(56 popliteal fossa reoperations)

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Summary

The study relates to 56 popliteal recurrences after initial short saphenous surgery because of primary varicose veins (49 residual short saphenous refluxes and 7 ablations of the popliteal fossa area vein).

During the same period, 4 years, 385 short saphenous refluxes and 67 popliteal fossa area vein refluxes were operated. The reoperation was always performed under ambulatory local anaesthesia in prone position, with a horizontal incision of the popliteal fossa centred by means of a Doppler ultrasonic search.

The results show 87% recurrences after incomplete exeresis of the short saphenous vein (49% cases): 6 undamaged short saphenous vein, 1 short saphenous crossectomy without stripping, 1 Jiacomini's vein ligation, 41 long residual stumps with reappearance of a popliteal varix on the stump because of improper ligation, of a popliteal fossa vein on the stump or neoangiogenesis, and 3% popliteal perforator appeared after a complete cure of the short saphenous reflux (7 cases).

The study of the literature and the operative findings show that among the great variety of the origins of short saphenous, the short saphenous junction responsible for the reflux are mainly those placed in the popliteal fossa, easy to access for surgery. The comparative study for the frequency of the short saphenous vein insufficiency and the popliteal fossa vein reflux shows that the deep hemodynamic phenomena play an important part in the appearance of the superficial reflux.

INTRODUCTION

Varices with a popliteal fossa origin appear to have a particular identity among all existing limb varices. The literature seldom studies the frequency of popliteal fossa recurrences after reflux surgery on the short saphenous vein. Indeed, the appearance of a short saphenous reflux after a varix cure depending on the long saphenous vein should not be considered as a short saphenous recurrence (16% of the 385 cures of the short saphenous reflux in our experience)[1]. Short saphenous recurrence rates vary from 1.8% Vasdekis [2] to 48% Trempe [3]. Rivlin [4] indicates 8% recurrences from 5 to 10 years out of 285 operations for short saphenous reflux.

Their anatomic differences certainly explain the high recurrence frequency.

We studied 56 popliteal reoperations in order to try to understand superficial venous reflux physiology in popliteal fossa and in order to propose operative procedures allowing us to limit this risk of recurrence.
PATIENTS AND METHODS

This retrospective study performed from 1990 to 1994, concerning only primary varicose vein, relates to 56 popliteal fossa reoperations for varicose recurrences after initial short saphenous surgery. 23 cases (40%) are personal cases. During the same period, we performed 452 operations for varices coming from the popliteal fossa, that is 385 short saphenous refluxes and 67 refluxes on a perforator of the popliteal fossa. Each reoperation was preceded by a Doppler ultrasonic search during the preoperative mapping (ESAOTE AU 530 probe 7,5-10 Mz). At the beginning of our experience, we performed 10 varicose phlebographies in order to show the feeding zone of the reflux. The operation was performed by the same operator. The 56 popliteal reoperations are shared between 49 reoperations for residual short saphenous vein and 7 ablations of a popliteal fossa perforator.

OPERATION

The operation was always performed under ambulatory local anaesthesia by a subcutaneous injection of HCL XiloçaÔne diluted in 0,75 bicarbonate in order to reduce the pains caused by the injections. The patient is in a prone position, with half-bent knees. The incision is horizontal, from 3 to 4 cm, centred 1 cm below the source of the reflux on the deep tract marked with the Doppler search, always some distance away from the previous scar - generally lower.

The operation is performed by means of a magnifying glasses with a x4 magnification. The dissection is minimal, following the short saphenous stump or the popliteal area vein up to the deep tract. The new ligation is made close to the deep tract without exploration or any major dissection of the venous complex of the popliteal fossa. The closure is secured using ercedex on the aponeurosis, and separated stitches of intradermic unresorbable thread, hidden knots.

The bandage consists of a double compression with either:

- a preliminary cotton elastocompressive bandage fixed for 4 days, covered by a removable class 2 elastic bandage (20 mmHg) necessary for standing and walking.
- 2 elastic stockings (class 2) providing a compression (class 4).

RESULTS

The peroperative exploration allowed us to define different anatomic types of varicose recurrences which are distributed as follows:

- 7 popliteal area vein perforators, of which 5 appeared after the complete cure of a short saphenous reflux (without residual stump). The popliteal area vein is generally placed higher and more laterally than the previous short saphenous implant, which corresponds to the usual location of the popliteal area vein.
- 6 undamaged short saphenous vein with a non dissected junction in normal continuity with the short saphenous vein. The small size of the initial incision, and sometimes its incorrect centring with regard to the short saphenous vein discovered, are the reasons...
for the improper surgical procedure.

- 41 refluxes on a residual stump longer than 3 cm. The varicose veins were fed by an branch which developed on this stump. Among these long stumps we found:

  - a neoangiogenesis on the ligation thread with a reconnection of the long stump reflux and of the short saphenous vein left in its place (1 case)
  - a slack ligation with unresorbable thread without resection, with a complete redraining of the ligation et refeeding of the short saphenous vein (2 cases)
  - a voluminous perforator of the popliteal area vein type connected to the stump of the short saphenous vein (1 case)
  - a reflux in a long stump fed by a reflux on a double branch (1 case)
  - an orthograde reflux in the Jiacomini's vein directly fed by the reflux on the residual long stump (1 case)
  - a neoangiogenesis on the long stump tip.

- 1 ligation and ablation of the Jiacomini's vein mistaken for the short saphenous vein, because of a low anastomosis of the short saphenous vein and incorrect operative exploration.

- 1 complete crossectomy of the short saphenous vein without stripping. The persistent short saphenous reflux with a 7 mm diameter short saphenous vein being fed once more by means of popliteal junction coming from the previous crossectomy.

Two patients were reoperated on because of second popliteal recurrences; this involved a reappearance of popliteal perforators after a proper cure of a short saphenous reflux

One patient was reoperated on because of a 3rd popliteal recurrence; this involved a neoangiogenesis at the termination of the residual short saphenous long stump, already reoperated twice.

The recurrences of the popliteal fossa are rather early recurrences (Tab II). As a matter of fact, whilst the delay (in years) between the first operation and the recurrence may vary from 0 to 27 years, the cumulated percentage curve of the 56 patients, depending on the delay between the first operation and the reoperation, shows that 50% are reoperated on 3 years later, whilst 14% are already reoperated on during the first post-operative year, and 32% during the second year.

The similar curve corresponding to 23 patients in our own experience (Tab III) shows the same incline with a slightly shorter interval between the two operations, which simply indicates a better postoperative follow-up.

**DISCUSSION**

In the literature, the frequency of the short saphenous reflux varies from 3% to 30% depending on the population recruitment and on the preoperative explorations showing the short saphenous failure (Tab IV). For our part, we found 8% short saphenous reflux out of 1500
patients with varices who were examined during the preoperative period, from 1990 to 1993.

**PATHOGENESIS AND TREATMENT OF THE RECURRENCE**

Up to 1990, the absence of any preoperative Doppler ultrasonic search, and the single short saphenous ligation in its accessible section, explain the high number of early recurrences, since in our 10 personal recurrences operated on in 1990, half of these patients had been operated during the previous year, and among the other 13 patients reoperated from 1990 to 1994, none of them were patients operated on from 1990 to 1994 with a marking Doppler ultrasonic scan and a short saphenous ligation close to the deep tract. On the contrary, all are patients previously operated under conditions of operative marking which we retrospectively thought was not sufficient (Tab V). In the same way, for the 56 recurrences operated on between 1990 and 1994, none of the corresponding operations performed for the first time in that same period are personal cases with a preoperative Doppler ultrasonic scan (Tab VI).

**Table V**

Out of the 56 recurrences studied (Tab I), 49 (87%) are due to technical errors, either a crossectomy not performed or incorrectly performed, leaving the short saphenous system in place (9 cases), or an incomplete exeresis leaving the refluant short saphenous trunk in place (1 case), or leaving in place a long stump of the short saphenous vein, which is always a source of reflux (39 cases). We can find all these technical errors (long stumps) in numerous studies, Royle [5], Vandendriessche [6], Thibault [7], Doran [8], Lofgren [9], Elbaz [10], Perrin [11], Rettori [12], Rivlin [4] give, half undamaged short saphenous vein out of 21 reoperations. The associated reflux in the gastrocnemius vein is certainly underestimated as, if its frequency is not high in some studies (Barthelemy [13] 2.1%), it is shown to be very high in others (Cheatle [14] 20%, Dodd [15] 71%). Thierry [16-17] and Vandensriessche [18] recommend the ligation of the incontinent gastrocnemius vein, and Van Der Stricht [19-20] respects its hemodynamic roll. The gastrocnemius veins must be considered as veins related to the deep venous system and the anastomosis below the inferior popliteal valve lets them play the roll of an absorbing volume for the pressure rush of the popliteal vein. They deserve to be respected for this reason (Van Der Stricht [20]).

**Table VI**

Only the 7 appearances of reflux in a popliteal perforator (12.5%) can be considered as inevitable recurrences because of the existence of an identical deep popliteal cause.

Five neoangiogenesis [21-22-23], recurrent phenomenon, were found in this study (3 of them are recurrences from the same popliteal operation). Neoangiogenesis seems to be infrequent, 2 cases for 56 recurrences (3 ;5%); it is described as a cavernoma in previous studies (3,6 %) Elbaz [10].

We did not find neovascularization coming from the vasa nervorum of the sciatic nerve or of its...
branches. The embryologic development of the short saphena explains why it sometimes rushes directly or via its branches into the different nerves of the popliteal fossa. Sheppard [24].

The necessity of a new and more extensive surgical exploration leads some authors to propose passages that are broader with Z-shaped flaps, Doran [8], Royle [5] or by the posterolateral approach, Van Der Stricht [25].

As far as we are concerned, the properly centred horizontal path, at a certain distance from the previous scar, has always appeared to be sufficient and is advantageous in as much as it is not very painful in the short term, and is cosmetic in the long term.

**PATHOLOGY OF THE POPLITEAL FOSSA AREA VEIN**

Initially described by Dodd [15], the popliteal fossa area perforator is a particular identity of the popliteal fossa.

Out of the 452 operations performed for varices of the popliteal fossa, 385 are short saphenous refluxes (85%), and 67 are refluxes coming from a popliteal perforator (15%) (Tab. VII, Tab. VIII). The isolated pathology of a popliteal vein prevails over the isolated pathology of the short saphenous vein (62% versus 53%). In a patient with a long saphenous vein insufficiency, there are twice as many short saphenous associations than associations with a popliteal fossa area vein. We might well think that the reflux in a popliteal fossa area vein is more often secondary to the ablation of the short saphenous vein. If we refer to the pathogenic hypothesis of the popliteal varices [26] which might come from popliteal hyperpressure mechanisms, the same causes producing the same effects, the removal of a reflux volume during the first operation immediately recreates the same initial conditions of pressure coming from a popliteal vein tributary.

**Table VII / Table VIII**

In our study, the reflux in a popliteal fossa area vein appears more frequently in a patient operated for a long saphenous reflux.

In a previous study performed from 1990 to 1993 [1] on a varicose population of 1500, we found a 1.4% frequency of reflux appearing on a popliteal fossa area vein, and a 8% frequency of short saphenous reflux, (Marques [27] provides similar results : 10.7% short saphenous and 1.6% popliteal fossa vein on 330 explorations).

In this study, in patients with a popliteal varices, 15% have a varicose vein coming from a popliteal fossa perforator and 85% have a short saphenous reflux.

The same proportion can be found in the different patients with popliteal varicose recurrences, because 12.5% out of them have a reflux in a popliteal fossa vein and 87.5% have a recurrence located on the short saphenous vein (Tab IX).
This may allow us to think that the frequency of a reflux appearing in a popliteal fossa perforator, compared to the frequency of a reflux appearing in the short saphenous vein is the same in the varicose population in general, patients with varices in the popliteal region and patients with popliteal varicose recurrences. Thus, the reflux in a popliteal fossa vein and the short saphenous vein reflux seem to have the same natural history.

**GENESIS OF THE SUPERFICIAL VENOUS REFLUX IN THE POPLITEAL FOSSA**

The numerous anatomical studies of short saphenous termination in patients with varicose veins show that the unique short saphenous termination in the popliteal vein at knee level represents between 50 and 80% of cases (72% for Gorny [8] out of 225, 50% found by Trempe [3], 60% for Vasdekis [29] out of 64, 80% for Dodd [15] out of 444).

There are only 15% (15.2% Dodd [15], 15.4% Engel [35], 16% Lee Thomas [36]) of the varices of the popliteal fossa fed by high reflux coming from the deep femoral vein, the gluteal vein, the crural muscular vein, the sciatic or the long saphenous vein.

On the other hand, the studies performed with healthy subjects provide us with very different results.

Engel [33], out of 114 short saphenous terminations in healthy subjects shows that 46.6% of short saphenous vein present a high connection without any communication with the popliteal vein at the knee level. Engel [33] even assumes that the short saphenous vein in the healthy subject is in a direct connection with the deep veins of the high part of the thigh in 63.2% cases, and Kosinski for 80% cases [34].

If we compare the somewhat high percentages with regard to high connection in the healthy subject, 46.6%, 63% for Engel [33], 33%, 80% for Kozinski [34] and the somewhat lower frequency of the high connections found in pre- and peroperative in patients with varices (15%), we are led to suppose that these very high short saphenous modes of termination are much more frequent than we imagined and much less exposed to reflux than the short saphenous terminations at the popliteal level.

It must be observed that all the operated recurrences are fed by a reflux coming from the deep venous system located at the level of the popliteal fossa; communication with the deep system has always been easily surgically accessible in the open space of the popliteal fossa. The recurrences coming from these high junctions are seldom described.

The dilatation of the ascending branches in the thigh and, secondarily, the appearance of the reflux in these high collateral branches of the short saphenous vein could be a secondary phenomenon to a reflux located lower on gastrocnemius perforators connected to the popliteal fossa varicose vein. The deformation of the short saphenous system would take place from low to high. The dilatation and the reflux should be reversible after ablation of the short saphenous vein and of the low sources of reflux. Cotton [30], Thibault [7], Lofgren [9], King [31], Abu-Own
[32] have widely developed this ascending theory of varicose pathology.

The popliteal fossa is the only zone in which the deep venous vessels are exposed to low pressure; this free zone is between two other zones, above and below, where the vessels are subject to high muscular pressure.

- Simultaneous contractions of the calf muscles and the thigh muscles prevent normal blood drainage from the calf muscles into the popliteal vein. The bursts of pressure between these two areas (leg and crural) can be seen in the collateral branches of the popliteal vein, including the short saphenous vein (Marques [27]). The orthograde reflux in Giacomini’s vein and in the ascending branches of the thigh, often associated to a dilatation, often exists without reflux in the long saphenous trunk. These ascending orthograde refluxes are considered as safety valves that allow phenomena of excess pressure to be evacuated into the popliteal vein (Engel [33]).
- Forcing of the short saphenous vein is mainly due to a deep venous insufficiency that is responsible for the predominate excess pressure on the popliteal saphenous junction (Brunner [26]). Furthermore, we have often observed a positive Valsalva in peroperative work at the short saphenous stump among patients in prone position under local anaesthetic.

Deep venous reflux in patients with popliteal varices has been observed in numerous studies (36% Redwood [37]). 12% of patients with short saphenous vein recurrence have a related popliteal reflux, according to Grouden [38] and to Thibault (6.6%) [7].

The relatively short time between operation and recurrence (50% after 3 years), and its sometimes violent and painful appearance, are elements in favour of a particular hemodynamic origin of reflux on the short saphenous vein.

Somjen [39] shows that some popliteal venous and deep femoral venous refluxes related to short saphenous vein reflux disappear after ligation of the short saphenous vein, and concludes that deep venous reflux is the consequence of superficial reflux.

The study carried out by Plate [40] on patients with congenital avalvulation would not appear to demonstrate any particular correlation between avalvulation and varicose risks.

**CONCLUSION**

Varices from the popliteal fossa appear to have a special identity due to exposure in the popliteal fossa of the deep venous system between two zones of muscular compression, above and below. Among the wide variety of situations for implantations of the short saphenous vein in the deep vein, the only ones that would seem to be at risk of reflux are those located at the popliteal fossa, and thus in an area that is easy to reach for surgery. 87% of popliteal refluxes are considered to be technical errors that could have been avoided using preoperative Doppler scanning, and flush ligation of the short saphenous vein.

Given that the short saphenous vein implantations that are subject to reflux are mainly those located in the popliteal fossa, and given that this area is the easiest part of the deep vein to
reach for surgery, an operation after accurate Doppler ultrasonic scanning should reduce the risk of recurrence.

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