

MIDTERM OUTCOME OF FEMOROFEMORAL CROSS OVER BYPASS GRAFTS

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ABSTRACT -

Background: Femorofemoral crossover bypass (FCB) is a procedure for patients with unilateral iliac artery disease. Our goal was to assess mid-term patency of graft used in FCB.

Methods: A retrospective review from a single centre of consecutive patients who underwent Femorofemoral crossover bypass from November 2017 to February 2021 was done. Data was collected from hospital records and follow-up done up to February 2022. We have analysed the graft material used, size of graft and operative procedures.

Results: The indications for FCB were claudication in 42 and critical limb ischemia in 10 patients. The 1-month patency rate is 100%, 3 month patency rate is 96%, 6 month patency rate is 94% and 1 year patency rate is 90%.

Conclusion: Our mid-term analysis suggests that FCB might be a valuable alternative treatment modality in patients with unilateral iliac artery disease.

Keywords: Femorofemoral crossover Bypass, Iliac artery, vascular patency.

1. INTRODUCTION -

Femorofemoral crossover bypass (FCB) was introduced by Freeman and Leeds in 1952.^[1]Femorofemoral bypass is a procedure of surgical revascularization. It has been used as an alternative to anatomic reconstruction for high-risk patient with unilateral iliac occlusive disease. At present, most patients with symptomatic iliac stenosis or occlusion are treated primarily with angioplasty and stenting.^[2]Femorofemoral bypass is a method of surgical revascularization used in the setting of unilateral common and/ or external iliac artery occlusive disease. The technique is dependent upon a patent iliac arterial system without hemodynamically significant disease to supply adequate inflow of blood to both lower limbs. The femorofemoralcross over bypass involves making an incision in the groin area to access the femoral artery, which is a major artery in the leg. The surgeon then creates a bypass by connecting the healthy portion of the femoral artery to a healthy segment of other femoral artery, allowing blood to flow past the blockage and restore circulation to the affected leg.This procedure is commonly used means of extra anatomical vascular reconstruction for patient with disabling claudication or critical limb threatening ischemia. However, open surgical treatment is still recommended for a long iliac occlusion.^[3]

2. MATERIALS AND METHODS -

2.1 Study setting: A single centric retrospective study was conducted in the department of Cardiothoracic and Vascular Surgery (CTVS), Pt. Jawaharlal Nehru Memorial Medical College, Raipur, Chhattisgarh, India from November 2017 to February 2021.

2.2 Samples: During this duration of 3 years, 52 patients who were found to have unilateral aortoiliac/iliac disease with critical limb ischemia were included. Contraindications for Femorofemoralcross over bypass are significant occlusion in donor vessel, poor run off of recipient vessel, bilateral aortoiliac disease and extreme medical risks for surgery.

2.3 Pre procedural evaluation

Pre procedural work up starts with non invasive arterial physiologic study including ankle brachial index (ABI) and duplex ultra sonography. If we suspect any iliac occlusive disease then we perform computed tomography angiography(CTA) for the assessment of anatomic information which help us for planning of revascularization procedure. Computed tomography angiography of abdominal aorta and bilateral lower limb vessels showing left common iliac artery occlusion.(Figure 1)

2.4 Equipments

Equipments generally used for femorofemoral cross over bypass is as follows –

- Routine vascular clamps and vascular slings
- Tunneling device – We use ' C ' shaped stainless steel tunneling device.(**Figure 3**)
- Polytetrafluoroethylene (PTFE) graft (6-8 mm) of appropriate length and size. These grafts are either plain or ring enforced PTFE graft.
- Continuous wave doppler for intraoperative assessment of blood flow.

2.5 Procedure:

Our all procedure were performed under spinal anaesthesia. Aseptic painting and drapping of surgical site. Patient placed in supine position. Bilateral longitudinal groin incision carried over femoral artery. Longitudinal incision is better for assessing proximal and distal femoral arteries. Before systemic heparinisation subcutaneous or preperitoneal tunneling was performed with the help of tunneling device (figure 3). Polytetrafluoroethylene graft was passed through the tunneling device. We keep PTFE graft in inverted 'C' position. So that graft is directed longitudinally at the anastomoses. Then we give heparin at the dose of 1mg/kg body weight. We keep activated clotting time (ACT) more than 220 seconds. In most of the cases we

take inflow from common femoral artery and out flow in common femoral artery or superficial femoral artery. We perform end to side anastomosis with 6-0 polypropylene suture or PTFE suture in continuous manner. We perform anastomosis first in donor vessel after that in recipient vessel (figure 2). Then we check the blood flow in recipient vessel with wave doppler machine. Post procedure we keep patient in heparin. Then gradually shift from systemic anticoagulation to oral anticoagulation and dual antiplatelets.

PTFE (Polytetrafluoroethylene) graft was used in all the patients. The indication of FCB in a unilateral occlusive disease with good iliac artery as inflow and femoral artery as out flow. The patients' characteristics, including the demographic data, the cardiovascular risk factors, the indications for surgery, the preoperative treatment, the ankle-brachial pressure index, the operative procedure and material used and the medication after the operation were analysed. Graft surveillance was performed using the ankle brachial index (ABI) after surgery and at 3 months, 6 months and 1 year. Duplex scans were performed for confirmation.

2.6 Data analysis: Data analysis was done using Microsoft Excel version 2007 and Open Epi version 3.0 software package.

3. RESULTS

TABLE 1- Patient Characteristics

Demographic variables (n = 52)		Frequency (%)
Age (in years)		45.48 + 11.24
Gender	Male	46 (88.5%)
	Female	6 (11.5%)
Indications	Claudication	42(80.8%)
	Critical limb ischemia	10(19.2%)
Coexisting medical condition	Smoking	47 (90.3%)
	Hypertension	41(78.8%)
	Coronary artery disease	18(34.6%)
	Diabetes mellitus	15(28.8%)
	Cerebrovascular disease	12(23%)
	Chronic pulmonary disease	6(11.5%)
	Chronic renal failure	1 (1.9%)
	Malignancy	4 (7.6%)
PREOPERATIVE ABI	Donar leg	0.89±0.28
	Symptomatic leg	0.52± 0.26
POST OPERATIVE ABI	donor leg	0.81± 0.31
	symptomatic leg	0.74± 0.36

Patent tibial artery	1	9(17.3)
	2	23(44.2)
	3	20(38.4)

Values are presented as mean± SD or number (%), ABI- Ankle brachial index.

All the patients' characteristics, including demographic data, the cardiovascular risk factors, the pre-operative treatment, the indications of surgery, the ankle-brachial pressure index, the operative procedure are shown in table 1, Table 2. The mean follows up period was 12months.

Majority of the patients were male (88.5%) and the mean + SD age of the patients was 45.48 + 11.24. Indications

of surgery were claudication and critical limb ischemia. Out of these two-indication claudication was primary indication in 80.8% patients. The patients co-existing medical condition was also noted. Majority of patients (90.3%) were smokers and second most common factor is hypertension (78.8%). The other coexisting medical condition includes diabetes mellites (28.8%), coronary artery disease (34.6%), cerebrovascular disease (23%), chronic pulmonary disease (11.5%) etc(Table 1). We have kept the patients on continuous dual antiplatelet (Aspirin 150 mg + Clopidogrel 75 mg), oral anti-coagulation (Nicoumalone) and atorvastatin for lifetime.

TABLE 2- Operative procedures and inflow procedures

Operative procedure	Frequency (%)	
Graft material of PTFE	Plane	30 (76.9%)
	external ring enforced	20(38.4%)
	internal ring enforced	2(3.8%)
Size of graft	number 6	34(65.3%)
	number 7	12(23%)
	number 8	6(11.5%)
Flow of direction	right to left	31(59.6%)
	left to right	21(40.3%)
Proximal anastomosis	CFA	42(80.7%)
	SFA	10(19.2%)
Distal anastomosis	CFA	34(65.2%)
	SFA	18(34.6%)
Femoral endarterectomy	Yes	12(23%)
	No	40(76.9%)

Values are presented as number (%)
PTFE- polytetrafluorethylene; CFA- common femoral artery; SFA- superficial femoral artery

In all patients PTFE graft material was used. Three types plain, external ring enforced and internal ring enforced. In majority of patient plain PTFE graft (76.9%) was used. Size of graft was number 6,7 and 8 was used, 65.3%, 23% and 11.5% respectively. Proximal anastomosis was done with CFA (80.7%) and SFA (19.2%). Distal anastomosis in CFA is 65.2% and SFA is 34.6%.

Femoral end arterectomy was majorly not done (76.9%).[TABLE.2]

During follow-up out of 52 patients, 5 Patients had graft occlusion. Out of which 1 was due to graft infection, which needed graft extraction and other 4 is due to thrombosis. Therefore 4 patients underwent thrombectomy due to recurrent ischemic symptoms. Patency rate of PTFE graft is 100% in 1month, 96% in 3month, 94% in 6 months and 90% in 1 year. [Table 3]

Table 3 Patency rate of PTFE graft evaluated by duplex scan.

Follow-up	1 month	3 months	6 months	1 year
Patency rate of the PTFE graft	52((100%))	50(96.1%)	49(94.2%)	47(90.3%)

Fig.1 – CT Angiography of abdominal aorta with bilateral lower limb vessels showing left common iliac artery occlusion.



Fig.2 – Intraoperative picture showing PTFE graft insitu



Fig. 3 Tunnelling device



4. DISCUSSION

Femorofemoral cross over bypass, is a surgical method used for severe peripheral artery disease (PAD) or atherosclerosis, condition the result in reduced blood flow to legs due to build up of plaques in the arteries. More recently percutaneous transluminal angioplasty and stenting were introduced to treat stenosis and occlusion. The indications for surgery are long segment unilateral iliac disease.^[4] Femorofemoral crossover bypass (FCB) represents a valuable alternative option to anatomic bypass for unilateral iliac occlusive disease in patients with prohibitive surgical risks for aortic surgery or a poor general condition, coronary artery disease, chronic obstructive pulmonary disease or a local condition such as a hostile abdomen, sepsis or a porcelain aorta.^[5,6] Our research showed a good patency rate like other FCB studies.^[3,4] But Schneider et al. reported that the of FCB were clearly inferior to the results of aortofemoral bypass.^[7] In our study the perioperative mortality rate was 0% whereas in most of the studies, the perioperative mortality was reported as 0% to 5%.^[2,3,8]

In our study, primary patency rate up to 1 month is 100%, 3 months is 96%, 6 months is 94% and 1 year is 90%. Blockage of graft occurring between 6 months and 1 years after surgery is usually due to anastomotic intimal hyperplasia. In this study, no predictors and influencing factors for the patency rates were identified. The various series have not supplied a detailed breakdown of the results on the basis of the operative indications, symptoms, failure of previous bypass grafts, the operative risk, the graft material used for reconstruction, preoperative evaluation of the donor iliac artery and the procedures adopted to improve the outflow.^[6,8,9] The lack

of well-defined categorizations of results according to these variables creates a bias in the analysis of the mid-term outcome. Our study gives a detailed description of midterm usefulness of FCB with taking into account not only the patency rates, but also the clinical efficacy. We infer that FCB in patients with symptom caused by unilateral iliac artery disease is still a good alternative treatment method.

Ethical consideration: The study was ethically approved by the Institutional Ethical Committee, Pt JNM Medical College, Raipur, C.G. (IEC No./MC/Ethics/2023/74 dated 13/10/2023). Confidentiality was maintained.

Conflict of interest: None

Source of funding: This research received no specific grant from funding agencies and the public, commercial, or, not-for-profit sectors.

Declaration of competing interest: Authors declare no potential conflict of interest concerning the research, authorship, and/or publication of this article.

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