



Medical audit

Femoro-femoral arterial bypass is an effective and durable treatment for symptomatic unilateral iliac artery occlusion

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Aims: This study was designed to determine the effectiveness of femoro-femoral arterial bypass (FFB) operation at hospital discharge and 1 year after operation, and to determine the role of long saphenous vein (LSV) as a conduit.

Methods and Results: A retrospective review was undertaken of 161 consecutive patients (median age, 66 years; range, 44–97 years) who had femoro-femoral grafts during the 12 years from July 1987 to March 1999. The indication for operation was claudication in 66 patients and critical ischaemia in 95. A synthetic graft was used in 123 patients and LSV in 38. Six patients with LSV had a previously infected synthetic graft and 2 a previously occluded synthetic graft. In-hospital operative mortality was 13 (8.1%). One year postoperatively, known mortality was 29, fifteen patients were lost to follow-up putting 1-year mortality at 18.0–27.3%. Eight of these had LSV as the conduit. At discharge from hospital, the median improvement in the ankle brachial pressure index was 0.3 (range, 0–1.0) overall, and 0.32 for patients with LSV (range 0–1.0). Among the 117 known survivors at 1 year, secondary graft patency was 107 confirmed by Doppler or duplex (91.5%) overall, and 25 (89.3%) for LSV; 100 (85.5%) maintained symptomatic improvement, 11 (9.4%) were experiencing no benefit and 6 (5.1%) were worse, of whom 2 had undergone amputation. In patients in whom LSV was used, 22 (78.8%) remained symptomatically improved, 3 (10.7%) experienced no benefit, 3 deteriorated and one had an amputation.

Conclusions: One year following FFB, at least 18.0% of patients were dead. Among possible survivors to 1-year, graft patency was at least 78.8% and at least 75.8% remained clinically improved. FFB is effective in the treatment of unilateral iliac artery occlusion. LSV is as effective as a synthetic conduit.

Key words: Peripheral vascular disease – Femoro-femoral crossover graft – Long saphenous vein

Most patients with symptomatic iliac artery stenosis or occlusion are now treated primarily with angioplasty supplemented, when necessary, with stenting. Surgery is reserved for those patients in whom angioplasty is unsuccessful on one or both sides. Femoro-femoral extra-anatomical arterial bypass (FFB) is one of the most commonly done operations for persistent, unilateral, iliac artery occlusion. We

have reviewed our recent experience of FFB to establish its effectiveness at 1 year after operation.

LSV has been used as a conduit intermittently over the study period, in particular when patients have been at risk of groin infection from obesity, under-nutrition or pre-existing groin infection or had previously occluded a synthetic graft. The secondary purpose of this study was

to analyse the outcome of the use of LSV compared with synthetic graft material.

Patients and Methods

We retrospectively reviewed 161 consecutive patients who had FFB in the 12-year period from July 1987 to March 1999. There were 120 men and 41 women. The median age was 66 years (range, 44–97 years). Of these 161 patients, 146 were followed up or known to be dead at 1 year after operation. All patients available for follow-up were assessed clinically and for graft patency at 1 year with hand-held Doppler or duplex ultrasonography.

Results

The study group consisted of 161 patients who had a FFB over a 12-year period. Of these, 15 patients were lost to follow-up at 1 year. Of the 161 patients, 29 were known to be dead at 1 year: 13 of these deaths were in the 30 days after surgery (peri-operative mortality 8.1%) while 16 died in the following 11 months. The indication for surgery was disabling intermittent claudication in 66 patients and critical limb ischaemia in 95. These included 81 patients with rest pain, 24 with ischaemic ulcers, and 15 patients with gangrene. Of the total, 82 patients were smokers, 61 patients had ischaemic heart disease, and 59 patients were hypertensive. Only 24 patients had diabetes. Of the 161 patients, 155 had unilateral iliac artery occlusion. In 3 patients, the operation was performed after occlusion of one limb of an aorto-bifemoral graft. One patient had the common iliac artery ligated during removal of a malignant pelvic tumour. One patient had occlusion of the cross-over limb of an axillo-bifemoral graft and one patient had an iliac aneurysm. In 35 patients, angioplasty of an occluded iliac artery had been attempted but had failed. Forty-six patients had co-existent disease of the superficial femoral artery of the ischaemic limb of whom 17 had disease in one or more crural arteries in the leg. In 2 patients, only crural arteries were diseased.

Synthetic grafts were used in 123 patients – PTFE in 71 and Dacron in 52. The LSV was used in 38 patients. In 43 patients, a femoral endarterectomy of the recipient artery was required. In 4 patients, a femoro-popliteal bypass was performed to improve outflow to the recipient limb. The median ankle brachial pressure index (ABPI) pre-operatively was 0.31 (range, 0–1.0) in the recipient limb and postoperatively was 0.65 (range, 0–1.0). The median increase in the ABPI was 0.25 (range, 0–1.0).

In all, 117 patients were known to be alive at 1 year. In this group, 100 patients were still improved compared with pre-operatively, 50 of whom were claudicants and 50

had CLI. All of these patients had a patent graft. Eleven patients believed that their symptoms were unchanged after surgery; 6 of whom were claudicants and 5 had CLI. Nine of these patients had a patent graft. The recipient limb was worse than pre-operatively in 6 patients, 3 of whom were claudicants. Two of these required amputations one of whom was a claudicant. Both of these had blocked grafts. The remaining 4 patients had no further interventions.

The overall primary patency was at least 71.2% and secondary patency was at least 78.8% on Doppler or duplex ultrasonography. The primary and secondary patency rates for claudicants were 71.6% and 77.7%, respectively, and for patients with CLI, 73.8% and 80%, respectively.

LSV was used primarily as a conduit in 32 patients. It was used as a second graft in the remaining 6 patients, 4 of whom had an infected synthetic graft and 2 had an occluded synthetic graft. One-year mortality in these patients was 8 (25%). Two more patients were lost to follow-up at 1 year. The median improvement in ABPI at discharge was 0.27 (range, 0–1.0). Of the 28 patients who were available for follow-up at 1 year, 25 (89.3%) still had a patent graft. Twenty-two patients (78.6%) remained symptomatically improved, 3 patients (10.7%) were no worse while 3 patients (10.7%) said that they were worse. Only one patient had a major amputation.

Discussion

Angioplasty and stenting has been available at our institution since the early 1990s. Since then, there has been an increasing trend towards treating unilateral iliac lesions for symptomatic peripheral vascular disease with interventional radiological procedures. As a consequence of this, there has been a decrease in the number of FFBs undertaken for unilateral iliac occlusion. However, there are still lesions where angioplasty fails or cannot be used. Our data suggest that FFB continues to be an effective solution for these patients and keeps limb loss figures to a minimum. There have been a number of publications in the past to suggest that FFB is a useful procedure in disabling claudication. Berce *et al.*¹ showed a secondary graft patency of 98% at 1 year with limb survival being 99%. These patients, however, did not have any critical leg ischaemia. Moreover, an outflow procedure was required in 72 patients (35%) in order to restore circulation along with 3 femoral endarterectomies. In our series, only 4 patients required an outflow procedure; however, 43 needed an endarterectomy. Although all our patients had occlusive iliac disease, 28.6% of patients had co-existing infra-inguinal disease as well. Despite this, our limb-loss rate was only 1.7% merely by improvement in inflow. The mortality figure in the series of Berce *et al.* at 1 year was 2% while ours was a minimum of 18.8%.

This is likely to be the result of more advanced disease in our series reflected in the large proportion with CLI (59%) and cardiovascular co-morbidity (58%).

Two series in the early 1990s by Perler *et al.*² and Hanafy *et al.*³ recorded a graft patency of 79% at 1 year and 79% at 2.7 years, respectively. More recently, Lau *et al.*⁴ reported a 1-year patency of 86% comparable to our 1-year graft patency (*i.e.* at least 78.8%). While the first two series had a similar mix of claudicants and CLI as our series, the series of Lau *et al.* had only 9 patients with claudication out of 61 with the rest having CLI. No other series has as yet evaluated the degree of patient satisfaction and relief of symptoms. In our series, at least 75.8% of patients remained improved at 1 year with only 5.1% saying that they were worse than at the time of surgery. The limb-loss rates reported in various series have ranged from 0–18%. However, the major amputation rate in those series, which included limb salvage procedure, ranged from 9–18%, a value that is reflected in our series as well.

Anatomical bypasses such as ilio-femoral bypass (IFB) and aorto-femoral bypass (AFB) have also been used fairly commonly for unilateral or bilateral iliac occlusions. AFB has traditionally been reserved for bilateral iliac blocks but IFB has been studied and used frequently for unilateral iliac disease. There are conflicting reports *vis-à-vis* the efficacy of this procedure compared to FFB. Perler *et al.*² showed patency of 90% at 5 years in 22 ilio-femoral grafts compared to just 57% in 50 femoro-femoral grafts. However, the numbers in the study are small and 6 of 50 patients having the FFB had it done as an emergency procedure. The series of Hanafy *et al.*³ reported patency rates of 79% after 2.7 years for both ilio-femoral ($n = 32$) and FFB ($n = 42$). More recently, Nazzal *et al.*⁵ reported a series comparing the results in 68 patients having FFB and 40 patients having ilio-femoral grafts. The primary patency in the two groups at 5 years was 81.7% and 61.3%, respectively, showing better results in the femoro-femoral group although they were not statistically significant. Ilio-femoral bypasses are at best as good as FFB in the short-to-medium term. FFB has the advantage of being able to be done under local anaesthesia.

In summary, FFB still plays a useful role in both relief of disabling claudication and limb salvage. In a group of patients who have significant cardiovascular morbidity, it plays its role effectively even in the presence of multiple level disease.

Only one other series has reported on autologous LSV being used as a conduit.⁵ This series, however, did not report results specific to the LSV. Our series shows that, at 1 year, LSV is at least as effective as synthetic conduits. There was no increased morbidity. While technically it would be mean a longer operating time, there are benefits in using LSV in some specific circumstances such as local infection or as a re-do procedure for an occluded or infected synthetic graft. All 6 patients who had LSV used as a conduit for re-do FFB had a patent graft at 1 year and all had a viable limb. One argument that can be forwarded against the use of LSV is that it should be preserved for any distal bypass may need to be done in the future. However, in the short-to-medium term, this has not been borne out as the limb loss in our series was only 1.7% with only 4 patients needing a femoro-popliteal bypass.

Conclusions

FFB is an effective procedure in unilateral iliac occlusions for both limb salvage and relief of symptoms. Of surviving patients at 1 year, 4 out of 5 had a patent graft and only 2 patients had major limb loss at 1-year follow-up despite 61% having critical leg ischaemia at presentation. LSV should be considered as a conduit for femoro-femoral crossover grafts particularly in re-do surgery in which it is effective as synthetic conduits.

References

1. Berce M, Sayers RD, Miller JH. Femoro-femoral crossover grafts for claudication: a safe and reliable procedure. *Eur J Vasc Endovasc Surg* 1996; **12**: 437–41.
2. Perler BA, Burdick JE, Williams GM. Femoro-femoral or ilio-femoral bypass for unilateral inflow reconstruction? *Am J Surg* 1991; **161**: 426–30.
3. Hanafy M, McLoughlin GA. Comparison of ilio-femoral and femoro-femoral crossover bypass in the treatment of unilateral iliac arterial occlusive disease [see comments]. *Br J Surg* 1991; **78**: 1001–2.
4. Lau H, Cheng SW, Hui J. Eighteen-year experience with femoro-femoral bypass. *Aust N Z J Surg* 2000; **70**: 275–8.
5. Nazzal MM, Hoballah JJ, Jacobovitz C, Mohan CR, Martinasevic M, Ryan SM *et al.* A comparative evaluation of femoro-femoral crossover bypass and iliofemoral bypass for unilateral iliac artery occlusive disease. *Angiology* 1998; **49**: 259–65.