PRESENTATION AND OUTCOMES OF AORTOFEMORAL BYPASS SURGERY IN PATIENTS WITH AORTOILIAC OCCLUSIVE DISEASE. FOUR YEARS' EXPERIENCE AT A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To highlight the presentation and outcomes of Aortofemoral bypass surgery at a tertiary care hospital.
Study Design: Prospective observational study.
Place and Duration of Study: Vascular Surgery department, Combined Military Hospital Lahore, from Jan 2015 to Dec 2019.
Methodology: A total of 23 patients between 50-80 years of age presenting with critical limb ischemia due to Aortoiliac occlusive arterial disease type C or D of Trans-Atlantic inter Society Consensus (TASC) II classification confirmed on CT Angiogram, were included in the study. The clinical presentation, co-morbid illnesses, history of smoking, obesity, post operative patency of graft, wound infection, amputation rates, and mortality were documented on a structured proforma. All patients were followed up at 1, 6, 12 and 24 months of surgery. Outcomes were assessed in terms of graft patency, wound infection, limb survival, amputations and mortality. Data was analyzed by SPSS version 23.0.
Results: The mean age of patients was 71.04 ± 7.29 years. Most patients presented with rest pain (56.5%). The frequency of smokers was 78.3% while 34.8% patients had both diabetes mellitus and ischemic heart disease. Hyperlipidemia was present in 30.4% patients. Two patients (8.7%) developed superficial surgical site infection. The limb salvage rate was 95.7% and the mortality rate was 4.3%.
Conclusion: Aortofemoral bypass surgery is a safe and highly effective treatment modality for the management of aortoiliac occlusive arterial disease in experienced hands. Limb salvage can be successfully achieved in more than 95% cases.

Keywords: Amputation, Aortofemoral bypass, Aortoiliac occlusive disease, Critical limb ischemia, Gangrene.

INTRODUCTION

Atherosclerotic disease of abdominal aorta and iliac arteries is one of the most common therapeutic challenges encountered by vascular surgeons. It is manifested as symptomatic arterial insufficiency of the lower extremities, producing symptoms from mild claudication to more severe Critical Limb Ischaemia (CLI)[1]. The patients presenting with claudication secondary to aortoiliac disease are nearly a decade younger than those with claudication due to infrainguinal occlusive disease, despite the similar etiology and risk factors[2]. Depending upon the severity of the disease, various management strategies are used ranging from conservative to radical open bypass surgery. Supervised Exercise and Best Medical therapy are the cornerstones of the conservative management[3]. In case of failure of conservative treatment patient is to be managed invasively either with open surgery or through endovascular procedures.

Portuguese surgeon Dos Santos did first successful endarterectomy of common femoral artery in 1947[4]. Four years later in 1951, Wylie *et al* in San Francisco extended this technique to Aortoiliac level, but it took further 10 years to start Aortic Bypass after the advent of synthetic grafts[5]. Since then the advancements in the graft material and surgical techniques have

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significantly improved the results and outcome of Aortofemoral bypass surgery in correctly identified cohort. The Trans Atlantic Inter-Society Consensus (TASC) classification currently provides an anatomic guide for the therapy in invasive group. In general, TASC type A lesions are best treated with endovascular therapy, whereas TASC type D lesions are best treated with surgical revascularization[6].

The rationale of conducting this study was that there is dearth of research protocols on the Aortofemoral bypass graft surgery in the Pakistani literature. The findings of this study will help in gathering data for establishment of evidence based practices regarding management of Aortofemoral bypass surgery in patients presenting with Aortoiliac occlusive arterial disease in Pakistani local population.

METHODOLOGY

This prospective observational study was carried out at the Department of Vascular Surgery, Combined Military Hospital, Lahore after ethics review committee approval vide IRB certificate number 203/20. The duration of study was 4 years, from January 2015 to December 2019. The sample size was calculated by the WHO sample size calculator as follows: confidence level= 95%; absolute precision required = 0.07 and anticipated population proportion of graft patency = 97%[7]. The sample size came out to be 23 patients. The sampling method used was non-probability consecutive sampling. A written consent was taken from all patients included in the study.

The sample inclusion criteria included patients of both genders presenting with critical limb ischemia due to aortoiliac occlusive arterial disease type C or D of Trans-Atlantic inter Society Consensus (TASC) II classification confirmed on CT angiogram of abdominal aorta. Patients were diagnosed as CLI by history of chronic ischemic rest pain in one or both lower limbs along with ulcers or gangrene secondary to arterial occlusive disease. The cutoff value for ankle pressure was <50 mmHg in patients with ischemic rest pain and an ankle pressure of <70 mmHg in patients presenting with toe ulcers or gangrene[8]. The exclusion criteria set for the study was patients having severe sepsis, patients unfit for general anesthesia (GA) and patients with concomitant proximal aortic occlusion.

Demographic details of all patients included in the study including history of smoking, comorbids including diabetes mellitus (DM), hypertension (HTN), chronic kidney disease (CKD), ischemic heart disease (IHD) and hyperlipidemia were documented. The symptoms like buttock claudication, impotence, rest pain, tissue loss and diminished femoral pulses were also documented. The BMI of patients was also documented. All patients fulfilling the operational definition of CLI underwent computed tomography angiogram (CTA) with 3-D reconstruction to determine the level of occlusion from abdominal aorta till peripheral run off vessels. The workup of patients was completed and they were planned for aortofemoral bypass graft.

All risks, potential complications and benefits were explained in detail to the patient and their families before surgery. All the patients were operated under GA with intra-arterial pressure line monitoring, epidural catheter, foley catheter and pre-operative antibiotics. The femoral arteries were exposed through longitudinal incisions in each groin and control of CFA, SFA and PFA arteries on each side was achieved through vessel loops.

Infra renal aorta was exposed through midline longitudinal incision extending downwards from xiphoid process to below the umbilicus. Abdomen was explored for any other pathology. Ligament of Treitz was then taken down and duodenum was mobilized to the right to access the infra renal aorta. The exposure was facilitated with the help of application of Omni tract retractor system. Infra renal aorta was exposed till bifurcation. Retroperitoneal tunnels were completed on either side for the passage of femoral limbs of the graft anterior to iliac vessels but posterior to the ureters. Once the dissection work was complete 5000 unit IV Heparin was given.

After applying proximal and distal aortic clamps, about 3cm longitudinal aortotomy was fashioned over anterior aspect of infra renal aorta at as proximal disease free part as possible. Loose debris and mural thrombus was removed from the dissected part. Beveled top end of the graft was anastomosed in end to side fashion with proline 3/0 round body suture. After completion of abdominal portion of the procedure, the graft limbs were clamped with soft clamps and flushed

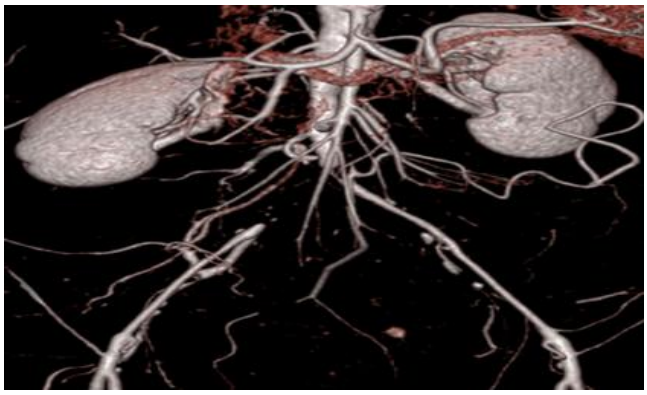

Figure-1: CT Angiogram of a 65 years old patient.

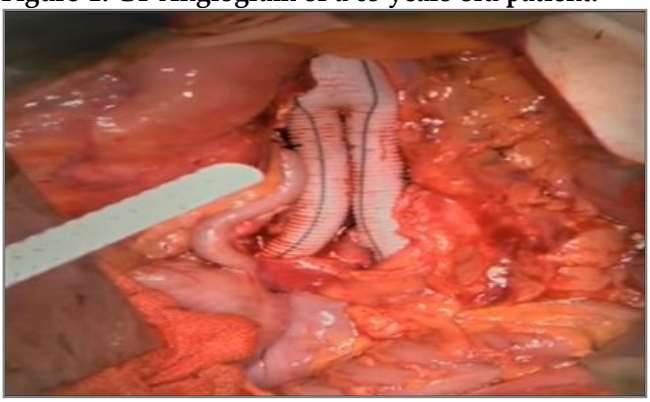

Figure-2: Aortobifemoral bypass graft in place in the same patient.

with Heparinized saline. They were then passed through the tunnels for distal anastomosis. Proximal femoral control was obtained with application of satinsky clamp placed from a lateral direction while distal control was achieved through Bulldog and profunda clamps. Longitudinal arteriotomy was done extending till the origin of profunda femoris artery. The distal anastomosis was done with proline 5/0 using end to side technique.

Adequate distal perfusion and absence of distal embolization was ensured per operatively. Need of further procedure for distal revascularization if required was assessed at this point. After achieving hemostasis, retro peritoneum was closed over the graft. A sleeve of omentum was placed between graft and duodenum to prevent aorto-enteric fistula if required. Abdomen was

Table-I: Summary of demographics and presentation.

Variable	Groups	No. of Patients (%)
Age (years)	50-65	6 (26.1%)
	66-80	17 (73.9%)
Presentation	Rest pain	13 (56.5%)
	Toe gangrene	6 (26.1%)
	Forefoot gangrene	3 (13.0%)
	Foot gangrene	1 (4.3%)
Smoking	Smokers	18 (78.3%)
	Non-smokers	5 (21.7%)
Co-morbids	Diabetes mellitus	17 (73.9%)
	Hypertension	16 (69.6%)
	Ischemic heart disease	12 (52.2%)
	Chronic kidney disease	2 (8.7%)
	Hyperlipidemia	7 (30.4%)

Table-II: Outcomes of the study data stratification for age, gender, smoking, and co-morbids illnesses for Graft patency is given in table-III.

Outcome Variable	Outcome	No. of Patients (%)
Surgical site infection	Yes	2 (8.7%)
	No	21 (91.3%)
Amputation	Toe	6 (26.1%)
	Forefoot	3 (13.0%)
	Below knee	1 (4.3%)
Graft Patency	Yes	21 (91.3%)
	No	2 (8.7%)
Mortality	Yes	1 (4.3%)
	No	22 (95.7%)

closed with proline 1 as mass closure. Groin wounds after through lavage were closed with absorbable Vicryl sutures in multi layers. Skin was closed with proline in interrupted fashion. Dacron graft was used in all cases. Postoperatively patients were followed up at 1, 6, 12 and 24

month intervals. The patency of the graft was confirmed by hand held Doppler and ultrasound Doppler where required. Patients developing gangrene in the follow up period had amputations as required. The overall mortality rate was assessed at 2 year follow up.

All the data was collected on a pre-designed proforma. Follow up was ensured by taking contact numbers of patients. Data was entered in and analyzed by using SPSS version 23.0. Mean and standard deviation were calculated for age. Frequencies and percentages were computed for quantitative variables like gender, obesity, smoking, hyperlipidemia, co-morbid illnesses, limb involved, procedure performed and outcomes in terms of graft patency, wound infection, limb salvage and mortality. Chi-square test was applied after data stratification in terms of age, gender, smoking and co-morbid illnesses taking *p*-value of ≤0.05 as statistically significant.

RESULTS

A total of 23 patients were included in the study. The mean age of patients was 71.04 ± 7.29 years with a range of 50-80 years. Twenty one patients (91.3%) were males and only 2 patients (8.7%) were females. The most common presentation was patients with CLI having rest pain which was seen in 13 patients (56.5%). One patient, an 80 years old male presented with gangrene of whole foot. Most of the patients were smokers (78.3%). Five patients (21.7%) had a body mass index (BMI) of more than 30 Kg/m^2. Hyperlipidemia was found in 7 patients (30.4%) while the DM and IHD combination was the most common co-morbid illness found in 8 patients (34.8%).

Table-III: Graft patency in patients.

Graft Patency				
Variables		**Graft Patency**		***p*-value**
Variable	**Groups**	**Yes**	**No**	
Age (years)	50-65	5 (21.7%)	1 (4.3%)	0.420
	66-80	16 (69.6%)	1 (4.3%)	
Gender	Male	20 (87.0%)	1 (4.3%)	0.030
	Female	1(4.3%)	1 (4.3%)	
Smoking	Smokers	17 (73.9%)	1 (4.3%)	0.311
	Non-smokers	4 (17.4%)	1 (4.3%)	
Comorbids	Diabetes mellitus	16 (63.6%)	1 (4.3%)	0.420
	Hypertension	14 (60.9%)	2 (8.7%)	0.328
	Ischemic heart disease	10 (43.5%)	-	0.156
	Chronic kidney disease	-	2 (8.7%)	<0.001
	Hyperlipidemia	6 (26.1%)	1 (4.3%)	0.529

Table-IV: Outcomes of aortofemoral bypass studies.

Study	Year	Patients	Mortality	5 year Patency rate
Sharma *et al*[15]	2018	133	0.8%	77.2%
Tanaka *et al*[16]	2019	122	9%	91.2%
Chiu *et al*[17]	2010	5738	4.1%	86.3%
Igari *et al*[18]	2020	21	-	94.8%
Lee *et al*[19]	2012	72	5.6%	85.3%

The summary of distribution of patients according to age, gender, presentation, smoking, obesity, hyperlipidemias and co-morbid conditions is given in table-I.

All the patients had their Aortofemoral bypass surgeries under GA with additional femoropopliteal bypass performed in 1 patient (4.3%) having concomitant occlusion of SFA during the same setting using ipsilateral great saphenous vein graft in reverse fashion. The disease was more profound in the right lower limb in 15 patients (65.2%).

Regarding the outcomes, two patients (8.7%) developed superficial SSI who were managed by intravenous antibiotics. In our study, one patient (4.3%) who was an 80 years old male with DM, HTN and IHD died despite having undergone below knee amputation. The limb survival rate was 91.3% after two years. The outcomes of the study are shown in table-II below.

DISCUSSION

The management of aortoiliac occlusive disease is a rapidly evolving field in vascular medicine and surgery. There are multiple approaches that must be considered, ranging from medical management to endovascular and open surgical procedures[9,10]. Aortofemoral bypass is the most common open surgical method used to treat aortoiliac occlusive disease. In the early experience of aortic surgery, unilateral ABF or even Aortoiliac bypass was performed to limit the extent of the procedure. However, as more experience was gained with these operations, using the common femoral arteries as the outflow target clearly produced better long-term patency results[11].

The mean age of patients in our study was 71.04 ± 7.29 years. Ashraf *et al* in 2015 reported a mean age of 58.32 ± 6.60 years in patients presenting with aortoiliac occlusive disease[12]. A study by Sen *et al* from India reported a younger mean age of 53 years[11]. Our study comprised of 91.3% male patients. Ashraf *et al* and Sen *et al* reported the frequency of male patients to be 76% and 91% respectively[11,12]. On the contrary, Sharma *et al* reported a higher number of female patients with a frequency of 56.4%[13]. Graft survival was also found to be significantly associated with gender in our study (p=0.030).

The graft survival rate after 2 years in our study was 91.3%. Similarly Sen *et al* reported graft survival rate of 84% on 2 years follow-up. Our mortality rate of 4.3% is also comparable to the mortality rate of 3% reported by Sen *et al*[11]. Danczyk *et al* reported a higher mortality rate of 11.6% in patients undergoing aortofemoral bypass surgery at 2 years follow-up[13].

A study by Dorigoet al in 2017 compared the outcomes of aortofemoral bypass and kissing stentsin patients presenting with aortoiliac occlusive disease[14]. A total of 82 patients underwent aortofemoral bypass surgery. There were 2 cases of peri operative graft thrombosis. None of the patients required amputation. Cumulative local and systemic complications were recorded in 17 patients. There was 1 peri operative death. Mean duration of follow up in that study was 38 months. The overall graft patency rateat 6 year was 65.5%. In our study, we had one major amputation and three fore foot amputations. Graft thrombosis was seen in 1 case. However our results are based on a two year follow-up only.

The limitations of our study was the small sample size and the duration of follow up being two years. We are however following the patients and will report on their long term follow up in due course of time. But the study is still the first of its kind on the topic in Pakistan. Few of the studies showing their outcomes for aortofemoral bypass surgery published in literature are shown in table-IV. The patients operated after 2000 in study by Sharma *et al* have been quoted.

CONCLUSION

Aortofemoral bypass surgery is a safe and highly effective treatment modality for the management of aortoiliac occlusive arterial disease in experienced hands. Limb salvage can be successfully achieved in more than 91.3% cases. Although the duration of follow up in our study was relatively short but results are in line with many other contemporary studies in literature.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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