty patients who met the inclusion criteria were selected and the sample consisted of 37 lower limbs.

This study had two phases: in the first, clinical examination and color Doppler mapping was performed, and in the second phase, surgical reintervention was performed at the saphenofemoral junction.

The patients' mean age was 53.7 years (32 to 74 years old). Twenty-seven (90%) were females and three (10%) were males. Twenty-seven (90%) were Caucasian and three (10%) were Black. Nine patients had arterial hypertension (30%), and one had diabetes mellitus (3.33%). The right lower limb was affected in 21 cases (56.8%), and the left lower limb in 16 cases (43.2%). Regarding risk factors for varicose veins, 24 women (88.9%) had had two or more pregnancies (Table 1).

Physical examination was performed with the patient in the supine and upright positions. The lower limbs were evaluated as to color, presence of edema, deformities, hemangioma, muscular hypertrophy, hyperpigmentation, teleangiectasias, varicose veins, skin trophic changes and dermatomycosis and onychomycosis. The scars from the previous surgical incisions were evaluated as to the position at or above the inguinal crease, and varicose veins on the groin and/or on the anteromedial portion of the thigh were noted (Figure 1).

Femoral, popliteal, tibialis anterior and posterior pulses were assessed, and the limbs tested for edema. The varicose veins were palpated and the presence of superficial phlebitis was excluded in all cases.

Out of the thirty patients with recurrent varicose veins, 22 (73.3%) had been operated upon once previously, five (16.7%) had been operated twice, and three (10%) had undergone three operations (Table 2).

All patients underwent color Doppler flow mapping in different institutions, according to their health care insurance coverage. The diagnostic hypothesis of

recurrent varicose veins was specified at test ordering, so the superficial and deep venous systems and the perforating veins were investigated.

After preoperative clinical evaluation the color Doppler flow mapping, the patient was subjected to operation by a 3-cm incision at the groin. The saphenofemoral junction was approached directly in 29 limbs (78.4%), and, in eight cases (21.6%), the femoral vessels were dissected.

The groins that had not been previously operated upon were intact. When previous ligation of the greater saphenous vein had been distal to the saphenofemoral junction, the groin was easier to dissect, because the region not been explored before (Figure 2). When it had been previously approached, dissection was more difficult due to local fibrosis. In those cases, the technique described by Li<sup>25</sup> was used, consisting of extending the incision laterally onto the femoral pulse, which allows dissection of the femoral vein and of the saphenofemoral junction. The saphenous vein stump can then be sutured with 5-0 polipropilene. The subcutaneous tissue was closed with 3-0 absorbable sutures, and the skin closed with intradermal sutures of 4-0 poligalactin. After

**Table 1.** Distribution of women presenting recurrent varicose veins in the lower extremities after saphenectomy, and number of pregnancies after primary surgery.

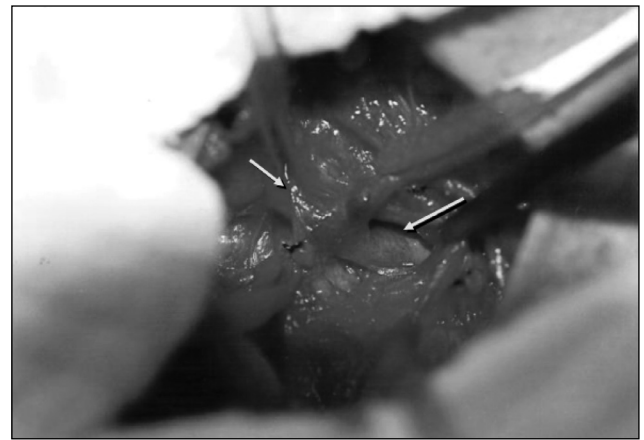
| Pregnancies | n  | %     |
|-------------|----|-------|
| 0           | 1  | 3.7   |
| 1           | 2  | 7.4   |
| 2           | 13 | 48.2  |
| 3           | 7  | 25.9  |
| 4           | 4  | 14.8  |
| Total       | 27 | 100.0 |

**Table 2.** Number and percentage of previous operations in patients with recurrent varicose veins in the lower extremities.

| Previous operations | n  | %     |
|---------------------|----|-------|
| 1                   | 22 | 73.3  |
| 2                   | 5  | 16.7  |
| 3                   | 3  | 10.0  |
| Total               | 30 | 100.0 |



**Figure 1.** Mapping of recurrent varicose veins, starting from the saphenofemoral junction. The arrow indicates a distal previous surgery wound.



**Figure 2.** Intraoperative view of the saphenofemoral junction dissection. The arrow indicates the dissected common femoral vein, and the smaller arrow indicates the isolated saphenous vein groin.

handling the saphenofemoral junction, the varicose veins were treated by the conventional technique of excision through stab incisions.

The descriptive analysis of study variables was used. Qualitative variables were expressed as absolute and relative values. The kappa test was used to correlate the findings of physical examination, color Doppler flow mapping and surgical exploration. Values adopted were: less than zero, absence of agreement; from 0 to 0.19, low agreement; from 0.20 to 0.59, medium degree of agreement; from 0.60 to 0.79, high degree of agreement; from 0.80 to 1.0, almost perfect agreement. Data were analyzed by the computer program SPSS 14.0 for Windows.

**Results**

The findings of color Doppler flow mapping of the groin showed saphenous vein stump insufficiency in 22 (59.5%) cases (Table 3, Figure 3).

At reoperation, 33 of the limbs (89.2%) were found to have insufficient greater saphenous vein stumps, and in 4 limbs (10.8%), the saphenofemoral junction was intact (Table 4).

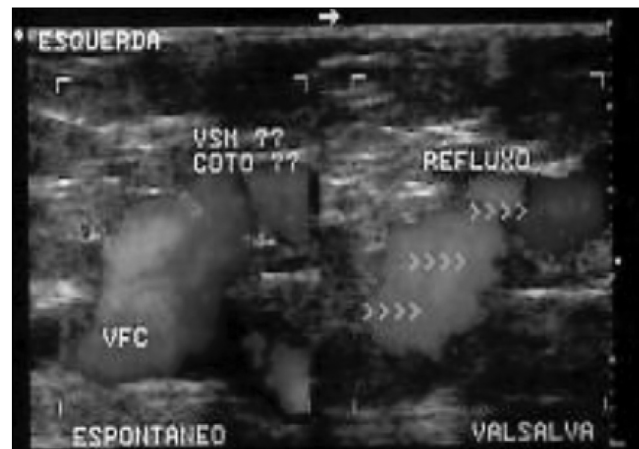
Out of the 11 limbs (29.7%) that showed no agreement between ecocolor Doppler mapping and surgical findings, in 4 limbs (10.8%) the saphenofemoral junction was intact and in 7 limbs (18.9%), an insufficient saphenous vein stump was found (Chart 1).

Two patients (5.4%) had perioperative complications. One of these patients presented lymphorrhea that lasted eight days and resolved spontaneously. The other patient had an operative injury of the saphenofemoral junction that was immediately identified and treated with primary venorrhaphy.

Comparison between color Doppler flow mapping and surgical findings in patients with recurrence of varicose veins in the groin and antero-medial aspect of the thigh showed agreement in 26 limbs (70.3%) and no agreement in 11 limbs (29.7%) (Table 5) (kappa=0.4; medium degree of agreement). The agreement between

the presence of recurrent varices in the groin and in the anteromedial portion of the thigh at clinical examination and the surgical finding of saphenofemoral junction insufficiency (with a stump) was 100% (kappa=1.0; perfect agreement).

The sensitivity of color Doppler flow mapping to the presence of an insufficient greater saphenous vein stump was 70.3% (26 agreements in 37 limbs). False-negative results were found in 11 limbs (29.7%). The sensitivity



**Figure 3.** Color Doppler flow mapping showing insufficient saphenous vein stump with reflux.

**Table 3.** Findings of color Doppler flow mapping in patients with recurrent varicose veins after saphenectomy.

| Findings of color-Doppler flow mapping | n  | %     |
|--|----|-------|
| Insufficient saphenous vein stump      | 22 | 59.5  |
| Insufficient saphenous vein            | 4  | 10.8  |
| Saphenectomy without groin management  | 9  | 24.3  |
| Dilated veins                          | 2  | 5.4   |
| Total                                  | 37 | 100.0 |

**Table 4.** Surgical findings in patients with recurrent varicose veins after saphenectomy.

| Surgical findings                 | n  | %     |
|-----------------------------------|----|-------|
| Insufficient saphenous vein stump | 33 | 89.2  |
| Intact groin                      | 4  | 10.8  |
| Total                             | 37 | 100.0 |

**Chart 1.** Distribution of cases without diagnostic association between Doppler mapping and surgical findings in patients with recurrent varicose veins after saphenectomy.

| Case | Findings of color-Doppler flow mapping | Surgical findings  |
|------|--|--------------------|
| 1    | Saphenectomy                           | Insufficient stump |
| 2    | Saphenectomy                           | Intact groin       |
| 3    | Saphenectomy                           | Intact groin       |
| 4    | Saphenectomy                           | Insufficient stump |
| 5    | Saphenectomy                           | Insufficient stump |
| 6    | Dilated veins                          | Intact groin       |
| 7    | Dilated veins                          | Intact groin       |
| 8    | Saphenectomy                           | Insufficient stump |
| 9    | Saphenectomy                           | Insufficient stump |
| 10   | Saphenectomy                           | Insufficient stump |
| 11   | Saphenectomy                           | Insufficient stump |

**Table 5.** Number and percentage distributed according to diagnostic association between Doppler mapping and surgical findings in patients with recurrent varicose veins after saphenectomy.

| Association | n  | %     |
|-------------|----|-------|
| Yes         | 26 | 70.3  |
| No          | 11 | 29.7  |
| Total       | 37 | 100.0 |

of the clinical finding of groin and anteromedial varicose veins in relation to greater saphenous vein stump insufficiency was 100% (37 associations among 37 limbs), without false-negative results.

## Discussion

Recurrent varicose veins are a concern for surgeons since 1940, when Stalker and Heyerdale<sup>26</sup> and other authors<sup>27-29</sup> pointed out the importance of this problem. The incidence of recurrence is variable, depending on the technique used in the initial operation. A high incidence of recurrent varicose veins can be avoided by careful dissection and ligation of all tributary veins of the proximal saphenous vein and at the saphenofemoral junction<sup>30-37</sup>.

Rivlin<sup>8</sup> has stated that the leading cause for recurrent varices is dissecting the saphenous vein at a superficial level, i.e., when an inexperienced surgeon does not dissect deep enough to reach the saphenofemoral junction and performs ligation of the greater saphenous vein distally to the tributary veins draining into the it. Franco et al.<sup>7</sup> have stated that 95% of recurrence cases are the result of incomplete surgical handling of the saphenofemoral junction. Wali et al.<sup>19</sup>, Jiang et al.<sup>20</sup>, and Zaraca e Ebner<sup>38</sup> have also suggested that in some cases, this may happen when the surgeon mistakes the greater saphenous vein for the common femoral vein, and goes on to ligate the accessory saphenous vein instead of the greater saphenous vein. Wali et al.<sup>19</sup> have claimed that recurrence can be avoided if the surgeon performs the dissection at the saphenofemoral junction and ligation close to the femoral vein.

Reoperation at the saphenofemoral junction can be difficult when there is intense fibrosis, and in this situation, the femoral artery and vein should be dissected, so the saphenofemoral junction can be approached from its lateral aspect<sup>25</sup>. In the present study, eight out of 37 limbs (21.6%) required this technique.

Hayden and Holdsworth<sup>39</sup> stated that there were no cases of venous injury among the limbs they reoperated, but lymphatic injuries were frequent. According to those authors,

lymphorrhoea or lymphocele was the most common complication, present in 26% of the cases, followed by wound infection, observed in 16% of the population. De Maessenner et al.<sup>40</sup> confirmed those concerns in a study with limbs submitted to saphenoplasty with silicon implants, in which they reported a complication rate of 9.5% of the patients operated: infection in 2.8% of the cases, lymphatic injuries in 3.2%, venous thromboembolism in 3.0%, and common femoral vein stenosis with hemodynamic repercussion in 0.9%. In our study, there was a case of lymphorrhoea (2.7%) and a case of saphenofemoral junction injury (2.7%), both with good recovery.

In the study by Egan et al.<sup>37</sup>, neovascularization was found in 8.2% of the limbs, however all cases were associated with an insufficient saphenous vein stump or saphenous vein reflux in the thigh. In none of the cases, neovascularization was the sole cause of recurrence. Small vessels that may be present as a result of healing at the saphenofemoral junction are not large enough to be a cause of recurrence and to remodel the local venous anatomy<sup>14,15</sup>. Neovascularization as a direct cause of varicose vein recurrence at the saphenofemoral junction was not found in any of the 37 cases of the present series.

The diagnosis of recurrent varicose veins and their possible causes is made initially by clinical examination<sup>5,7-9,19,20</sup>. With the increasing use of color Doppler flow mapping, the investigation of recurrent varicose veins and their causes have easier and thorough<sup>16-20</sup>. The clinical examination now plays a secondary role in the decision-making process. Some authors<sup>17,18</sup> claim that color Doppler flow mapping alone is enough to decide on the need for reoperation, according to the findings of whether insufficient saphenous vein stump and/or insufficient tributaries are present or not.

The color Doppler flow mapping advantages of low cost and noninvasiveness are offset by the fact that this exam is wholly dependent on the examiner's proficiency<sup>22,23</sup>. Besides that, one should emphasize the lack of standardization of this exam in the evaluation of recurrent varicose veins<sup>22,23</sup>.

Enrici et al.<sup>32</sup> reported recurrent varicose veins in 15.6% of their patients. They state that the efficacy of diagnostic methods in preventing this complication was higher when a combination of color Doppler flow mapping, phlebography, phlebomanometry and bidirectional Doppler flowmetry associated with pletismography were used in combination before the initial operation. primary intervention. This thorough combination of different diagnostic methods may have contributed to the lower rate of recurrence observed in their series compared to ours.

França et al.<sup>33</sup>, using color Doppler flow mapping, showed a 27.5% prevalence of reflux in the saphenous vein

stump of the patients presenting recurrence of varicose veins after saphenous vein stripping. In our study, the prevalence was 59.5% of the operated limbs.

Morais et al.<sup>30</sup> studied the accuracy of color Doppler flow mapping to indicate surgical treatment in patients with varicose veins, using the surgical findings at operation as the gold standard. Total accuracy was 0.87 for clinical examination and 0.95 for color Doppler flow mapping, which resulted in an agreement of 87.2% between the two methods, when the varicose veins were located only in the greater saphenous vein. Those authors have concluded that color Doppler flow mapping presents optimal diagnostic accuracy and should be performed as an adjuvant to the clinical examination before operations for varicose veins of the lower extremities. In the present series, the results of color Doppler flow mapping of limbs with recurrent varicose veins have reinforced the hypothesis that the findings of varicose veins in the groin and anteromedial aspect of the thigh at clinical examination justify reoperation of the saphenofemoral junction. That is, color Doppler flow mapping plays an adjuvant role in the decision to reoperate the saphenofemoral junction.

Color Doppler flow mapping is regarded as a reliable method to locate perforating veins and points of reflux<sup>17,18,35,36</sup>. Egan et al.<sup>37</sup> reported that color Doppler flow mapping showed an intact greater saphenous vein despite previous saphenous vein stripping in 17.4% of the patients, a finding similar to ours (10.8%).

In the present study, the relatively low sensitivity of color Doppler flow mapping may be explained by the fact it is an exam that is dependent on the examiner's proficiency and the exams were performed in several institutions by different examiners. We conclude that the need for reoperation of the groin and saphenofemoral junction may be decided upon the findings at clinical examination of varicose veins in the groin and anteromedial aspect of the thigh, but only the color Doppler flow mapping can confirm the presence of greater saphenous vein stump insufficiency. Nevertheless, failure of this method may be explained by fibrosis in the previously operated site, which may confuse the examiner<sup>22,23</sup>.

Color Doppler flow mapping is a noninvasive exam that is important in the assessment of venous points of reflux that may cause new varicose veins. Along with clinical examination, this method is helpful in indicating the need for reoperation on the saphenofemoral junction. Besides that, an color Doppler flow mapping of the lower limb venous system is crucial to planning the surgical treatment of varicose veins.

We conclude that, in patients previously subjected to saphenous vein stripping, the findings of varicose veins in the groin and anteromedial aspect of the thigh suggest the need for reoperation of the greater saphenous vein at the groin. Color Doppler flow mapping should be performed to confirm saphenous vein stump insufficiency and to allow adequate planning of the surgical treatment.

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**Author's contribution**

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