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GRAFT PATENCY FOR VARIOUS SURGICAL TECHNIQUES IN FEMORAL-POPLITEAL REVASCULARIZATION: A COMPARATIVE STUDY

Surgery

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ABSTRACT

Objective: This study is aimed at comparing primary graft patency of the various revascularization. **Material and methods :** From August 1, 2012, to July 1, 2018, 127 infra-inguinal arterial revascularization procedures were performed. Femoral-popliteal bypass was done in 32(25.20%), below knee popliteal bypass in 45(35.43%), popliteal bifurcation bypass in 23(18.11%), tibial bypass in 15(11.81%) and segmental bypass in 12(9.45%) patients. Autogenous reversed saphenous vein graft was used in 102(80.31%) patients and prosthetic grafts(polytetrafluoroethylene-PTFE) were used in 25(19.69%). Of these 102 patients with saphenous vein graft, 80 patients (62.99%) were grafted with reversed vein, 6(4.72%) patients with in-situ vein and 8 patients (6.30%) were grafted with translocated vein. In remaining 8(6.30%) patients, endarterectomy of the distal anastomosis site was done along with vein grafting. **Results :**14 patients (11.02%) failed to patency criteria during follow-up, and 17 patients (13.38%) were lost to follow-up. Early graft failure (in first 6 months) occurred in 2 operations (1.57%), both in endarterectomy patients. Overall graft patency rates were comparable in all procedural configurations, at 12 months (segmental bypass-100%, above knee femoral-popliteal-96.61%, below knee bypass- 97.57%, bifurcation bypass-95.66%, tibial bypass- 93.33%), at 6 years (segmental bypass-90.90%, above knee femoral-popliteal -93.04%, below knee bypass- 87.33%, bifurcation bypass- 85.64%, tibial bypass- 75.00%). Early patency rates (at 12 months) were 97.28% for reversed vein graft, 100% for prosthetic, in-situ vein graft and translocated vein conduits. Endarterectomy patients showed a lower patency rates , at 6 months 87.50% and 73.20% at 12, 36 and 72 months. Late patency at 3 and 6 years is very similar to each other in all groups. **Conclusion:** Though autogenous saphenous vein graft appears to provide the best results with regard to long-term patency in all clinical situations, prosthetic graft also appears to provide same advantage if their use is optimally decided.

KEYWORDS

Infra-inguinal revascularization, femoral-popliteal bypass, graft patency, in-situ vein graft, translocated vein graft

INTRODUCTION

Peripheral arterial disease is a systemic response to atherosclerosis. Intermittent claudication is a classic symptom of ischemic disease of the lower limbs . The superficial femoral artery (SFA) is atherosclerotically changed in the form of stenosis and/ or occlusions. Stenosis are typically short, less than 5 cm in length, as opposed to occlusions, which are often diffuse, severely calcified and longer than 5 cm[1].

Diagnosis is based on physical examination, examination by duplex sonography, and imaging methods (angiography and digital subtraction angiography). Intermittent claudication is treated mainly conservatively. Conservative therapy includes an aggressive effort to decrease the risk factors for atherosclerosis, anti-aggregation and vasoactive therapy and rehabilitation.

If following conservative treatment, patient feels significantly restricted on walking, a form of revascularization is indicated. Revascularization in chronic occlusion of the femoro-popliteal (FP) area is currently performed using bypass technique with natural vein or artificial graft- FP bypass. Other method is endarterectomy and vein patch repair of a short segmental disease. Various methods of surgical revascularization has been described like surgical bypass with saphenous vein graft (SVG), prosthetic bypass grafting, end arterectomy and vein patch grafting, segmental bypass grafting or combined endarterectomy and bypass grafting. Each of these revascularization methods and techniques has its advantages and disadvantages and thus limitations in their use. Knowledge and accessibility of all methods allows us to correctly indicate the proper type of procedure.

Most vascular surgeons agree that the type of conduit, the site of distal anastomosis, quality of the inflow and outflow tract are the most relevant predictors of infra-inguinal bypass patency[2].Autogenous single-segment vein grafts generally maintain superior patency compared with prosthetic conduits[3&4].However, many patients with long-segment occlusions lack adequate saphenous vein, either due to inadequate size or because it has been previously harvested, and are thus faced with receiving a less-than-ideal bypass conduit[5].Short-segment prosthetic bypasses to above-knee targets can approach the 66–80% 5-year patency rates obtained with long-segment SVGs[6]. SVG has been used in two forms either reversed(RSVG) or non-reversed. Technical innovations in obtaining optimal preservation of histo-cytological integrity of vein has made it safer to use non-reversed SVG in two forms- in-situ vein graft (ISVG) technique as described by Hall[7], and translocated saphenous vein graft (TSVG)[8&9].Infra-inguinal revascularization with the greater saphenous vein (GSV) as the arterial conduit has been performed successfully in numerous institutions[10,11,12&13].However, the effectiveness of prosthetic grafts below the knee is inferior to that of all-autogenous conduits in most studies. Modifications with a cuff or patch of autogenous vein or an arteriovenous fistula at the distal anastomosis of prosthetic grafts have been used in a number of institutions in an attempt to improve graft patency[14%15].

MATERIALAND METHODS

Database and patient demographics

From August 1, 2012, to July 1, 2018, 127 infra-inguinal arterial revascularization procedures were performed. Patients were treated at the LPS institute of cardiology and LLR hospital , CSJM University and other hospitals in Kanpur. During this time we performed 102 bypass graft procedures with a SVG conduit. 25 were performed with prosthetic grafts composed of polytetrafluoroethylene(PTFE). The demographics of the 127 patients are shown in Table 1,2 and 3

Table 1: Demographic features of patients

Serial no.	Patient characteristics	Number of patients	SVG patient	Prosthetic graft patient
1.	Male (%)	97(76.38%)	84 (66.14%)	13(10.23%)
2.	Females (%)	30(23.62%)	18(14.17%)	12(9.44%)

3.	Diabetes (%)	58(45.67%)	48(37.79%)	10(7.87%)
4.	History of smoking (%)	92(72.44%)	82(64.56%)	10(7.87%)
5.	Hypertension (%)	58(45.67%)	52(40.94%)	6(4.72%)
6.	Chronic obstructive pulmonary disease(COPD) (%)	86(67.71%)	80(62.99%)	6(4.72%)
Major presenting symptom				
1.	Gangrene	12(9.44%)	5(3.94%)	7(5.51%)
2.	Ischemic ulcer	37(29.13%)	29(22.83%)	8(6.30%)
3.	Ischemic rest pain	88(69.29%)	66(51.97%)	22(17.32%)
4.	Disabling claudication	127(100.00%)	102(80.31%)	25(19.68%)
Side of disease				
1.	Right	79(62.20%)	69(54.33%)	10(7.87%)
2.	Left	48(37.79%)	33(25.98%)	15(11.81%)
Disease distribution				
1	Isolated short segment femoral /popliteal disease	12(9.45%)	12(9.45%)	0
2	Femoral with/without adjoining popliteal disease	32(25.19%)	21(16.53%)	11(8.66%)
3	Femoro-popliteal disease	45(35.43%)	31(24.41%)	14(11.02%)
4	Extensive popliteal disease	23(18.11%)	23(18.11%)	0
5	Popliteal bifurcation disease	15(11.81%)	15(11.81%)	0

Table 2: Details of various Revascularization procedures done

Procedure	Number and percentage of patients
Femoro-popliteal bypass	32(25.20%)
RSVG	12(9.45%)
In-situ SVG	6(4.72%)
Translocated SVG	3(2.36%)
Prosthetic	11(8.66%)
Below knee popliteal bypass	45(35.43%)
RSVG	26(20.47%)
Translocated SVG	5(3.94%)
Prosthetic	14(11.02%)
Popliteal bifurcation bypass	23(18.11%)
RSVG	18(14.17%)
Endarterectomy with vein bypass	5(3.94%)
Tibial bypass	15(11.81%)
RSVG	12(9.45%)
Endarterectomy with vein bypass	3(2.36%)
Segmental bypass	12(9.45%)
Femoro-femoral with RSVG	8(6.29%)
Distal femoral to popliteal bypass with RSVG	4(3.15%)

Table 3: Details of various conduits used

Conduit	Total no. & percentage
Autologous SVG	102(80.31%)
R-SVG	80(62.99%)
In- situ SVG	6(4.72%)
Translocated SVG	8(6.30%)
Endarterectomy along with RSVG	8(6.30%)
Prosthetic graft	25(19.69%)

The majority of the revascularization procedures were performed for limb salvage, including gangrene (12), ischemic ulcer (37), ischemic rest pain(88) and disabling claudication in 127 [Table 1]. Our analysis was limited to patients whose graft origins were the femoral, or above-knee popliteal arteries and whose targets were distal femoral, above knee popliteal, below-knee popliteal, tibial, vessels; lower extremity bypass grafts to the pedal vessels were excluded.

Post-operative follow up

During the first year, patients were followed with out-door department visits at 1,6, and at 12 months and yearly thereafter. Graft patency was determined with clinical examination of pulses distal to the bypass graft and with doppler examination. Angiography was done in patients where there was suspicion of graft occlusion.

Definitions of Outcome Measures

The criteria for patency rates used in this study are those outlined by the Ad Hoc Committee on Reporting Standards of the Society for Vascular Surgery and the North American Chapter of the International Society for Cardiovascular Surgery.

RESULTS

Over the 6-year period of study, 127 patients with atherosclerotic chronic femoro-popliteal disease including 97 males and 30 females were treated by use of the protocol described above.

Major indication for surgery was: disabling claudication(n =127, 100%), ischemic rest pain (n=88, 69.29%), ischemic ulcer (n=37, 29.13%), gangrene (n=12, 9.45%).

Concerning comorbidity, 58 patients (45.67%) had diabetes, 86 patients (67.71%) had COPD, 58 patients (45.67%) had hypertension. Many of the patients (n=92, 72.44%) were smokers also.

Arteriography showed femoral artery disease with/without short segment adjoining popliteal artery disease in 32 patients(25.19%), femoro-popliteal disease in 45 patients(35.43%) , extensive involvement of popliteal artery in 23 patients (18.11%), involvement of popliteal bifurcation in 15 patients(11.81%) and isolated short segment disease either femoral or popliteal artery disease in 12 patients(9.45%).

Outflow arteries were selected as per disease distribution. Above knee femoro-popliteal bypass was done in 32 patients with mainly femoral artery disease with or without adjoining popliteal artery involvement. Below knee femoro-popliteal bypass was done in 45 patients with both femoral and popliteal involvement. Popliteal bifurcation was the site for distal anastomosis in 23 patients with extensive popliteal involvement and the tibial vessels were in 15 patients with popliteal bifurcation disease. In 15 patients with short segment involvement of either femoral or popliteal artery, segmental bypass was the procedure of choice.

Outcome by Type of Revascularization procedure

Patients were monitored after operation for a period of 72 months. 14 patients (11.57%) failed to patency criteria during follow-up, and 17 patients (13.38%) were lost to follow-up. Early graft failure (in first 6 months) occurred in 2 operations (1.57%). 1 patient with endarterectomy with tibial bypass develop graft occlusion at 1 month follow up. No attempt at graft revision was made, but major amputation was not necessary, and the patients continued to be ambulatory at 72 months follow-up. 1 patient with popliteal bifurcation graft developed graft occlusion at 6 month follow up. This patient was managed by a femoro-tibial bypass. In rest of 12 patients that failed to show patency, no attempt at graft revision was made and were managed conservatively.

Patency is reported as primary patency only. A comparison of outcome measures between the patients receiving different revascularization procedures under study is shown in table 4 and 5.

Table 4: Life table analysis of cumulative primary patency rates for different revascularization procedures:

A-Above knee femoro-popliteal bypass

A	B	C	D	E	F	G
Interval (months)	**No. at risk at beginning of**	**No. failed during interval**	**Withdrawn during interval**	**Interval failure rate**	**Cumulative patency rate (%)**	**Standard error**
At discharge	32	0	0	0	100	0.00%
1	32	0	0	0	100	0.00%
6	32	0	2(RSVG)	0	100	0.00%

12	30	1(RSVG)	1(ISVG)	0.0339	96.61	3.247%
24	28	1 (prosthetic)	0	0.0357	93.04	4.638%
36	27	0	1(TSVG)	0	93.04	4.724%
48	26	0	1 (prosthetic)	0	93.04	4.814%
60	25	0	0	0	93.04	4.909%
72	25	0	0	0	93.04	4.909%

B-Below knee femoro-popliteal by pass

A	B	C	D	E	F	G
Interval (months)	**No. at risk at beginning of interval**	**No. failed during interval**	**Withdrawn during interval**	**Interval failure rate**	**Cumulative patency rate (%)**	**Standard error**
At discharge	45	0	1(RSVG)	0	100	0.00%
1	44	0	0	0	100	0.00%
6	44	0	3(1 prosthetic+ 2 RSVG)	0	100	0.00%
12	41	1 (RSVG)	0	0.0243	97.57	2.375%
24	40	3(1RSVG+2prosthetic)	0	0.0750	90.07	4.488%
36	37	0	0	0	90.07	4.666%
48	37	0	0	0	90.07	4.666%
60	37	1 (TSVG)	1 (RSVG)	0.0274	87.33	5.110%
72	35	0	1 (prosthetic)	0	87.33	5.254%

C- Popliteal bifurcation by pass

A	B	C	D	E	F	G
Interval (months)	**No. at risk at beginning of interval**	**No. failed during interval**	**Withdrawn during interval**	**Interval failure rate**	**Cumulative patency rate (%)**	**Standard error**
At discharge	23	0	0	0	100	0.00%
1	23	0	0	0	100	0.00%
6	23	1(endarterectomy)	0	0.0434	95.66	4.155%
12	22	0	1(RSVG)	0	95.66	4.249%
24	21	0	0	0	95.66	4.349%
36	21	1(RSVG)	0	0.0476	90.90	5.984%
48	20	0	1(RSVG)	0	90.90	6.131%
60	19	1(RSVG)	0	0.0526	85.64	7.445%
72	18	0	0	0	85.64	7.649%

D-Tibial bypass

A	B	C	D	E	F	G
Interval (months)	**No. at risk at beginning of interval**	**No. failed during interval**	**Withdrawn during interval**	**Interval failure rate**	**Cumulative patency rate (%)**	**Standard error**
At discharge	15	0	0	0	100	0.00%
1	15	1(endarterectomy)	0	0.0667	93.33	6.223%
6	14	0	0	0	93.33	6.442%
12	14	0	2(1RSVG + 1 endarterectomy)	0	93.33	6.442%
24	12	1(RSVG)	0	0.0833	85.00	9.503%
36	11	0	1(RSVG)	0	85.00	9.926%
48	10	1(RSVG)	0	0.1000	75.00	11.858%
60	9	0	0	0	75.00	12.500%
72	9	0	0	0	75.00	12.500%

E-Segmental bypass

A	B	C	D	E	F	G
Interval (months)	**No. at risk at beginning of interval**	**No. failed during interval**	**Withdrawn during interval**	**Interval failure rate**	**Cumulative patency rate (%)**	**Standard error**
At discharge	12	0	0	0	100	0.00%
1	12	0	0	0	100	0.00%
6	12	0	0	0	100	0.00%
12	12	0	1(RSVG)	0	100	0.00%
24	11	1(RSVG)	0	0.0910	90.90	8.268%
36	10	0	0	0	90.90	8.671%
48	10	0	0	0	90.90	8.671%
60	10	0	0	0	90.90	8.671%
72	10	0	0	0	90.90	8.671%

Table 5: Comparison of different revascularization procedure's cumulative primary patency rates

Interval (Months)	Above knee femoro-popliteal bypass	Below knee femoro-popliteal bypass	Popliteal bifurcation bypass	Tibial bypass	Segmental bypass
At discharge	100	100	100	100	100
1	100	100	100	93.33	100
6	100	100	95.66	93.33	100
12	96.61	97.57	95.66	93.33	100
24	93.04	90.07	95.66	85.00	90.90
36	93.04	90.07	90.90	85.00	90.90
48	93.04	90.07	90.90	75.00	90.90
60	93.04	87.33	85.64	75.00	90.90
72	93.04	87.33	85.64	75.00	90.90

All patients were discharged with patent grafts (100% cumulative patency). Early graft patency rates (at 6 months) were similar for all(100%) except popliteal bifurcation bypass (95.66%) and tibial bypass (93.33%).

Overall graft patency rates were comparable in all procedural configurations at 12 months (segmental bypass-100%, above knee femoro-popliteal- 96.61%, below knee bypass- 97.57%, bifurcation bypass-95.66%, tibial bypass- 93.33%). But still there is a trend of decreased patency towards distal grafts.

Graft patency at 3 years follow up also had same variation between the different procedures (segmental bypass- 90.90%, above knee femoro-popliteal -93.04%, below knee bypass- 90.07%, bifurcation bypass-90.90%, tibial bypass- 85.00%).

Late graft patency at 6 years follow up also had same variation between the different procedures. Higher patency was noted with proximal bypasses and decreasing trend of patency towards the distal grafts (segmental bypass-90.90%, above knee femoro-popliteal – 93.04%, below knee bypass- 87.33%, bifurcation bypass- 85.64%, tibial bypass- 75.00%).

Outcome by Type of Conduit

Table 6: Life table analysis of cumulative primary patency rate for different conduits A-RSVG

A	B	C	D	E	F	G
Interval (months)	**No. at risk at beginning of interval**	**No. failed during interval**	**Withdrawn during interval**	**Interval failure rate**	**Cumulative patency rate (%)**	**Standard error**
At discharge	80	0	1	0	100	0.00%
1	79	0	0	0	100	0.00%
6	79	0	4	0	100	0.00%
12	75	2	3	0.0272	97.28	1.852%
24	70	3	0	0.0428	93.00	2.941%
36	67	1	1	0.0150	91.50	3.259%
48	65	1	1	0.0155	89.95	3.537%
60	63	1	1	0.0160	88.35	3.799%
72	61	0	0	0	88.35	3.861%

B-Prosthetic graft

A	B	C	D	E	F	G
Interval (months)	**No. at risk at beginning of interval**	**No. failed during interval**	**Withdrawn during interval**	**Interval failure rate**	**Cumulative patency rate (%)**	**Standard error**

At discharge	25	0	0	0	100	0.00%
1	25	0	0	0	100	0.00%
6	25	0	1	0	100	0.00%
12	24	0	0	0	100	0.00%
24	24	3	0	0.1250	87.50	6.315%
36	21	0	0	0	87.50	6.751%
48	21	0	1	0	87.50	6.751%
60	20	0	0	0	87.50	6.917%
72	20	0	1	0	87.50	6.917%

C-Endarterectomy along with RSVG

A	B	C	D	E	F	G
Interval (months)	**No. at risk at beginning of interval**	**No. failed during interval**	**Withdrawn during interval**	**Interval failure rate**	**Cumulative patency rate (%)**	**Standard error**
At discharge	8	0	0	0	100	0.00%
1	8	1	0	0.1250	87.50	10.937%
6	7	1	0	0.1430	73.20	14.323%
12	6	0	1	0	73.20	15.470%
24	5	0	0	0	73.20	16.947%
36	5	0	0	0	73.20	16.947%
48	5	0	0	0	73.20	16.947%
60	5	0	0	0	73.20	16.947%
72	5	0	0	0	73.20	16.947%

D-In- situ SVG

A	B	C	D	E	F	G
Interval (months)	**No. at risk at beginning of interval**	**No. failed during interval**	**Withdrawn during interval**	**Interval failure rate**	**Cumulative patency rate (%)**	**Standard error**
At discharge	6	0	0	0	100	0.00%
1	6	0	0	0	100	0.00%
6	6	0	0	0	100	0.00%
12	6	0	1	0	100	0.00%
24	5	0	0	0	100	0.00%
36	5	0	0	0	100	0.00%
48	5	0	0	0	100	0.00%
60	5	0	0	0	100	0.00%
72	5	0	0	0	100	0.00%

E-Translocated SVG

A	B	C	D	E	F	G
Interval (months)	**No. at risk at beginning of interval**	**No. failed during interval**	**Withdrawn during interval**	**Interval failure rate**	**Cumulative patency rate (%)**	**Standard error**
At discharge	8	0	0	0	100	0.00%
1	8	0	0	0	100	0.00%
6	8	0	0	0	100	0.00%
12	8	0	0	0	100	0.00%
24	8	0	0	0	100	0.00%
36	8	0	1	0	100	0.00%
48	7	0	0	0	100	0.00%
60	7	1	0	0.1430	85.70	12.249%
72	6	0	0	0	85.70	12.249%

Although there is a big mismatch between the group of patients receiving different conduits in our study, but still our results exhibits a comparable patency rates among different conduits except those having distal endarterectomy along with bypass. Early patency rates (at 6 months) were 100% for RSVG, prosthetic, ISVG and TSVG conduits. Endarterectomy patients showed a lower early patency rates (73.2%). Graft patency at 3 years is very similar to each other in all groups (RSVG-91.50%, ISVG-100%, TSVG-100%, endarterectomy along with RSVG bypass-73.20% and prosthetic-87.50%). Late graft patency at 3 years follow up also had same variation between the different conduits (RSVG-88.35%, ISVG-100%, TSVG- 85.7%, endarterectomy with RSVG bypass-73.20% and prosthetic-87.50%).

DISCUSSION

The performance of lower extremity revascularization has demonstrated progressive improvement that has led to increased limb preservation and reduced rates of lower extremity amputation [16,17&18].An extensive number of reports have confirmed the effectiveness of infra-inguinal revascularization in producing excellent long-term patency and limb salvage rates[10,11&12]. The patency results described in this report are considerably better than the patency obtained with the same procedures performed earlier. Multiple factors are probably important in achieving improved results. Examination of the life-table 4,5& 6 reveals that the improved results can be almost entirely accounted for by a marked improvement in early patency (up to 6 months). Beyond this point the patency curves are quite similar.

Early postoperative graft occlusions have been traditionally attributed to operative technical failures. We believe that an important part of the learning curve has been our increasing awareness of the extreme delicacy necessary in handling small, diseased, below-knee arteries. Clamp injuries, elevation of intimal flaps by the sucker tip, and endothelial stripping with balloon catheters may all result in graft failure. We have not recognized a single immediate postoperative graft failure in a patient with a satisfactory procedure.

Since the autogenous SVG was first described as a bypass conduit for femoral arterial disease in 1949[19], it has remained the conduit of choice for bypass targets. However, prior reports have demonstrated that an acceptable autologous SVG remains unavailable for as many as 20% of bypass patients[3]. These patients often receive a prosthetic bypass conduit. Prosthesis (PTFE) is a graft material of choice when the GSV is already used, damaged or calcified and when the occlusion is longer than 4 cm and is not suitable for stent grafting[20 & 21] .

Multiple procedures are performed and various conduits are used in different manners to salvage a single extremity. In an attempt to determine the optimal alternative conduit and procedure for lower extremity revascularization, we have compared the results of above mentioned different bypass graft procedures performed with autogenous SVG in three forms-RSVG, ISVG and TSVG and with prosthetic grafts. By doing this we hoped to make easier our future selection of alternative procedure and conduit in the difficult clinical situation.

We did not include the use of cryopreserved vein, upper extremity vein, spliced or composite vein grafts, or prosthetic grafts with a venous cuff, as we aimed to make uniform comparisons in our analysis. Last, we used a broad definition for use of antithrombotic regimens, with the use of anti-coagulative regimen (clopidogrel + aspirin) along with antithrombotic (warfarin) at preoperative and long-term follow-up and use of heparin in early postoperative in selected cases.

The use of an autogenous conduit appears to be an important factor in achieving the highest patency and limb salvage rates. ISVG and TSVG has allowed the use of smaller veins for leg bypass than can be successfully used for RSVG, which thus allowed increased vein usage and avoids prosthetic bypass in large numbers of patients[8,9&22]. We have used prosthetic graft in cases in above-knee and below-knee femoro-popliteal bypass grafts only (not in popliteal bifurcation and tibial bypass). Patients with endarterectomy of distal anastomotic site were also not bypassed with the prosthetic grafts. This graft configuration may account for the higher patency rates for prosthetic grafts in our study. Our investigation has shown that, within a 6-year period, prosthetic infra-inguinal bypass grafts can perform competitively with SVG given appropriate patient selection and antithrombotic therapy.

In the 127 patients in this series who required bypass to infra-inguinal arteries, the 75.00% to 93.04% grafts patency (segmental bypass-90.90%, above knee femoro-popliteal – 93.04%, below knee bypass-87.33%, bifurcation bypass- 85.64%, tibial bypass- 75.00%) figures at 6 years confirm the reliability of these techniques. We do have slight lower patency rates for infra popliteal arteries(tibial vessels), 75.00% as compared to 93.04% at 6 years, but these are sufficient to encourage us. Our results with tibial grafts are particularly noteworthy and this improved patency may relate to the use of RSVG to tibial vessels rather than prosthetics.

In this series, only 19.69% patients who needed lower extremity revascularization had unsuitable or diseased GSV. Our vein utilization

rate of 80.31% overall includes those patients who were able to have autogenous re-vascularization by a variety of techniques, including anastomosis of RSVG, use of ISVB, TSVG, and graft to an endarterectomised distal artery to reduce the length of vein required. The patency figures for these patients are not different from those of the group as a whole (table 6), which emphasizes the reliability of these conduits and techniques.

This report has provided figures for patency rates for different procedures for revascularization and usage of different conduits. We conclude that, although GSV is a useful and durable conduit in various forms(RSVG,ISVG or TSVG), we are not in a state of conclusion that one is superior to other.

We concede that the results presented in this report are open to criticism because of the short length of the overall study period (6 years) and considerable variation in number of patients in different groups. Although long-term patency may be considerably less than patency at 6 years, it has been reported experience in many RSVG and ISVG series, that patency curves decrease slowly beyond 2 years[23, 24, 25]. The primary difference in patency between reported series of leg revascularization lies in the early (within 1 year period) patency figures. It is our opinion that recently reported marked improvement in patency and vein usage figures, regardless of method, reflect widespread improvement in overall lower extremity revascularization techniques, and not innate superiority of any particular configuration of the vein bypass conduit.

In conclusion, several alternative conduit and surgical procedure options are available for use when a limb is threatened due to ischemia. The use of autogenous SVG appears to provide the best results with regard to long-term patency in all clinical situations, particularly when the bypass graft extends below the knee. Prosthetic graft also appears to provide same advantage in revascularization procedures, as compared with autogenous vein grafts if their use is optimally decided. Finally, good patency rates may be achieved in chronic infra-inguinal limb ischemic patients with a good surgical decision.

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