ENDOVASCULAR AND SURGICAL TECHNIQUES

Obturator Bypass to the Distal Profunda Femoris Artery Using a Medial Approach – Long-term Results

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Introduction

Bypass via the obturator foramen was first described by Shaw and Baue in 1963¹ and has since been used for iliofemoral arterial reconstruction in the presence of a hostile groin or graft infection. The long-term outcome has been compromised by a high failure rate especially in patients who require graft extension to the popliteal or tibial vessels.²⁻⁵ There are also a few case reports of thigh ischaemia despite adequate lower leg perfusion provided by an obturator bypass extended to below the knee level.⁶ These problems emphasise the importance of perfusing the profunda femoris artery, which may be excluded with conventional obturator bypass. The proximity to an infected groin increases the risk of secondary graft infection if the bypass is anastomosed to the profunda femoris artery exposed in a conventional manner.

Influenced by a communication by Nunez et al.⁷ describing exposure of the third portion of the profunda femoris artery using a posteromedial approach between the adductor muscles, we have performed obturator bypass using this exposure in six patients. The plane between the adductor longus and adductor magnus muscles leads directly to the obturator channel, which simplifies the tunnelling procedure. Only two single case reports using this technique have been found in the literature,⁸⁻⁹ both only providing short-term follow-up. Others have used the profunda femoris artery as an outflow vessel for obturator bypass,¹⁰⁻¹² but technical details were not described.

Patients

Six non-diabetic male smokers with a median age of 66 (50–79) had previously undergone aortobifemoral bypass and several other vascular procedures (Table 1). Four of the patients had culture-proven or suspected graft infection, whereas the indication for obturator bypass was a hostile groin following repeated vascular procedures in two patients with severe limb ischaemia. All had occlusive lesions of the femoropopliteal arteries precluding conventional obturator bypass to the superficial femoris artery. Two had severe ischaemia and three had claudication. The ankle-brachial index was 0.0–0.7 (median 0.5).

Operative Technique

The patients were draped with adhesive plastic on the abdomen and the affected thigh proximally and medially. The hip was flexed and rotated outwards. Using a longitudinal incision at least 10 cm from the groin, the plane between the adductor longus and adductor magnus muscles was explored directly to the obturator channel. Only two single case reports using this technique have been found in the literature,⁸⁻⁹ both only providing short-term follow-up. Others have used the profunda femoris artery as an outflow vessel for obturator bypass,¹⁰⁻¹² but technical details were not described.

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Table 1. Previous vascular procedures, present problem, and bacterial cultures in six patients operated with obturator bypass.

<table>
<thead>
<tr>
<th>Pat no.</th>
<th>Previous vascular procedures involving the same groin</th>
<th>Present problem</th>
<th>Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aortobifemoral bypass</td>
<td>Draining groin sinus</td>
<td>β-streptococcus (type G)</td>
</tr>
<tr>
<td>2</td>
<td>Aortobifemoral bypass</td>
<td>Graft limb infected</td>
<td>Staphylococcus epidermidis (multiresistant)</td>
</tr>
<tr>
<td></td>
<td>Femoropopliteal bypass</td>
<td>Groin infection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thrombectomy × 3</td>
<td>Recent thrombectomy</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Thromboendarterectomy</td>
<td>Occluded graft limb</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>Aortobifemoral bypass</td>
<td>Repeated procedures</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Thrombectomy + patch</td>
<td>Occluded graft limb</td>
<td>Not done</td>
</tr>
<tr>
<td>5</td>
<td>Femorofemoral bypass</td>
<td>Pseudoaneurysm</td>
<td>Staphylococcus epidermidis (multiresistant)</td>
</tr>
<tr>
<td></td>
<td>Thrombectomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Aortobifemoral bypass</td>
<td>Pseudoaneurysm</td>
<td>Negative</td>
</tr>
<tr>
<td></td>
<td>Occluded graft limb</td>
<td>Fever</td>
<td></td>
</tr>
</tbody>
</table>

covered by surrounding tissue in the retroperitoneum. An externally reinforced polytetrafluoroethylene graft (Gore-tex®) was anastomosed end-to-end to the proximal graft limb and tunneled through the obturator foramen, which was penetrated under direct vision. In the two cases with graft limb occlusion and a hostile groin, the prosthesis was anastomosed end-to-side to the contralateral graft limb (Fig. 1). All distal anastomoses were performed end-to-side to the profunda femoris artery using a vein cuff in three cases (Fig. 2).

Fig. 1. Artist’s concept of obturator bypass to the profunda femoris artery. Left: crossover bypass from the contralateral aortofemoral graft limb in case of graft limb occlusion and a hostile groin. Right: proximal anastomosis to divided ipsilateral aortofemoral graft limb in case of groin infection.
In two patients who had severe ischaemia and in one patient who had a previous femoropopliteal bypass that had to be disconnected from its inflow, an extensional bypass to the popliteal artery was performed using in-situ vein grafts in two cases and a polytetrafluoroethylene (Gore-Tex®) graft in one case. The incisions were closed in layers and covered, whereupon the problem in the groin was dealt with as required.

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**Fig. 2.** Artist’s concept of obturator bypass (arrow) to the profunda femoris artery (arrow-head), and it’s relationship to the surrounding tissues.

**Fig. 3.** Intravenous digital subtraction angiography performed 3 years after obturator bypass. The initial operation was performed with an end-to-side anastomosis to the contralateral aortofemoral graft limb and an end-to-side anastomosis to the profunda femoris artery. The infected graft limb was excised to the groin where the femoral arteries were divided. Following graft occlusion after 3 months, which was treated with thrombectomy, anticoagulation, and jump-graft extension to the popliteal artery, the reconstruction has remained patent for 5 years (patient 3).
Results

There was no operative mortality, no injury to the obturator nerve or vein, and no serious early morbidity related to the obturator bypass. The peripheral perfusion was sufficient in all patients (ankle-brachial index = 0.6–0.9), despite immediate occlusion of the graft extension to the popliteal artery in two patients. No prosthesis has become infected during a median follow-up of 5 (range 3–7) years. Two early obturator graft occlusions occurred after 2 and 3 months, respectively. These were treated with thrombectomy, graft extension to the popliteal artery, and oral anticoagulation, but only one of these two grafts remained patent (Fig. 3). The other early graft occlusion resulted in below-knee amputation. Three patients have died from unrelated causes after 10, 20 and 82 months, respectively. The primary patency was 67% (four of six grafts), 60% (three of five grafts), and 25% (one of four grafts) after 1, 3, and 5 years respectively, and the secondary patency was 83% (five of six grafts), 80% (four of five grafts), and 75% (three of four grafts) at the same time intervals.

Discussion

The advantage with this procedure is the preservation of thigh perfusion without risking infection of the new graft. In this series, no secondary graft infection occurred and perfusion of the thigh and lower leg was sufficient as long as the obturator bypass stayed patent. Bypass to the superficial femoral artery or the above-knee popliteal artery probably have the same chance of success as with this technique, provided arterial perfusion of the thigh is maintained. This is not always possible if the femoral arteries have to be ligated in the groin to control infection and if obstructive lesions in the femoropopliteal arteries prohibit sufficient retrograde flow up the superficial femoris artery.5 In addition, the chance of long-term patency is reduced if the obturator bypass is carried down to the below-knee vessels.34

With the described technique, the long-term results seem acceptable, and peripheral perfusion was adequate except in one patient where the graft permanently occluded. This provided a secondary graft patency rate of around 75% after 3 years. A short graft length and a high blood flow are crucial for maintained patency of prosthetic vascular grafts. Our technique provides the shortest possible distance to bypass and a good outflow via the profunda femoris artery which is usually less diseased. In case of ipsilateral graft limb occlusion, a crossover bypass is readily accomplished. This has been described previously11,16 but only Atnip8 used the present technique with anastomosis to the profunda femoris artery.

The primary patency may improve if postoperative anticoagulation is routinely employed. We used externally reinforced vascular prostheses as vascular conduits due to the risk of graft kinking or compression with passage of the narrow obturator channel.6,11 However, others have used autogenous vein grafts with good results10,13. Addition of a jump-graft extension to the popliteal artery was not successful in this small series. Only two out of five (three initial and two post-thrombectomy) extensions have remained patent. Although these occlusions may be due to technical problems, their failure did not seem to compromise peripheral perfusion or decrease patency of the obturator bypass graft per se. When compared to other series of conventional obturator bypass,3,4,6,16 we have demonstrated an equally good or superior early and late graft patency. Since the operative morbidity has been minimal by using this technique of obturator bypass, it is recommended especially in patients with obstructive lesions of the superficial femoris and popliteal arteries.

References


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