

# Angioplasty for Patients with Failing Infrainguinal Bypasses Graft, Jeddah Heart Institute Experience for Graft Salvage.

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## OBJECTIVE:

To evaluate the efficacy of duplex surveillance and concomitant peripheral angioplasty (PTA) in the treatment of failing infrainguinal bypass graft and recurrent lower limb ischemia.

## METHODS:

Between January 2005 and December 2007, 93 diabetic patients presenting with lower limb ischemia according to the TASC 2000 were admitted to our Jeddah heart institute centre (vascular unit). Among these patients, 16 of them had previously undergone bypass grafting: femoropopliteal in 12 patients and femoro-tibial in 4 patients. All these patients underwent angiography and, whenever possible, a concomitant PTA procedure. Two patients were excluded as they have complete occlusion of the grafts.

## RESULTS:

Two patients presented with stenosis at the distal anastomosis, 9 with stenosis at the proximal anastomosis, 2 patients both the distal and proximal anastomosis were stenosed and mid graft stenosis was present in one patient. The average time interval between bypass and subsequent hospital admission because of failing grafts was 6.3 +/- 4.6 months. A successful Techniqua PTA was performed in 14 patients (100%). Patients were followed up until December 31 2007, with a mean follow-up of 12.65 +/- 0.27 months. Restenosis occurred in 4 patients that needed reintervention again within one year follow up. At the end of the follow-up one year period the cumulative primary patency rate was 71.42%. Assisted primary patency rate after PTA reinterventions reached to 85.71%. Two grafts required redo surgical bypass and one patient ended with above knee amputation.

## CONCLUSIONS:

PTA is an optimal therapeutic approach for prevention and treatment of graft failure. Patency after infrainguinal bypass grafts is effectively preserved through surveillance programs identifying stenoses before complete occlusion of the bypass occurs. Delay in the treatment of grafts at risk may result in graft failure and a reduced chance of successful revascularization.

### Patients and setting:-

After the approval of the research protocol by the IRB of Dr. Erfan & Bagedo hospitals, Jeddah, KSA; all patients with intractable lower limb ischemia after infrainguinal bypass grafting, presenting to the hospital from January 2005 till end of December 2007 were prospectively entered into a database. A total number of 22 patients were included in the database. Those were screened for feasibility to include in the study using the predefined inclusion and exclusion criteria. A total of 14 patients fit for inclusion in the study were approached, to whom the study was explained and an informed consent obtained. Inclusion criteria patients with lower limb ischemia with significant stenotic segment at the infrainguinal bypass either synthetic or autogenous (vein) grafts with at least one artery run off. The end point for PTA reintervention for the grafts was peak systolic velocity (PSV) across the stenotic segment more than 150 cm/sec or systolic velocity ratio (PSV at the stenotic segment / PSV proximal) more than 2.5.

### Methods:

#### Preoperative assessment:

Patients' risk factors and co-morbidities, including sex, age, smoking history, diabetes mellitus, hypertension, dyslipidemia, and renal impairment or all were determined according to the Society of Vascular Surgery reporting standards.

Characteristic	N of patients (Percent)
Age	65 +/- 4 years
Male	12 (85.7%)
Diabetes	14 (100%)
Dyslipidemia	11 (78.57%)
CAD	12 (85.7%)
Hypertension	8 (57.00%)
Smoking history	10 (71.4%)
COPD	2 (14.28%)
Renal impairment	2 (14.28%)

Patient demographics at the time of intervention are listed in table 1.

The most frequently encountered risk factor among study patients was Diabetes mellitus which was encountered in all patients. All patients had assessed preoperatively on clinical basis and by duplex measurement of their Ankle Brachial Index (ABI). They were categorized according to revised version of the Joint Council of the Society of Vascular Surgeons and North American Chapter of the International Society of Cardio Vascular Surgeons (SVS/ISCVS) scale for chronic lower limb ischemia.

Clinical ischemic category	N of patients (Percent)
0-asymptomatic	2 (14.28%)
1-mild claudication	2 (14.28%)
2-moderate claudication	5 (35.70%)
3-severe claudication	3 (21.4%)
4-rest pain	1 (7.14%)
5-minor tissue loss	1 (7.14%)
6-major tissue loss	0 (0%)

Patient demographics at the time of intervention are listed in table 2.

Patients had moderate claudication considered the majority of our patients (35.7%). The mean pre-intervention ABI was 0.62 (SD 0.9). Table (3) shows distribution of cases according to ABI, and

Patient demographics at the time of intervention are listed in table 3.

Pretreatment ABI	N of patients (Percent)
< 0.4	1 (7.14%)
0.41-<0.5	2 (14.28%)
0.51-<0.6	3 (21.42%)
0.61-<0.7	4 (28.57%)
0.71-<0.8	4 (28.57%)

12 patients had femoro-popliteal bypass, 7 with upper popliteal synthetic (PTFE) graft and 2 with vein grafts at lower popliteal bypass. Preoperative lesion evaluation was obtained by duplex examination in all cases and direct angiography.

Distributions of lesion at the time of intervention are listed in table 4.

Location	N of patients (Percent)
Proximal anastomosis	9 (47.5%)
Distal anastomosis	2 (12.5%)
Combined distal & proximal	3 (18.7%)
Mid graft	1 (18.7%)

Nearly half of the lesions were located in the proximal anastomosis. Direct angiography was done in all cases in the same sitting for possible balloon dilatation. Distal run off of tibial and peroneal arteries were as the following.

ABI distributions are listed in table 5.

Distal run off	N of patients (Percent)
3 arteries	3 (21.4%)
2 arteries	5 (35.71%)
1 artery	6 (42.85%)

All patients with bypass grafts were picked up during follow up within one year surveillance protocol program. Clinical and duplex examinations were done as routine basis at 24 hours, three, six, and twelve months. Criteria of duplex examination that indicates severe stenosis of the graft PSV across the stenotic segment more than 150 cm/sec, or Vr > 2.5.

Follow up of stenotic lesions are summarized in table 6.

Patient	Age	Sex	Type of graft	Location	Immediate Result	Patency	ABI	Symptoms
1	54	M	PTFE	Proximal	+	12 m	0.62	MOC
2	77	F	PTFE	proximal	+	12 m	0.72	MLC
3	65	M	RSV	proximal	+	5.6 m	0.34	RP
4	66	M	PTFE	distal	+	3 m	0.45	TL
5	62	M	RSV	proximal	+	12 m	0.66	MOC
6	70	M	PTFE	distal	+	3.5 m	0.53	MOC
7	80	M	PTFE	proximal	+	12 m	0.77	AS
8	56	F	PTFE	combined	+	12 m	0.74	MLC
9	67	M	PTFE	Mid	+	12 m	0.67	MOC
10	66	M	PTFE	proximal	+	12 m	0.47	SC
11	68	M	PTFE	proximal	+	2 m	0.57	SC
12	59	M	PTFE	proximal	+	12 m	0.59	SC
13	55	M	PTFE	proximal	+	12 m	0.78	AS
14	64	M	PTFE	proximal	+	12 m	0.64	MOC

PTFE= polytetrafluoroethylene, RSV= reversed vein, ABI= ankle brachial index, AS= asymptomatic, MLC= mild claudication, MOC= moderate claudication, SC= severe claudication, RP= rest pain, TL= tissue loss.

## Endovascular Technique

All the patients were prone for angioplasty, received loading dose of clopidogrel (300mg) one hour before the procedure with exception for patients with diabetic retinopathy complicated by retinal hemorrhage. In the setting of well equipped cath lab (endovascular suite with a fixed imaging unit) with C-arm (Siemens Coroskop) and under local infiltrative anesthesia (10-20 ml of 1% Xylocaine) with controlled sedation (1-2 mg Dormicum) all interventions were performed. All lesions were tackled through retrograde cross over approach. 6f sheath is the slandered for vessel cannulation. Selective angiography was done in multiple angles. A Glow'N'Tell (Lemaitre vascular Inc., USA) tape was used in most of cases for better localization. After angiography, proper localization of the lesion and also assessment of vessel diameter pre and post lesion. A bolus dose of (100 U/Kg) of sodium heparin were given once access is gained and further increments were given hourly with objective of Activated Clotting Time (ACT) to be kept above 250 second during the whole procedure. Lesion crossing with guide wire was achieved with 0.35 guider tromeo wire and usually supported a peripheral balloon to facilitate passage of wire in occluded segment. After crossing the lesion, in both stenotic and obstructive lesions of these segments, peripheral balloon angioplasty was done, diameter of balloon is 1mm less the native vessel; balloon inflation was done at the lower luminal pressure & for 120 seconds. In the long segments, more than one inflation was needed starting distally first ranging from 2-5 times. Different balloons were used diameters of 4-6mm, depending on the diameter of native vessel; most were 5.0. High atmospheric pressure was needed reaching up to 15. All patients were received a combination of aspirin of dose 81 mg/day & clopidogrel 75mg/day for at least one year.

## Follow up

Follow-up physical examinations were routinely performed in the outpatient department at 24 hours, 3, 6 and 12 months. 16 limbs were observed for a mean of 12 months. Duplex restenosis was defined as Duplex ultrasound criteria for significant graft stenosis were peak systolic velocity greater than 150 cm/sec with loss of the reverse Doppler component and decreased systolic velocity beyond the stenosis or systolic velocity ratio Vr > 2.5.

## Results

Of 16 limbs that had entered the study, 14 reached an endpoint. Two patients were excluded because angiography showed complete occlusion of the grafts. No stent was required in all cases. Technical success was achieved in all patients (100%).

Clinical and duplex follow up of grafts after angioplasty were done at 24 hours, one, three, six, and twelve months. Any graft again that showed PSV across the stenotic segment more than 150 cm/sec or Vr > 2.5, trial of reintervention by balloon angioplasty was done.

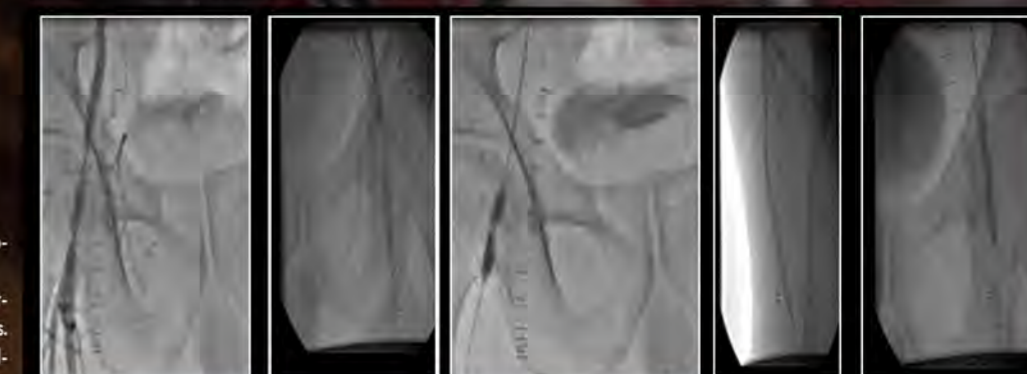
The primary patency rate during one year follow up were 100% (14/14) at 1 month, 81.1% (11/14) at 3 months, 71.4% (11/14) at 6 months and one year.

Four patients showed recurrent significant stenosis before six months at follow up. Two underwent again successful angioplasty using cutting balloon. Assisted primary patency reached to 85.7% (12/14). The other patients required redo femorodistal surgery. Failure of revascularization of one patient after redo bypass and ended by above knee amputation. No perioperative mortality at one year follow up.

Patency rates at defined follow up periods in table 7.

Follow Up	Point	Patent grafts
	Number	Percent
24 hours	14/14	100%
1 m	14/14	100%
3 m	11/14	81.1%
6 m	10/14	71.4%
12 m	10/14	71.4%

Preoperative duplex criteria for patient n 13



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