Result of Supra-Genicular Femoropoliteal Bypass Done for Critical Limb Ischemia

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ABSTRACT

Objective: To report our experience with supra-genicular femoropopliteal bypass performed for critical limb ischemia.

Methods: This is a retrospective review of supra-genicular femoropopliteal bypass were performed at our vascular surgery unit in King Hussein Medical Center, Amman, Jordan, between March 2008 and March 2010. Sixty three patients (49 male, 14 female) had 67 procedures (bilateral in 4 patients). Fifty seven procedures done in 53 patients for critical limb ischemia were followed up for twelve months. During this period eight patients were lost to follow-up and were also excluded from the analysis. Records of the remaining 45 patients (35 male, 10 female) with 49 procedures were analyzed for operative details, patient risk factors, primary patency rates, complications, limb salvage rates. The surgical technique was uniform. Follow-up was clinical and by duplex scanning at six weeks, three and six months, and one year. Graft patency was considered terminated if the patient had an occluded graft or needed further procedures to keep the graft patent.

Results: In 31 (63.3%) limbs the indication for the procedure was tissue loss, while in 18 (36.7%) it was rest pain. The primary end point was primary graft patency calculated as 69.4% (reversed long saphenous vein 83.3%, prosthetic 61.3%). The limb salvage rate was 83.7% (reversed long saphenous vein 88.9%, prosthetic 80.6%). Five major limb amputations were done for non-healing wounds and three for prosthetic graft infections. Procedure related complications included surgical wound problems,[5] and nerve injuries.[4] The most ominous complication was prosthetic graft infection as three out of four resulted in graft occlusion and removal and eventual limb loss while one was replaced by saphenous vein. Perioperative 30 day mortality was two (3.8%) patients while another six (11.3%) died during the one year follow up period.

Conclusion: Supra-genicular femoropopliteal bypass performed for critical ischemia has an acceptable patency rate at one year and is an effective mean of limb salvage. Prosthetic graft infections are a main cause of limb loss. The use of vein conduits should be aggressively pursued.

Key words: Bypass, Critical, Femoropopliteal, Ischemia, Supra-Genicular

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Introduction

For patients with ischemic rest pain or ulceration, femoropopliteal bypass offers the advantage of immediate revascularization. However, surgical bypass carries significant risks: potential infection of a synthetic graft, occlusion of perianastomotic segments if the bypass occludes, and a modest five year patency rate of around 60% for vein grafts and 40% for prosthetic grafts.[1,2] In our unit we take a conservative management attitude towards intermittent claudication as we believe it is a benign non limb threatening condition, and as such we tend to perform most of our supra-genicular femoropopliteal bypass for critical limb ischemia.

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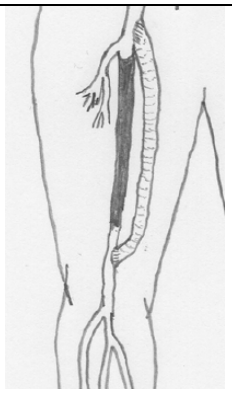

Fig. 1: Supra-genicular femoropopliteal bypass

Table I: Patient risk factors

Characteristic	Number/ 45	%
Male gender	35	77.8
Diabetes Mellitus	28	62.2
Hypertension	21	46.7
Hyperlipidemia	15	33.3
Tobacco use	41	91.1
Coronary artery disease	29	64.4

We report our experience in the specific subset of patients who had supra-genicular femoropopliteal bypass for critical ischemia. We aim to show the short term results that impacted our practice as to the use of the procedure and best conduit.

Methods

Sixty-three patients (49 males, 14 females) with a median age 61 (41-83) underwent 67 supra-genicular femoropopliteal bypass operations at the vascular surgery unit in King Hussein Medical Center, Amman, Jordan between March 2008 and March 2010. In 53 patients, with 57 procedures, the indication was critical leg ischemia defined as rest pain or tissue loss. A further eight patients were excluded from our analysis due to loss to follow up during the study period. Data relating to 45 patients (35 males, 10 females) who underwent 49 procedures (bilateral in 4 patients) was analyzed for outcome and complications.

Data was collected retrospectively from patient charts, operative records and duplex surveillance records in our vascular laboratory. Patient characteristics and anatomical risk factors including degree of ischemia and vessel run-off status were collected. Procedure related data including type of conduit, occlusion rates, primary patency rates, and complications were also collected. A diagrammatic presentation of the procedure is shown in Fig. 1. The surgical technique followed is classically described in the literature. The types of bypass grafts placed were reversed long saphenous vein (RLSV; n=18) and expanded polytetrafluoroethylene (ePTFE) grafts of 6–8-mm diameter with external support (n =31).

Intravenous second generation cephalosporin and the appropriate dose of unfractionated heparin were given perioperatively. All patients had regular follow-up which was started pre-discharge with ankle brachial index measurement supplemented by duplex scan for those with no improvement in ABPI. Further follow-up was according to our surveillance program which includes duplex scans at 6 weeks, 3 months, 6 months, then annually post operatively.

The frequencies of clinic visits for wound healing and symptomatic improvement were tailored to each individual case. The primary end points were primary graft patency rates, while the secondary end points were limb salvage and graft infection rates. Graft failure was determined by clinical examination and confirmed by duplex scan. Graft patency was considered terminated when thrombosis occurred or when revision surgery was performed for failing graft. Patients who died before discharge or those with inadequate records were excluded from the analysis of graft patency and long-term outcomes because of absence of follow-up data. The perioperative factors studied included gender, diabetes mellitus, hypertension, smoking, hyperlipidemia, ischemic heart disease, status of distal run-off, preoperative ankle–brachial index, and the type of graft material used.

Results are summarized as means and range for continuous variables while categorical data are summarized as counts or percentages.

Results

Patient demographics are presented in Table I. The indication for surgery was rest pain in 18 (36.7%) procedures and tissue loss in 31 (63.3%). The mean ABPI was 0.3 (0.1-0.6) pre-operatively and 0.5 (0.4-1.0) post-operatively.

All patients were followed up for a minimum of 12 months. The overall primary graft patency rate at one year was (69.4%) where 15 grafts (3 RLSV, 12 prosthetic) occluded during the study period.

Table II: Complications

Complication	Number	Action taken	Outcome
Surgical wound problems			
Hematoma	3	Drainage	Resolution
Wound infection	2	Wound care	Resolution
Nerve injury			
Sephanous (Neuropraxia)	3	None	Persistent
Peroneal (Foot drop)	1	Physiotherapy	Slight improvement
Prosthetic graft infection	3	Graft removal	Limb loss
	1	Graft replaced with LSV	Limb salvage

RLSV grafts had better primary patency at 83.3% compared to 61.3% for prosthetic grafts. The cumulative limb salvage rate was 83.7% at one year. RLSV grafts also had better limb salvage rate at 88.9% compared to 80.6%. Eight major limb amputations were done: five for non- healing wounds and three for prosthetic graft infection. Inflow source was 45 native common femoral artery, two aortofemoral bypasses, one axillofemoral bypass, and one femorofemoral bypass. The run off was a patent popliteal in 48 procedures, a blind popliteal segment in one procedure, one tibial vessel in 21 and two tibial vessels in 28 procedures. Procedure related complications are detailed in Table II.

Adjuncts measures used to aid healing included surgical wound care, applications of vacuum assisted dressings and skin grafts.

Perioperative 30 day mortality was two (3.8%) patients (both due to cardiac ischemic events) while another six (11.3%) died during the follow-up period.

Discussion

Since Kunlin performed the first bypass with an autologous saphenous vein in 1949, bypass grafting has proved to be an effective form of treatment for peripheral arterial occlusive disease and became one of the commonest vascular procedures performed.[3,4] In the current era of interventional non-surgical options first, the indication for the procedure is being constantly updated. As a matter of policy we treat the majority of our claudicant population conservatively as we ascribe to the point of view that intermittent claudication is a life style disease rather than limb threatening condition. In addition, limb loss following revascularization is a concern in patients presenting with intermittent claudication which makes infrequently justified procedure.[1,4]

The above policy in our unit meant that the vast majority of our supra-genicular femoro-popliteal procedures are done for critical leg ischemia. This is defined according to Fontaine classification of leg ischemia (stage 1: asymptomatic, stage 2: claudication, stage 3: rest pain, stage 4: ulceration or gangrene) as Fontaine stages three and four.[5] Toe pressure measurements are unfortunately not available in our unit and such are not used in the definition. Adequate and immediate revascularisation in critical ischemia is a great advantage of the procedure in terms of limb salvage. It is our view that critical leg ischemia is a more justifiable indication for the procedure. Another good reasoning for performing the procedure in patients with critical ischemia is the great difference it makes in terms of life quality for the rest of those patients anticipated limited survival. Interventional therapies with balloon angioplasty and stenting are always used first line in our unit. This is especially true when vein conduits are not available. The non feasibility or failure of interventional therapy warrants surgical intervention. The mean survival of patients who undergo femoropopliteal bypass for limb salvage is significantly shorter than those for claudication (57% versus 82% five-year survival rate) as limb-threatening ischemia is a manifestation of advanced generalized atherosclerosis.[1,6,7]

Aggressive management of these patients' risk factors is warranted. The small sample size in our study makes it difficult to draw any conclusions regarding these risk factors, however the multitude of these factors especially coronary artery disease and tobacco use is noticeable.

The one year graft patency and limb salvage rates at 69.4% and 83.7% in our series is comparable to those in the published literature. The difference between graft patency and limb salvage rates is explained by the fact that once the ulcer or ischemic injury has healed, the limb-threatening condition might not recur on graft blockage.[1,5,7,8] There has been a lot of debate in the medical literature regarding the best type of conduit for primary use in these patients. None of the studies showed PTFE to be superior or even equivalent to saphenous vein as graft material for above-knee femoropopliteal bypasses. The mean difference in 5-year patency was

20%, which is clinically relevant. Indeed, a significant difference in patency is already observed at one year.[3]

The above mentioned studies however do not on the whole differentiate between critical limb ischaemia and claudication as an indication. This is the main theme discussed in our paper. In a recent meta-analysis, which dealt with critical ischemia, the difference between the vein graft series and the prosthetic graft series was readily apparent and significant at most yearly intervals. The paucity of above knee vein graft series was evident and possibly reflected a more extensive popliteal involvement above the knee than below it, a better opportunity for using below knee vein grafts in situ, or both. The validity of the vein-sparing approach in terms of graft patency was denied even more emphatically than for claudicant patients. Because patients with critical ischemia deserve the best operation on the first occasion, an above knee prosthetic bypass should not be recommended in the presence of a usable saphenous vein.[9,10] When the operative indication is chronic critical ischemia, data strongly support the preferential use of vein over prosthetic conduits for femoropopliteal bypass grafting.[11,12]

The noticeable high rate of prosthetic use in our series is multifactorial. Some of the reasons are: non-availability of vein grafts, anticipated short life expectancy, and compromised patient condition. However, some are done for lack of staff and theatre time availability or as an emergency procedure in a poorly patient. We do realize the weakness of this justification and have recently, following the analysis of our results, moved to a vein only policy when possible. The mechanisms of graft failure between prosthetic and vein grafts differ. There is more sudden thrombosis in prosthetic grafts and greater myointimal hyperplasia in vein grafts — this is better identified by using a postoperative duplex surveillance program—as well as a greater need for urgent reoperation or a repeat bypass after prosthetic bypass which on the whole less successful.[12,13,14] Sparing a saphenous vein is also unreasonable because the rate of use of a saved vein in a late bypass has been consistently low, alternative autologous veins are often available for secondary bypass, and a failing vein graft can be treated with no further bypass. Hence, a smaller number of graft failures, together with less severe consequences of failed or complicated grafts, strengthen the argument for the use of a saphenous vein in primary femoropopliteal bypass.[9,10,15]

Prosthetic graft infection is one of the main reasons for limb loss in our series and adds to the argument for primary use of vein grafts when available. We have moved recently to a vein first policy for all our bypasses and hope this will be reflected in a better outcome in the future. Infection of prosthetic grafts may not be as rare as the frequency of 1-2 % suggested in some studies. Indeed, Pedersen *et al.* reported a graft infection rate of 12% in 141 supra-genicular prosthetic grafts for claudication.[10,15,16] Complications of the procedure add to its morbidity in terms of nerve injuries and wound problems but are offset by the benefit of limb salvage.

Conclusion

Supra-genicular femoropopliteal bypass performed for critical ischemia has an acceptable patency rate at one year and is an effective mean of limb salvage. Prosthetic graft infections are a main cause of limb loss. The use of vein conduits should be aggressively pursued.

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