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FACTORS OF POOR PROGNOSIS OF VASCULAR SURGERY USING PROSTHETIC DEVICES

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Abstract:
Objective: Substitutes in vascular surgery are essentially represented by biological grafts (veins) and synthetic material such as polytetrafluoroethylene (PTFE). In sub-Saharan regions, studies related to bypass grafting in a surgical procedure are rare. The goal of this study is to report our experience in the use of PTFE and to identify poor prognostic factors following peripheral arterial grafting.
Patients and methods: Between January 2007 and December 2014, 78 surgical procedures were performed in patient with variable vascular disease using bypass graft at the Heart Institute of Abidjan. This retrospective study concerned 56 male and 22 female patients whom mean age was 38. These patients had various vascular diseases: Chronic Peripheral Artery Disease (n=42), Aneurysm and pseudoaneurysm (n=17), Tetralogy of Fallot irregular (n=10), an arterial injury (n=8) and a repeated syncope (n=1). Various surgical procedures depending on the pathology were made. They were dominated by the femoro-popliteal bypass above the knee (n=23). All patients were put on anticoagulant for 48 hours relayed by an antiplatelet or antivitamin K.
Results: No patient died in our study. Morbidity was represented by an early prosthetic thrombosis occurred at 1day after surgery on 13 patients. Primary patency was 83%. Late thrombosis occurred after 12 months on 5 patients. The poor prognostic factors were:
Keywords: prosthesis - vascular surgery – prognosis.

Introduction

Substitutes invascular surgery are essentially represented by biological grafts (veins) and tubular prostheses (PTFE: polytetrafluoroethylene). Several studies and international consensus showed that the vein has better long-term patency than prostheses especially under inguinal position[1]. Prosthetic materials give equivalent results above the knee, below the knee while in the medium-term results of the PTFE revascularization are still poor with a leakage rateless than 50% at 2 years[2,3]. In Africa, in the tropics, studies related to the

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vascular prostheses are rare. The purpose of this study is to report our experience in the use of vascular prostheses and to identify poor prognostic factors.

Patients and methods: From January 2007 to December 2014, 78 consecutive patients who received a prosthetic vascular bypass in the Heart Institute of Abidjan were collected retrospectively. There were 56 male patients and 22 female, whom mean age was 38. These patients had various vascular diseases: chronic peripheral artery disease (n=42), aneurysm and pseudoaneurysm (n=17), tetralogy of Fallot irregular (n=10), an arterial injury (n=8) and a repeated syncope due to thrombosis of supra- aortic vessels trunks (n=1). Patients were evaluated preoperatively by vascular Echography-Doppler and/ or the Cardio-thoracic Angiography (CTA). The surgical revascularization indications in terms of under lying lesions were listed in Table1.

Table 1: Indications and revascularization underlying vascular lesions

Indications	Underlying lesions
Chronicperipheral artery disease (42)	
Stage IIIarteritis	*Iliac arteryocclusion(3)*
	Superficial femoral arteryOcclusion(12)
	Superficial femoral artery and popliteal Occlusion (8)
	extra-articular poplitealartery Occlusion (10)
	Popliteal artery sub-articular occlusion (9)
Aneurysmsand falseaneurysms(17)	
AAA > 50 mm	*Aneurysm of the abdominal aortaunder kidney(5)*
AA iliac> 30mm	*Aneurysm of the common iliacartery (1)*
AA femoral > 25mm	*Aneurysm of the common femoral artery(2)*
AA Popliteal > 20mm	*Poplitealarteryaneurysm(3)*
venousaneurysm > 15mm	*Aneurismal dilatationofthe cephalic vein(FAV) (2)*
Falsefemoral arteryaneurysm	*Iatrogenicfalse aneurysmcommon femoral artery(4)*
Tetralogy ofFallotin irregularanatomic forms(10)	
Anoxicunease	*Stenosis of the left pulmonaryartery (8)*
	Stenosisof the right pulmonary artery(2)
Arterialtrauma (8)	
Ischemiapost-traumatic lower limbfirearm	*Complete section+defect inthe superficial femoral artery(8)*
Thrombosis of thesupra-aortic trunks (1)	
Thrombosis of thesupra-aortic trunks	*thrombosisofbrachiocephalic artery+thrombosis of leftcarotid+stenosis of theleft subclavian*

AAA : Aneurysm of Abdominal Aorta; AA : Arteries Aneurysm;mm : millimeter; AVF : Arteriovenous Fistula

Lesions were dominated by the peripheral ischemia in stage III of Leriche and Fontaine classification (n =42), the anoxicun ease with the Tetralogy of Fallot in irregular anatomic forms (n =10) and arterial injury by fire arm (n = 8). All patients under general anesthesia. Surgical procedures were based on lesions presented by patients. Asynthetic prosthetic vascular bypass was performed in all patients. Surgical procedures were summarized in Table 2based on the vascular lesion presented by the patient.

Table 2: Surgical Gestures based on vascular lesions

vascular lesions	Surgical Gestures
Peripheral Artery Disease(42)	
Iliacartery Occlusion	*aorto-femoral bypass(6)*
Superficial femoral arteryOcclusion	*Femoro-popliteal bypass articular supplement (17)*
Superficial femoral artery and popliteal Occlusion	*Femoro-popliteal bypass articular supplement (6)*
	Femoro-poplitealbypassinarticular(2)
ArteryOcclusionextra-articular	*Femoro-popliteal bypass inarticular(7)*
Poplitealarteryin-articular Occlusion	*Bridgingfemoral-tibial-peroneal trunk(2)*
	Bridgingfemoral-tibial-peroneal trunk(2)
Aneurysm and false aneurysm(17)	
Abdominal aortic aneurysmsub-renal	*Flatteningbifemoralcoronarygraft (5)*
Aneurysm of thecommon iliacartery	*Flatteningcoronarybifemoralbypass(1)*
Aneurysm of thecommon femoral artery	*Flatteningiliofemoralsurgery bypass (2)*
Poplitealarterytrans-articularaneurysm	*Flattening-popliteal bypass infemoralarticularsurgery (3)*
Aneurysmal dilatationofthe cephalic vein(in AVF)	*Cerebrospinalcephalicresectionbypass surgery (2)*
Iatrogenicfalse aneurysm ofcommon femoral artery	*IliofemoralbypassResection (4)*
Tetralogy of Fallotirregular (10)	
Stenosis of theleft pulmonaryartery	*Shuntsubclavian artery - left pulmonaryartery(8)*
Stenosisofthe right pulmonary artery	*Shunt BCAT-right pulmonaryartery (2)*
Arterialtrauma (8)	
Complete section+defect inthe superficial femoral artery	*femoro-femoral bypass (8)*
Thrombosis of supraaortic trunks(1)	
thrombosisofbrachiocephalic arterythrombosis+left carotid+stenosis of theleft subclavian	*Aorto-carotid bypass Prostheticbypass-left subclavian*

AVF: Arteriovenous Fistula. BCAT: Brachiocephalic Artery Trunk

Surgery management was dominated by the femoro-popliteal articular bypass (n = 23), the femoro-popliteal bypass injoint (n = 16) (**Figure**), and systemico-pulmonary shunt by insertion of a Goretex tube between left pulmonary artery and left subclavian (n =8).

Figure: Femoro-popliteal Bypass in articular

Intraoperatively all patients were anticoagulated with heparin, continued 48 hours postoperatively and relayed by acetyl salicylic acid or antivitamin Kin case of distal bypass. Antibiotic therapy was administered until healing of surgical incisions. The permeability of bridging was confirmed by the presence of a down stream pulse and/ or a continuous sub-clavicular breath. A marked change in the vascular assessment led to the realization of other vascular explorations and if needed, reoperation. The patients were regularly monitored with a decline of one year. In order to determine the factors of poor prognosis prostheses, we define and compare two groups of patients. The first group (G1) includes patients who have their prosthesis permeable at the end of the study and the second group (G2) includes those thrombosed their prosthesis and required surgical reintervention. The statistical study was performed by the Stata version 9.0 software. Quantitative variables are expressed as means ± standard deviation and categorical variables as percentages. Comparison between both groups was performed by Student t-test and the Chi2 Test. A value of $p<0.05$ was considered significant.

Results

No patient died in our series. The mean duration of post operative hospital stay was 15.5 days

(range8 to 22days). The morbidity was marked by an early prosthetic thrombosis occurred at 1 day post operatively in 13 patients including 10 by pass in joint and 3 systemico-pulmonary shunts. All were re-operated and we performed surgical thrombectomy. Primary patency was 83% in our series. A late thrombosis occurred at 12 months in 5 patients among which 3 popliteal bypass under articular and 2 extra articular surgery. They had reached a stage beyond revascularization, and thus were amputated. Permeability at one year was78%. A patient operated at the 10^{th} hour of a complete section of the left common femoral artery gun had presented a J1 compartment syndrome requiring fasciotomy of the anterior internal and external compartment of the leg. A postoperative J2 had presented acute renal failure requiring dialysis sessions 6 which resulted in a total recovery of renal function. During routine follow-up, 45 postoperative days, a patient with inguinal infection without extension on the prosthesis had been treated locally with success. In our series, it was not noted for periprosthetic hematoma, seroma, aneurysm and prosthetic infection tracking year. At follow up, the poor prognostic factors identified on Table 3 (in our series) were: ineffective coagulation in immediate post-operative (21.7% vs 78.2% p = 0.01) and the femoro-popliteal bypass in articular (18.7% vs 81.2% p = 0.03).

Table 3: Poor prognostic factors of vascular prostheses

PARAMETERS	**G1 Succeed**			**G2 Succeed**			**P**
	Mean G1	**(n= 60)**	%	**(n=18)**	**%**	**Mean G2**	
Pt <1.5	-	5	21,74	18	78,28	**-**	**0,0183**
Prosthesisin articular	-	3	18,75	13	81,25	**-**	**0,0340**
Tetralogy of Fallot	-	7	70	3	30	-	0,2402
Anemia (Hg < 10g/dl)	-	5	41,67	7	58,33	-	0,5692
Age (old)	38 ± 13	-	-	-	-	36 ± 17	0,5964

Pt = Prothrombin time; Hg= hemoglobin; dl = deciliter; G1 = group 1; G2 = group 2.

Discussion

In general, recent developments in the surgical treatment of occlusive disease led to interesting improvements on the approach, the permeation rate, and the morbidity and mortality per-operative[4,5]. Our series reported 83% primary patency. Our results are comparable to those of Walter[6] and Nicholas[7] which respectively relates to a primary patency80.3and 80%, and rival those of Roberto[4] who reports a 90.3% primary patency. In

our study, in effective anticoagulation in immediate postoperative period (p =0.01) represents a poor prognostic factors. Indeed, anticoagulation with heparin and immediate post operative reduce the thrombogenicity of the prosthesis. According to some authors[8,9,10], heparin not only provided a specific antithrombotic effect due to its interaction with the thrombin-antithrombin system, but it also has intrinsic anti-inflammatory properties, and can potentially lead to inhibition of proliferation and migration of smooth muscle cells which are the primary pathophysiological mechanism of neointimal hyperplasia. Walpoth[11] reports that in recent years, several modified vascular prostheses have been developed and studied with particular chemical, physical and mechanical properties to improve the intrinsic thrombo-resistance. Particularly it has been proposed the use of prostheses coated with heparin as an alternative to the autologousve into reduce the primary thrombotic risk and late development of vessel intra-mural hyperplasia due to the anti-inflammatory characteristics of this antithrombotic drug. The 2ndfactor of poor prognosis in our study is under articular prosthetic bypass (p =0.03). It is reported by several studies which show that below the knee, the medium-term results of the PTFE revascularization are still poor with a leakage rateless than 50% at 2 years (2.3). Our series reports 77% permeability to a post-operative year. According to Veith[12] before the situations of low flow and high resistances no synthetic prosthesis has shown sufficient resistance to thrombosis. Similarly, vessel intra-mural anastomotic hyperplasia would also be the cause of thrombosis. For Parson[13] fully prosthetic grafts are useful to save short-term members when the amputation is the only alternative. Given these unsatisfactory results in joint prostheses when the autogenous venous capital is limited. He recommends the modified configuration anastomos is between the prosthesis and the vein to achieve a composite sequential bypass. It represents an alternative to the conventional procedure and may help to preserve the permeability of the venous graft in case of thrombosis of the prosthesis.

Conclusion

The factors of poor prognosis of vascular prostheses in our study are represented by the inefficiency of the anticoagulation in immediate postoperative cure and in articular prostheses. Effective anticoagulation using hepar in coated prostheses and composite sequential coupling technique are crucial in maintaining a long-term patency of the prosthesis.

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