Objectives. The purpose of this study was to assess limb salvage and functional outcome in patients who underwent distal reconstructions.

Design. Retrospective study.

Materials and methods. Fifty-nine consecutive patients underwent 63 femorodistal bypass operations during 1998–2002 at a university hospital. Late functional outcome was assessed using a questionnaire (mean 27 months after the primary operation).

Results. At the end of the study, 81% (30/37) of the surviving patients were alive with a viable limb. In all, 90% (27/30) of patients were living in their own homes and 3% (1/30) in a nursing home. Sixty percent (18/30) were able to walk independently. The walking distance was unlimited in 42% (13/31) and limited in 42% (13/31) of the operated limbs. In 16% (5/31) of cases, the treated limbs served only as a support.

Conclusions. According to our results, the functional outcome of distal bypasses seems to be favourable. It is recommended that these operations should be performed even in elderly patients to avoid major amputations and to maintain the independence of the patient.

Keywords: Functional; Lower limb ischemia; Bypass surgery; Outcome.

Introduction

Distal bypasses are used in the treatment of acute or chronic limb threatening ischemia in order to avoid major amputations. The outcome of distal bypass is well established in terms of patency and reoperation rates, however, the functional outcome is less well defined. In this retrospective analysis, we have examined the long-term functional outcome of distal bypasses. Functional outcome was determined by a questionnaire addressed to surviving patients without major amputation of the operated limb. Limb salvage and overall survival rates are also presented.

Materials and methods

Patient population

All 59 patients that underwent distal bypass for lower limb ischaemia in Kuopio University Hospital between 1/1998 and 4/2002 were included in this retrospective study. The follow-up was completed at the end of August 2002. There were 63 operated limbs; four patients had surgery on both legs. Patient characteristics, preoperative risk factors and operative indications are presented in Table 1. The mean age of the patients at the time of the operation was 69 years and 95% of the patients had preoperative risk factors. Previous endovascular procedures (PTA, embolectomy, thrombolysis) had been performed on 51% of the limbs (n = 32). Furthermore, previous surgical arterial reconstructions had been performed on 11 limbs (17%), including endarterectomy, profundoplasty and iliac-femoral, femoropopliteal and aortofemoral bypasses. Three limbs (5%) had undergone toe amputation.

The routine postoperative follow-up examination was performed 1 month after the procedure, and further visits were arranged according to the clinical situation. Follow-up was considered terminated at the time of major amputation, death, or the most recent examination. The mean follow-up period was 19 months (median 14 months; range 0–56 months). Follow-up data and causes of deaths were obtained from patient files and the records of Statistics Finland, which records the deaths of all Finnish citizens.
The approval of the ethical committee of Kuopio University Hospital and of surviving patients themselves was obtained.

Complications were classified as major, minor and systemic. A major complication required either active treatment or a prolonged hospital stay. Clinically insignificant complications were classified as minor. The surviving patients without major amputation in the operated limb(s) were sent a questionnaire at the end of the study (mean 27 months after the primary distal bypass operation). The questionnaire enquired about the patients' place of residence (home, nursing home or hospital ward), ability to move independently with or without walking aids or whether they needed to use a wheelchair. The questionnaire also included questions concerning the presence of trophic lesions in the operated limb(s) and the need for pain medication due to lower limb pain.

Statistical analysis

Nominal variables of the study groups were analysed using the Chi-square test. The independent samples t-test was used for continuous variables. Limb salvage, survival and life with limb(s)—rates were calculated using the life table-method. Life with limb(s) refers to the percentage of patients alive without major amputation in the treated limb(s). Statistical analyses were performed with SPSS for Windows 11.5 (SPSS Inc., Chicago, USA) statistical software.

Results

Operations

The most frequent site for proximal anastomosis was the common femoral artery \((n=27, 43\%\)\), whereas the posterior tibial artery was selected most commonly as the outflow artery \((n=23, 37\%\)\) (Table 2). Reversed saphenous grafts were used most frequently. Additional procedures such as endarterectomy, toe and transmetatarsal amputations, fasciotomies or skin grafting were required in 43\% of the operations.

Outcome of operations

Four grafts (6\%) occluded during the first 30 days. The 30 mortality rate was 2\% \((n=1)\); this patient had received distal bypass as treatment for gangrene, and the cause of death was myocardial infarction. Vascular reinterventions were required on five limbs (8\%). Plastic surgery procedures were required on 16 limbs (25\%).

Limb salvage

During the follow-up time, there were 10 (16\%) major amputations, with five (8\%) being below-knee and five (8\%) above-knee amputations. Three (5\%) Table 2. Graft details

<table>
<thead>
<tr>
<th>Graft type</th>
<th>(N=63)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>In situ greater saphenous vein</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Reversed greater saphenous vein</td>
<td>35</td>
<td>56</td>
</tr>
<tr>
<td>Exsised vein (lesser saphenous vein or arm vein)</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Combi-graft</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Jumping-graft</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Inflow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External iliac artery</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Common femoral artery</td>
<td>27</td>
<td>43</td>
</tr>
<tr>
<td>Superficial femoral artery</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>Proximal popliteal artery</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Distal popliteal artery</td>
<td>17</td>
<td>27</td>
</tr>
<tr>
<td>Prosthesis: extra anatomic/aortobi-femoral</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Outflow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tibiofibular trunc</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Anterior tibial artery</td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td>Posterior tibial artery</td>
<td>23</td>
<td>37</td>
</tr>
<tr>
<td>Peroneal artery</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Dorsalis pedis artery</td>
<td>18</td>
<td>29</td>
</tr>
</tbody>
</table>

MI, myocardial infarction; CABG, coronary artery bypass grafting; AP, angina pectoris.
amputations were performed during the first post-operative month. In three cases (5%), metatarsal amputation had to be extended to below-knee amputation and in one (2%) to femoral amputation. In 30% (n=3) of the major amputations, the graft was documented as being patent at the time of amputation and in 70% (n=7) it had occluded. In addition, minor amputation was required in 11 limbs (17%).

Limb salvage rates at 1, 2 and 4 years were 83% (SEE±0.04), 83% (SEE±0.05) and 77% (SEE±0.07), respectively. The incidence of amputations among limbs operated on for ulcers were 3/21 (14%), for gangrene 4/17 (24%) and for acute thrombosis 3/9 (33%). Patients with severe claudication or pain at rest did not require major amputations.

Patient survival and life with limb(s)

Twenty-two patients (37%) died during the follow-up time. Cumulative survival was 76% (SEE±0.06) at 1 year, 69% (SEE±0.06) at 2 years and 48% (SEE±0.10) at 5 years. Those patients succumbing died on average 12 months (range 3 days–56 months) after the bypass operation and 88% (21/24) of the treated limbs were still salvaged at the time of death. According to the life table method, 59% (SEE±0.06), 55% (SEE±0.07) and 37% (SEE±0.09) of the patients were alive without major amputation of the operated limb(s) at 1, 2 and 5 years after the bypass operation.

Functional outcome

At the end of the study, 30 patients were alive without having suffered any major amputation in their 31 operated limbs (Fig. 1). All of these subjects were sent the functional outcome—questionnaire and completed it a mean of 27 months after the operation. The results of the inquiry are presented in Table 3. Altogether 90% (n=27) of the patients were living independently in their own homes and 93% (n=28) could walk either with or without a walking aid.

Discussion

The functional outcome of distal bypass is rarely presented and in the recommended reporting standards for lower limb ischemia the functional outcome is not discussed. This study has evaluated the functional outcome after distal lower limb revascularisation. The selected outcome criteria are simple and universal. The results showed that after a moderate follow-up time, nearly half of the operated patients were still living in their own homes with a salvaged limb. In addition, most of them were able to move independently without any help. Although the survival of patients with critical limb ischaemia is generally poor and the operative treatment carries risks, the results are encouraging and we are convinced that distal revascularisations are beneficial to the patient and society.

In a recent study it was concluded that infrapopliteal bypass surgery is often complicated by prolonged recovery and multiple reoperations and readmissions and that traditional reporting standards have underestimated the expenditure of effort required to achieve limb salvage. Indeed, distal reconstructions in patients with critical ischaemia often require repeated interventions to guarantee limb salvage. However, in
the long term, the costs are lower even in the case of reoperations in independently living patients compared to the alternative of major amputation and subsequent institutionalisation since amputation in this group of patients leads to institutionalisation in about 75% of cases.4

Revascularization for critical limb ischemia has been found to improve the quality of life by decreasing pain level and sleep problems.5 Furthermore, all patients who experienced post-reconstructive major amputation felt that the attempt at limb salvage had been worthwhile. Survival with a saved functional limb is increasingly regarded to be the primary endpoint for the patient.67 In the present study, in 88% of the patients who died, the treated limb(s) has been salvaged. Furthermore, 2 years after the primary operation, 73% of the surviving patients were still living in their own homes with salvaged limb, 8% were institutionalised with an intact limb and only 19% had undergone a major amputation in the treated limb. Among patients with a salvaged limb, there was a large number of patients (28/30) who could move independently with or without a walking aid. Furthermore, the skin in the operated limb was intact in 84% of the patients with a salvaged limb. In a recent study, the healing process of pedal lesions was analysed following femorodistal bypass.7 In patients with a patent graft, 89% of ulcers and 91% of gangrenous lesions had healed and recovered at 1 year. In the present study, 84% of the patients were able to walk either without restriction or at least for short distances. Almost half of the patients did experience some pain in the limb and pain medication was required either daily or at times in about three out of every four patients. However, in this age group musculoskeletal pain is also common and it is not easy to differentiate this non-specific pain from ischemic pain.

In conclusion, this evaluation of the functional outcome of distal bypass was encouraging. It is recommended that distal bypass surgery should be performed even in elderly patients to maintain their independence.

References


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