Surgery for Recurrent Sapheno-femoral Incompetence Using Expanded Polytetrafluoroethylene Patch Interposition in Front of the Femoral Vein: Long-Term Outcome in 119 Extremities

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ABSTRACT

Objective: To assess the long-term results of re-do surgery for recurrent varicose veins using polytetrafluoroethylene patch interposition to correct a recurrent varico-femoral junction (RVFJ).

Methods: In 170 extremities (137 patients) with RVFJ greater than 3 mm in diameter, re-do surgery was done with patch interposition and without extensive resection of neovascularisation. Follow-up data based on physical and ultrasound examinations were obtained for 119 of these extremities (100 patients).

Setting: Private-practice vascular surgery centre.

Results: At follow-up (mean 4.9 years), 5 extremities (4.2%) had another RVFJ. In the 114 extremities with no RVFJ, 27.7% had no varicose veins or incompetent superficial veins, 45.3% had several small varicose veins without reflux, and 22.6% had diffused varicose veins and a new site of incompetence between the deep and superficial venous system.

Conclusions: Re-do surgery using patch interposition lowers the long-term risk of another RVFJ. Wide resection of neovascularisation in the groin seems unnecessary.

Keywords: Expanded polytetrafluoroethylene; Great saphenous vein; Neovascularisation; Recurrent varicose veins; Venous incompetence

Introduction

Recurrence of varicose veins is a serious public health problem [1,2], and the rate of recurrence requiring a re-do procedure after primary surgical treatment of varicose veins is between 20% and 30% [2,3]. If re-do surgery is necessary, the groin dissection likely to be required is difficult and associated with considerable morbidity. Moreover, neither closure of the prevascular fascia in front of the femoral vein [4,5] nor muscle plasty [6], which is ineffective [7], is feasible in re-do surgery. The only possibility for effective re-do surgery may be interposition of an expanded polytetrafluoroethylene (ePTFE) patch in front of the femoral vein [8–10]. This study assessed the long-term results achieved with a patch interposition procedure for re-do varicose vein surgery that was developed to prevent a subsequent recurrence requiring another re-do procedure in the groin.

Materials and Methods

Patients

A total of 137 consecutive patients (170 extremities) underwent re-do surgery with patch interposition for recurrent sapheno-femoral incompetence between April 1992 and June 1994. A preliminary report on the procedure used, including its morbidity and short-term results, was published previously [11]. All patients had clinically documented recurrent varicose veins classified as C2, C3 or C4 in accordance with the CEAP criteria. In all extremities, the re-do procedure involved the previous ligation site. All patients underwent Doppler ultrasonography (done by the same technician) before
The vascular sheath was opened, and the residual stump by using binocular loupes without an electric scalpel. Dissection directly to the femoral vein was accomplished marked preoperatively with the use of Doppler scanning. Medial end above the residual stump that had been cm oblique lateral skin incision was made, with the dissection to expose the stump of the tied vein. A 4-remote from the femoral vein and minimal tunnel approach involving an incision placed at a distance employed in endoscopic procedures, with a lateral approach. Eighty-two others were discharged the day after surgery.

**Surgical Technique**

The re-do surgical procedures were done with the patient under locoregional anaesthesia, with a femoral nerve block, injection of 50% lidocaine solution (1%) to extend the area of anaesthesia to residual varicose veins and, if requested by the patient, injection of midazolam and afentanil for sedation and pain control. Eighty-two per cent of patient chose to be treated as outpatients; the others were discharged the day after surgery.

The operation was done using a method similar to that employed in endoscopic procedures, with a lateral approach involving an incision placed at a distance remote from the femoral vein and minimal tunnel dissection to expose the stump of the tied vein. A 4-cm oblique lateral skin incision was made, with the medial end above the residual stump that had been marked preoperatively with the use of Doppler scanning. Dissection directly to the femoral vein was accomplished by using binocular loupes without an electric scalpel. The vascular sheath was opened, and the residual stump was dissected by raising the prevascular flap forward. After initial suture ligation of the stump flush with the femoral vein, dissection was continued distally to the division branches of the residual stump. Collaterals were divided after placement of clips. If present, the isolated stump or residual great saphenous trunk was pre-tied for stripping. Obliteration of the stump was achieved by burying it under its lumen with a back-and-forth suture, laying the stump over the adventitia of the femoral vein.

A partition was made between the stump suture and the tied collaterals in the prevascular subcutaneous tissues by interposing an ePTFE patch (0.1 mm thick, 1 cm long, 1.5 cm wide; Prelude Peritoneal Membrane, W.L. Gore & Associates, Flagstaff, AZ). The patch was attached by applying biological glue under it and in the dissection space. To facilitate placement and avoid displacement of the patch, the dissection space was made as obliquely and as small as possible. No suction drains were inserted. The incision was closed with intradermal resorbable sutures.

Incompetent residual saphenous trunks and collateral trunks were stripped with a Pin-Stripper (Tüscher, Berne, Switzerland). Varicose veins were removed with Muller avulsion hooks inserted through phlebectomy incisions. Postoperative compression was achieved by applying double class II stockings for 3 days followed by single class II elastic compression for 1 month. No antibiotic therapy was given. Postoperative injection sclerotherapy was not prescribed for any patient, but 25 did have a few injections; compliance with this treatment was poor.

**Follow-up Study**

Starting in February 1997, all patients who had undergone re-do surgery for recurrent varicose veins were contacted and asked to undergo a follow-up evaluation including a physical examination and Doppler ultrasound study. The assessed extremities of patients who underwent this evaluation were initially classified into two categories: (1) poor results or failure of re-do surgery, with an incompetent reflu- xing RVFJ having a diameter greater than 3 mm at the stump of the tied vein, theoretically requiring another re-do procedure in the groin; and (2) good results indicated by the absence of RVFJ in the groin and by the femoral vein showing a smooth anterior or medial aspect and no stump. The presence of a single visible or palpable varicose vein, even if only a few centimetres long, was considered evidence of continuing varicose veins. A new insufficient communication between the deep and superficial system was sought for in the thigh, calf and popliteal fossa.

**Results**

The female patients had undergone a mean of 2.5 pregnancies before the re-do varicose vein surgery.
Between 1997 and 1999, 100 patients (90 women, 10 men; mean age 53.5 years, range 26–72 years) had 119 extremities (61 right legs, 58 left legs) examined in the follow-up study. The mean time between re-do surgery and follow-up was 4.9 years (range 3–7 years).

At follow-up, 114 extremities showed good results (no RVFJ in the groin). Within this group, 33 extremities (27.7%) had no varicose or incompetent veins; 54 (45.3%) had one or several small varices, without reflux from deep to superficial system, requiring phlebectomy of sclerotherapy only; and 27 (22.6%) had diffused varicose veins with a new insufficient communication between the deep and superficial system (perforators or short saphenous insufficiency). Only 5 extremities (4.2%) had poor results, with varices and a new RVFJ in the same site as previously and theoretically requiring another re-do procedure in the groin. Two of the 5 failures occurred in obese patients, including the only patient who had an abscess (on postoperative day 6). This patient has not yet undergone reoperation. Another failure was due to insufficient resection. One of the extremities with failure had exclusively inguinal varicose veins, whereas the other 4 had varicose veins in the groin, thigh and leg. One patient with a new RVFJ had a perforating vein of the thigh, another had recurrent popliteal varicose veins after surgery on the short saphenous vein, and 2 had incompetent translymphatic veins.

In 10 extremities, one or more incompetent tortuous inguinal veins (3–6 mm in diameter) were observed in front of, but not connected to, the femoral vein. Similar findings were noted in 2 other extremities, except that the veins were competent. On ultrasonography, the ePTFE patch was visualised in a vertical position in front of, but not connected to, the femoral vein. Similar findings were noted in 2 other extremities, except that the veins were competent. On ultrasonography, the ePTFE patch was visualised in a vertical position in front of, but not connected to, the femoral vein. Thus, the neovascularisation that always left in smooth continuity with the adventitia of the residual stump flush with the femoral vein, another had recurrent popliteal varicose veins after surgery on the short saphenous vein, and 2 had incompetent translymphatic veins.

Ten patients with varices at follow-up had previously undergone a re-do procedure. The 10 procedures had involved a perforating vein of the popliteal fossa (2 patients), an incompetent short saphenous vein (1 patient), an incompetent perforating vein in the thigh (1 patient) and phlebectomy incisions (6 patients).

### Table 1

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>No. of patients</th>
<th>Assessment method</th>
<th>Follow-up (years)</th>
<th>Recurrence rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khaira et al. [17]</td>
<td>1966</td>
<td>190</td>
<td>CDU</td>
<td>Not given</td>
<td>49</td>
</tr>
<tr>
<td>Jones et al. [10]</td>
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<td>CDU</td>
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<td>52</td>
</tr>
<tr>
<td>De Maeseneer et al. [18]</td>
<td>1999</td>
<td>106</td>
<td>CDU</td>
<td>4.6</td>
<td>45</td>
</tr>
<tr>
<td>De Maeseneer et al. [21]</td>
<td>1997</td>
<td>177</td>
<td>CDU</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Glass [8]</td>
<td>1998a</td>
<td>141</td>
<td>Surgical exploration</td>
<td>&gt;4</td>
<td>25</td>
</tr>
<tr>
<td>Turton et al. [19]</td>
<td>1999</td>
<td>46</td>
<td>CDU</td>
<td>1</td>
<td>4.3</td>
</tr>
<tr>
<td>Sarin et al. [20]</td>
<td>1994</td>
<td>90</td>
<td>CDU</td>
<td>1.7</td>
<td>14</td>
</tr>
</tbody>
</table>

CDU, colour duplex ultrasonography.

a Patients were seen in 1951 to 1958.

### Discussion

Re-do surgery for incompetence of the great saphenous vein is challenging. In 67% of cases, dissection in the groin is required [12] to achieve disconnection of an RVFJ corresponding to a residual communicating femoral branch with or without neovascularisation. Various approaches have been described for exposure of the tied stump at re-do, including the superior [13], medial [6,14,15] and lateral [16] approach. Although the goal with all approaches is to avoid the cicatricial zone, we prefer the lateral approach because it provides the greatest distance from both the cicatricial zone and the lymph nodes. Frequent location of the tied stump on the anteromedial side of the femoral vein did not hamper the exposure achieved with this approach.

The reported rate of neovascularisation as the cause of recurrence after primary varicose vein surgery ranges from 4% to 52% [8,10,17–21] (Table 1). This variability is due to differences in methods used to identify neovascularisation. Most evidence is based on radiological, ultrasound or surgical findings. The only clinicopathological criterion for identifying neo-vascularisation was proposed by Nyamekye et al. [22], who used immunohistochemical staining with S100 protein to demonstrate absence of transparietal nerves in the walls of the new vessels.

The findings in our patients indicate that the term ‘neojunction’ may be more accurate than ‘neovascularisation,’ since a direct connection with the femoral vein was not found when new vessel formation was present. The neojunction was located on the anteromedial aspect of the femoral vein at the same place the original sapheno-femoral junction had been. In our series, the surgical procedure always included division and ligation of the residual stump flush with the femoral vein, regardless of the stump’s length, and the stump was always left in smooth continuity with the adventitia of the femoral vein. Thus, the neovascularisation that occurred reflected a newly formed network of communicating veins that appeared to establish a connection between the stump and residual varicose veins in the thigh or incompetent residual saphenous vein trunk. No conclusive evidence that such vessels are
new has been provided. Alternative explanations are that these vessels develop from pre-existing veins [12,23] or correspond to hypertrophy of lymph node vessels [24].

The rationale for placing an ePTFE patch in front of the femoral vein is that after division and ligation of the residual stump, the two vein sections will come into direct contact with each other when the incision is closed and the patch will provide a barrier between two vein ligations. We secure the patch with biological glue rather than sutures to avoid additional trauma and to facilitate removal of the patch in case of infection (although, in our series, patch removal was not required in any patient, including the one in whom an abscess developed). The long-term results (mean follow-up period 4.9 years) with our technique were satisfactory: only 4.2% of extremities had RVFJ warranting another re-do procedure. This percentage is lower than those previously reported [9,18,21,25] (Table 2).

The low rate of neovascularisation in our series indicates that healing is a major factor in vessel formation. Our technique was designed to minimise operative trauma. The femoral vein was exposed by placing a lateral incision directly under the prevascular fascia, without passage through the lymph node layer, extensive tissue excision or dissection, or use of an electric scalpel or drains. No patient had postoperative lymphorrhoea, lymphoedema or haematoma, and only one patient, who was obese, had a postoperative abscess. In summary, in the light of previous studies showing that neovascularisation after varicose vein surgery is consistently associated with aspects of the surgical technique, including extensive excision in the groin through a wide subcutaneous approach, exposure of the femoral vein and en bloc removal of scar tissue, we developed a less invasive technique involving division and ligation of the varico-femoral connection and interposition of an ePTFE patch. Our good long-term results are probably due to placement of the patch flush with the femoral vein and extensive excision of varicose veins, residual saphenous trunks and collaterals while leaving intermediate areas intact. Comparative studies are needed to evaluate the relative contributions of patch interposition and division without extensive dissection of the femoral area to these results. However our findings suggest that by containing neovascularisation, use of an ePTFE patch reduces the risk of RVFJ and, hence, the need for a subsequent re-do procedure.

Whereas neovascularisation may be related to healing in haematoma zones or lymph node layers, incompetence can occur only in the presence of incompetent residual thigh veins or saphenous trunks. Thus, the neovascularisation networks apparently continue to develop over time [21] but do not become incompetent and pathological unless they connect with incompetent superficial veins in the thigh. Some studies [18] have shown that inguinal neovascularisation is more common in patients with clinical recurrences characterised by new vessels with large diameters (>4 mm), but no study has quantified the influence of neovascularisation on clinical recurrence of varicose veins.

Table 2. Studies reporting recurrent varico-femoral junction or neovascularisation in the groin resulting in a new connection between the femoral vein and inguinal varicose veins after re-do varicose vein surgery done with or without patch interposition

<table>
<thead>
<tr>
<th>Surgery type/study</th>
<th>Year</th>
<th>No. of patients</th>
<th>Follow-up (years)</th>
<th>Recurrence rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-do without patch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>De Maeseneer et al. [21]</td>
<td>1997</td>
<td>14</td>
<td>1</td>
<td>21.4</td>
</tr>
<tr>
<td>De Maeseneer et al. [18]</td>
<td>1999</td>
<td>11</td>
<td>4.6</td>
<td>63.6</td>
</tr>
<tr>
<td>Re-do with patch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earnshaw et al. [9]</td>
<td>1998</td>
<td>15</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>Bhatti et al. [25]</td>
<td>2000</td>
<td>70</td>
<td>1.5</td>
<td>12</td>
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<tr>
<td>Creton (current series)</td>
<td></td>
<td>119</td>
<td>4.9</td>
<td>4.2</td>
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</table>

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References

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