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PERIPHERAL ARTERIAL ANEURYSMS: DIFFERENT AETIOLOGY AND MANAGMENT; EXTENDED STUDY

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Background: ***Peripheral arterial aneurysms pose a serious threat to the affected limb. Debate continues about the best form of treatment especially for asymptomatic lesions.***
Patients and methods: ***66 patients with peripheral arterial aneurysms presented to Mansoura vascular surgery unit from July 1998 to April 2002 . All patients were admited and subjected to clinical examination confirmed by investigations.***
Results: ***66 patients (45 males& 21 females) presented with (18 femoral aneurysms), (15 popliteal aneurysms), (5 subclavian aneurysms), (2 ulnar artery aneurysms), (2 ATA aneurysms), (2 axillary and brachial artery aneurysms),and 22 anastomotic aneurysms. The commonest type of aneurysms were anastomotic, then femoral and popliteal aneurysms. Most cases were presented with complications (70%) like acute and chronic ischaemia, bleeding, D.V.T.,or neurological manifestation while, early non complicated cases represented (30%). Aneurysmectomy with end to end anastomosis were done in 6 cases. Closure of the defect in the areterial wall was done in 4 cases of pseudoarterial aneurysms. Ligation of aneurysms with arterial by pass using autogenous vein graft were done in 21 cases, ligation of aneurysms with arterial by pass using synthetic graft in 18 cases. Ligation of arterial ends after aneurysmectomy without reconstruction of arterial continuty were done in 17 cases.***
No operative mortality was found but one case died due to myocardial infarction in postoperative period. 4 cases did above knee amputation due to late presentation with thrombosed aneurysms with limb salvage rate 94%.
Conclusion: ***Prophylactic surgical treatment of asymptomatic peripheral arterial aneurysms may avoid complications caused by thrombosis and embolisation of runoff, and so, elective surgical repair of peripheral aneurysms is safe, effective and durable technique without significant postoperative complications.***

Keywords: Peripheral arterial aneurysms , aetiology, management

INTRODUCTION

Peripheral arterial aneurysms are distinctly less common than aortic aneurysms but nevertheless can cause significant morbidity. Although occasionally these lesions may lead to death, the most common serious complications is usually limb loss or dysfunction [1].

Indepentent of aetiology, the most important factor in the production of aneurysm is the hydrodynamic force exerted on the vessel wall, turbulent flow beyond a relative stenosis and alterations in the arterial wall due to vibration and turbulence proximal to major branches [2].

All peripheral aneurysms can be considered rare. In descending order, the relative frequency of these aneurysms is propably popliteal, femoral, subclavian, axillary and carotid. More reports on distal aneurysms involving the brachial, radial, ulnar, profunda femoris and tibial peroneal arteries are limited to small series or case reports [3,4].

Femoral and popliteal artery aneurysms constitute the great majority of peripheral aneurysms [5]. Femoral and popliteal artery aneurysms seem to be increasing in frequency. They are important clinical entities because of their potential for limb-threatening complications [6].

Femoral aneurysms usually involve common femoral artery and may be classified as type I , those limited to common femoral artery and type II, those involving the orifice of the profundafemoris artery. There are two distinct kinds of popliteal aneurysms: Type I; high, large, elongated and often multilobular, often bilateral and common in elderly. Type II; smaller, unilateral, more rounded, clinically hidden behind the knee and typically seen in active, younger men [5].

Subclavian artery aneurysms arise from degenerative disease, thoracic outlet obstruction, or trauma. Aneurysms involving the proximal and mid-subclavian artery are usually non-specific or atherosclerosis-associated [7].

In our locality, we recorded many cases with peripheral aneurysms presented with diagnostic criteria of Behcet's disease like oral ulceration plus any two of : genital ulceration, eye lesion, skin lesion or deep venous thrombosis [8].

Behcet's disease is multisystemic vasculitis of unknown origin affecting all size of arteries and veins, arterial aneurysms in Behcet's disease were more frequent and usually has dramatic course and prognosis [9].Aneurysm formation in Behcet's disease is explained pathologically by rupture of internal and external laminae with intimal thickening, degeneration of media, and vasculitis of the vasa vasorum, with infilteration of perivascular lymphocytes [10].

Elective repair of the peripheral arterial aneurysms has been widely reported to be associated with high limb salvage rate [11].

Althought many studies on aetiology and outcome of peripheral arterial aneurysms have been reported by individuals and high-volume institutions, the results may not accurately reflect typical results acheived at most commonly hospitals [12].

Aim of the work :

This current study aiming at determining the magnitude of the problem and evaluation of the different lines of management in patients represented with peripheral aneurysms to prevent the complications and provide a good outcome with least morbidity and mortality.

PATIENTS AND METHODS

Between July 1998 and April 2002, 66 patients with peripheral arterial aneurysms were presented to vascular surgery unit at Mansoura Univeristy hospitals and Emergncy hospital. All patients were admitted and subjected to through history taking with stress on age, sex, occupation special habits, risk factors and predisposing conditions, recent history of ischaemia, trauma or vascular operations, past history of similar conditions.

Patients with peripheral aneurysms were presented with asymptomatic mass discovered accidently in highly suspicious patient, pulsatile mass discovered on physical examination, or may be present with complications as local pain, nerve compression, venous compression or limb ischaemia (Figs. 1,2).

The clinical diagnosis was confirmed with duplex scaning (Fig.3). Screening was carried out for contralateral limb, abdominal aortic aneurysms and other peripheral aneurysms. Patients were also assessed for the major recognised risk factors for arterial diseases.

Preoperative angiography to assess run-off was available in 30 cases (Fig.4). Perioperative angiography using C-arm was done in some cases to assess patency before arterial reconstruction CT angiography and MR angiography were done in some cases to avoid the complication of invasive technique of angiography (Figs. 5,6). Vein mapping using duplex scan for possible use the great or short saphenous veins in arterial reconstruction after aneurysm resection.

The technique of peripheral aneurysm repair included exploration and control of both ends of aneurysm (Fig.7) then excision of aneurysmal sac, exclusion by pass or aneurysmorraphy after evacuation of the aneurysmal sac contents, arterial thrombectomy to confirm the patency of the arterial lumen proximal and distal to aneurysm (Fig.8) then, restoration of the arterial blood flow after aneurysm resection or exclusion bypass using autogenous vein graft (insitu or reversed by careful harvest and preparation) (Fig.9), or synthetic conduit (polytetraflourethylene = PTFE), (Fig.10).

Occaionally, aneurysmectomy with ligation of the proximal and distal ends of the artery without restoration of the arterial blood flow were done when the aneurysm affecting an artery with good reputation especially in the presence of infected aneurysms as anastomotic aneurysm of the A-V fistula..

Postoperative care :

Heparin was continued throughout the operative (during arterial clamping) and postoperative periods and overlapping oral anticoagulation with warfarine group in few cases with hyper coagulability, otherwise antiplatelets drug therapy was enough.

Follow-up period :

Extented for 3 months after the last case with perfect

assessment of arterial blood flow of the affected limb using (hand-held doppler), duplex scanning and sometimes angiography when indicated.

Statisticl analysis :

Statistical analysis was done using SPSS, chi-squre test was used as a test of significance for qualitative data. The quantitative data were presented in the form of mean, standered deviation , median, and range.

RESULTS

66 patients (45 males& 21 females) presented with (18 femoral aneurysms), (15 popliteal aneurysms), (5 subclavian aneurysms), (2 ulnar artery aneurysms), (2 anterior tibial artery aneurysms), (2 axillary and brachial artery aneurysms),and 22 anastomotic aneurysms. The commonest type of aneurysms were anastomotic, then femoral and popliteal aneurysms (Table 1).

The age ranged between 18-72 years with mean age 45.5 years.

The risk factors for aneurysm development were shown in (Table 2).

Most cases were presented with complications (70%) like acute and chronic ischaemia, bleeding, D.V.T., or neurological manifestations while early non complicated cases represented (30%) (Table 3&4).

Management of the peripheral aneurysms were done to all patients with different techniques and approaches ; 6 cases did aneurysmectomy with end to end anastomosis, closure of the defect in the arterial wall was done in 4 cases of pseudoarterial aneurysms, ligation of aneurysms with arterial by pass using autogenous vein graft (reversed or insitu) was done in 21 cases, ligation of aneurysms with arterial by pass using synthetic graft were done in 18 cases, and ligation of arterial ends after aneurysmectomy without reconstruction of arterial continuity was done in 17 cases (Table 5).

There were no intra-operative death but one case died due to myocardial infarction in early post-operative period.

There were 6 cases developed haematoma and managed by surgical evacuation with suction drainage.

There were 3 above knee amputation due to late presentation of throbosed popliteal artery aneurysm. Another case did above knee amputation due to late presentation with thrombosed femoral artery aneurysm (limb salvage rate 94%).

Wound sepsis and gapping occured in 8 cases which were treated conservatively by daily dressing, local irrigation by antibiotics and systemic antibiotics after culture and sensitivity, then wound closure by secondary sutures.

Popliteal vein injury occured in 2 cases during dissection and repair of popliteal aneurysm.

Post-operative neuralgia (tingling and numbness) occured in one case of subclavian artery aneurysm which was treated conservatively.

Table (1): ***Anatomical distribution of the studied groups***

Groups	*Number*	*%*
Femoral AA (FAA)	18	27%
Popliteal AA (PAA)	15	23%
Subclavian AA (Sub AA)	5	7.5%
Axillary and Brachial AA	2	3%
Ulnar AA (UAA)	2	3%
Anterior Tibial AA (ATA)	2	3%
Anastomotic aneurysm	22	33.5%
Total	66	100%

Table (2): *Risk factors according to studied groups*

Risk Factors / *Group*	*D.M.*	*Hypertension and atherosclerosis*	*Smoking*	*Behcet's disease*	*Mechanical factors*
FAA	6	9	5	4	4
PAA	5	10	5	6	1
Subclavian AA	1	2	1	0	2
Axillary and Brachial AA	0	2	2	1	0
UAA	1	3	0	0	0
ATA	1	2	1	1	0
Anastomotic AA	4	10	8	0	22
Total	18	38	22	12	29

N.B. Multiple risk factors may be present in the same patient.

Table (3): *Early (uncomplicated) and Late presentation (complicated) of the studied groups*

Group	*Early (uncomplicated)*		*Late (complicated)*	
	Number	*%*	*Number*	*%*
Femoral AA (FAA)	7	39%	11	61%
Popliteal AA (PAA)	4	27%	11	73%
Subclavian AA (Sub AA)	2	40%	3	60%
Axillary and Brachial AA	1	50%	1	50%
Ulnar AA (UAA)	1	50%	1	50%
Anterior Tibial AA (ATA)	1	50%	1	50%
Anastomotic aneurysm	5	23%	17	77%
Total	21	30%	45	70%

Table (4): *Clinical presentation according to studied groups*

Group	*Silent*	*Swelling*	*DVT*	*Neurolog. Manifest.*	*Bleeding*	*Acute Ischaemia*	*Chronic Ischaemia*
FAA	2	5	1	0	1	5	4
PAA	1	3	2	0	0	5	4
Sub AA Brach.&Ax.	0	2	0	2	1	0	0
AA	0	1	0	0	0	0	1
UAA	0	1	0	0	1	0	0
ATA	1	0	0	0	0	1	0
Anast AA	0	5	0	0	13	0	4
Total	4	17	3	2	16	11	13

Table (5): *Management according to studied cases*

Type	End to end		Closure of defect		Synth. Graft		Saphen. Graft		Ligation	
	No	%	No	%	No	%	No	%	No	%
FAA	0	0	4	22%	6	34%	8	44%	0	0
PAA	0	0	0	0	8	54%	7	46%	0	0
Sub AA Brach.&Ax.	2	40%	0	0	0	0	3	60%	0	0
AA	1	50%	0	0	0	0	1	50%	0	0
UAA	1	50%	0	0	0	0	0	0	1	50%
ATA	1	50%	0	0	0	0	0	0	1	50%
Anast AA	1	5%	0	0	4	20%	2	10%	15	65%
Total	6	9%	4	6%	18	27%	21	32%	17	26%

Fig (1): Clinical presentation :

(A) complicated popliteal aneurysm *(B) complicated subclavian aneurysm.*

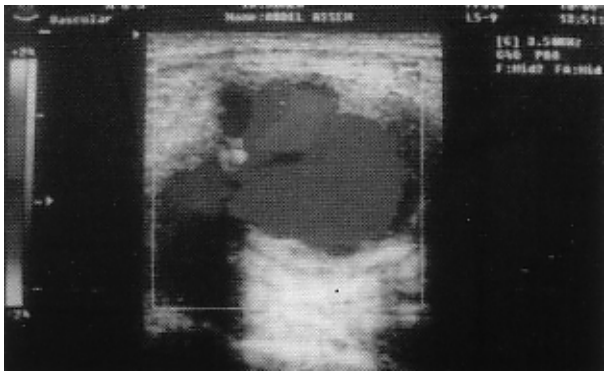

Fig (2) : Duplex scaning showing popliteal artery aneurysm.

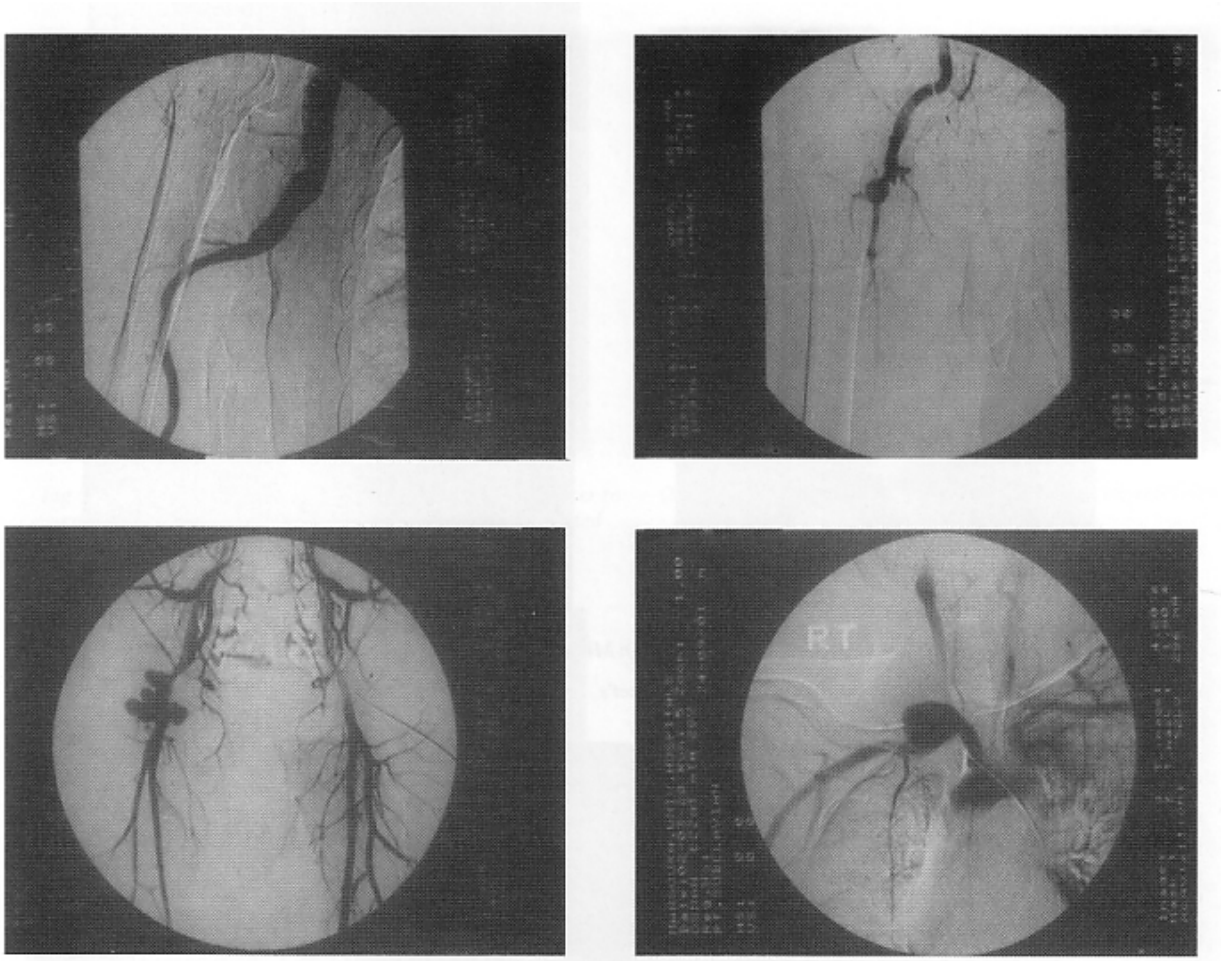

Fig (3) : Preoperative angiography showed :

(A)Type I FAA affecting common femoral artery
(B)Type II FAA affecting profunda femoris artery
(C) Femoral artery aneurysm in Behcet's disease
(D) Subclavian artery aneurysm.

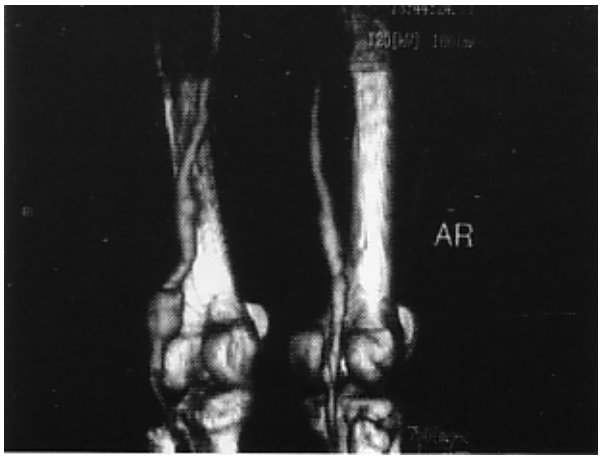

Fig (4) : CT angiography showing bilateral popliteal A.A.

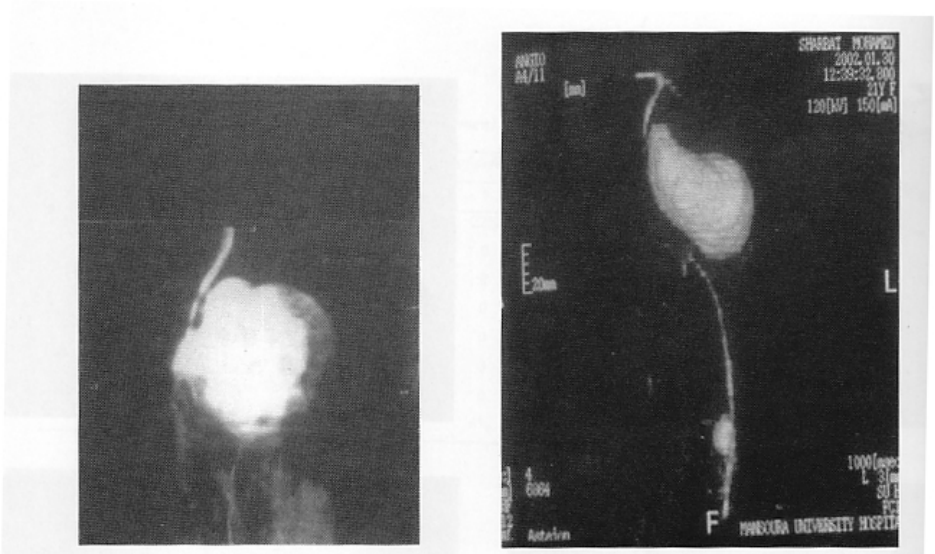

Fig (5): MRA showed

(A) Pseudo aneurysm of femoral A. In patient with Behcet's disease

(B) Axillary and Brachial aneurysms

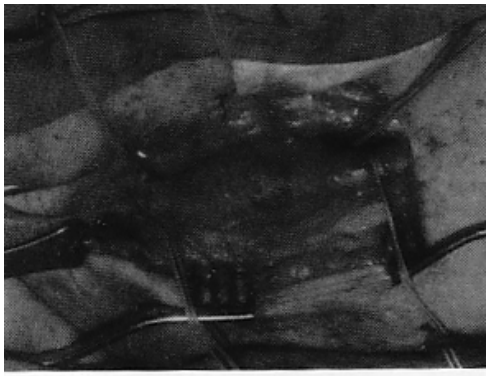

Fig (6) : Exposure and control aneurysm.

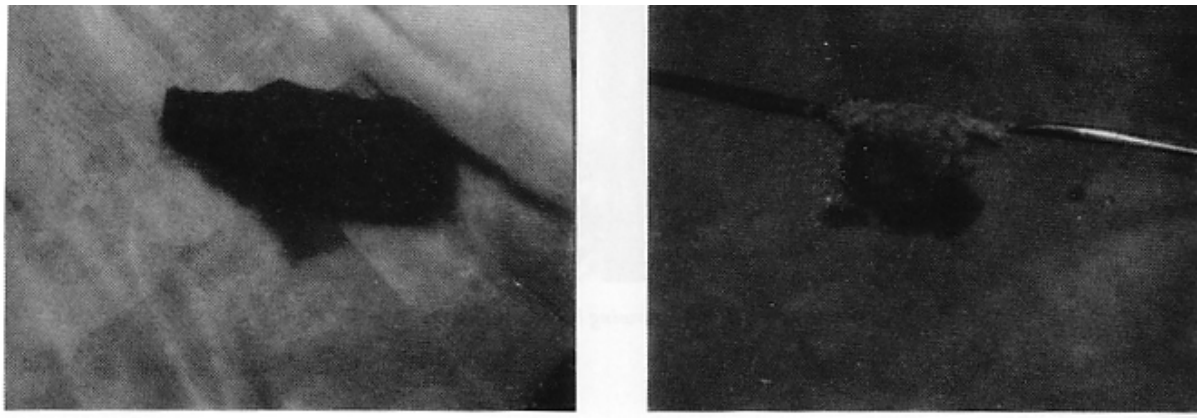

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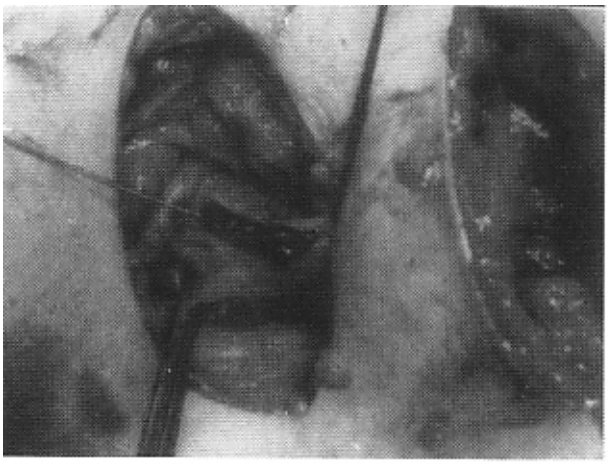
Fig (7): (A) Atherosclerotic aneurysm

(B) Infected aneurysm in patient with Behcet's disease.



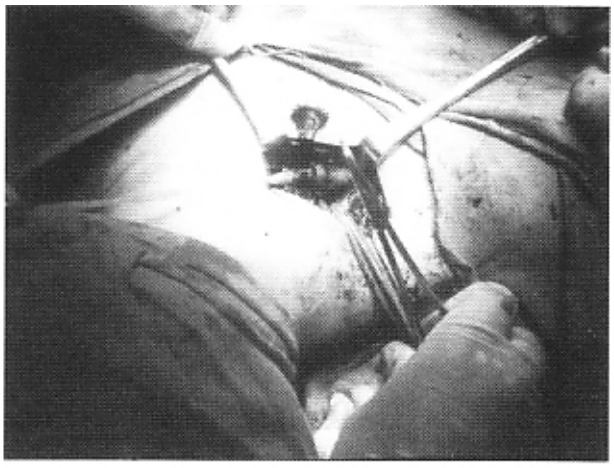
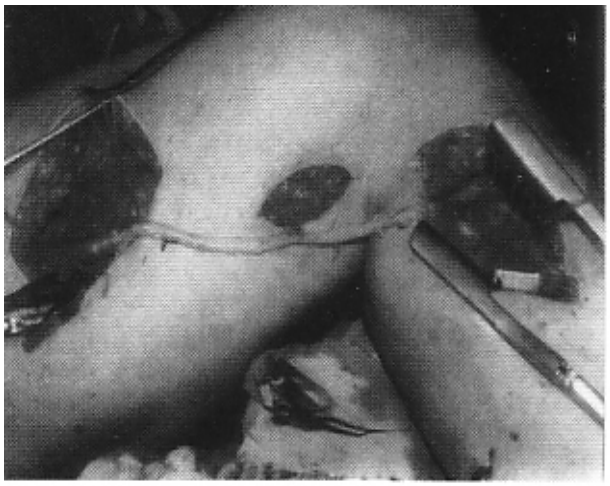


Fig (8): (A) Arterial thrombectomy using fogartey catheter to confirm patency of arterial lumen in case of complicated subclavian artery aneurysm

(B) Subclavian artery aneurysm with cervical rib resection



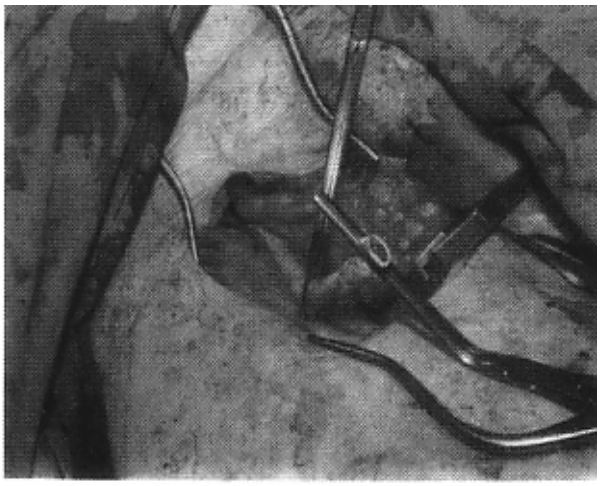


Fig (9): Exclusion bypass using autogenous vein graft

Fig (10) : Exclusion bypass using PTFE synthetic conduit

DISCUSSION

Location of aneurysm, urgency of repair, sex, and age are important factors related to patient treatment and outcome [13].

The high proportion of males in relation to femals in our series about 70% is in keeping with that in all other series, reporting a range from 80 to 90 % in recent meta analysis [12]. Duffy et. al., [11] reported 70-80 % in his series.

Many previous authors had reported a mean age in the seventh decade [14, 15]. The younger age group (mean 45.5) in our series may be attributed to the different types of aneurysms and different aetiology that affected younger age (traumatic and anastomotic).

Rates of tobacco use in patients with non-traumatic aneurysms have been reported between 60-80% [16] and this figure is somewhat higher than in our series (45%) and this is due to the different aetiology of aneurysms in this study.

Asymptomatic aneurysms are common, account for 43% [11] and 37.5% of other reported series [17] .

In our series, it seems with lower rates (30%) and it may be due to late presentations of our patients with complicated aneurysms.

Late presentations with complications had been

reported in many series. Hands and Collin [18] reported significant complications in 3 of 11 surgically repaired aneurysms. Ramesh [19] reported a significant higher risk of thrombosis in aneurysms larger than 3 cm with associated distortion on angiography. Dawson [15] reported an increased risk of complications with increased aneurysm size. It is widely reported that higher rates of ischaemic complications in untreated asymptomatic aneurysms [20,12].

Sie et. al. [17] clearly illustrated various clinical presentations with initial diagnosis varying from deep venous thrombosis to acute arterial occlusion and compression neuropathy. In our study the high figures of patients presented with complicated aneurysms (70%) may be due to late presentation of our patients, misdiagnosis and management and reluctance in referring the patients to specialised centers to do good evaluation and proper management.

Levi and Schroeder [21] in series of 17 patients underwent arterial reconstruction for true femoral aneurysms reported the diagnosis was clinical in 14 cases, by ultrasonography in 8 cases, by angiography in 4 cases, by CT scanning in 4 cases and at operation in 4 cases. In our study, clinical assessment highly suspect the diagnosis in 55 cases confirmed by duplex scanning (12 cases), MRA (10 cases) and angiography (20 cases).

Early operative intervention remains the mainstay in the successful management of popliteal aneurysms [17]. In general the policy regarding popliteal aneurysms is to operate upon them wheather they are symptomatic or not [15].

In our series, all patients with different types of aneurysms and different presentations were subjected to surgery. Duffy et al [11] reported that exclusion and vein bypass using medial incision was the operation of choice in treatment of popliteal aneurysms. Autogenous saphenous vein was available in 29 cases and in the remaining cases synthetic conduit (PTFE) was employed . Cappendijk [2] chose to treat their patients with a vein interposition graft, which they think that was the treatment of choice.

Anastomotic aneurysms resulted from a variety of processes and occur most commonly after prosthetic bybass or arterial puncture. Anastomotic aneurysms developed in about 5% to 8% of arteriovenous fistulae created as haemodialysis acess in chronic renal failure patients [22].

Diagnosis and treatment of anastomotic aneurysms vary according to aetiology and symptoms. In the absence of infection interposition grafting with prosthetic material is widely accepted as the best form of treatment. When infection is obvious or suspected, autogenous vein remains the optimal conduit [23]. In the presence of good backbleeding, limb preservation rates had been found to be no better after attempted revascularisation than when ligation alone was used [24].

In our series we did ligation of both ends of aneurysm (17 cases) due to the presence of severe infection or haemorrhage with adequate backbleeding.

In our study, 12 cases of Behcet's disease were presented with aneurysms, Ozeren [9] recommended surgical intervention only in patients with growing aneurysm, acute rupture or severe ischaemia, in cases of Behcet's disease as those patients progress with remissions and attacks which directly affect the prognosis that correlate with our findings. Exclusion bypass of the aneurysm using autogenous conduit of long saphenous vein was done in 6 cases of popliteal artery aneurysms. Excision of aneurysm with arterial reconstruction using prosthetic graft was done in 5 cases of femoral artery aneurysms and axillary artery aneurysms. Excision of aneurismal sac with ligation of both arterial ends in case of anterior tibial artery aneurysm (ATA).

No significant post-operative complications were reported in our study except for small haematoma evacuated surgically (in 6 cases), wound sepsis (in 8 cases) treated conservatively, poplital vein injury (2 cases), post-operative neuralgia (one case), 4 cases did above knee amputation due to late presentation with thrombosed aneurysm. These results are accepted by many authors that reported higher incidence of post-operative complications [21].

CONCLUSION

A high index of suspicion with early referral to specialised center of vascular surgery for assessment will undoubtedly save many limbs.

Prophylactic surgical treatment of asymptomatic peripheral aneurysms may avoid complications caused by thrombosis and embolisation of runoff, and so, elective surgical repair of peripheral aneurysms is a safe, effective and durable technique without significant post-operative complications.

In our experience, ligation of infected peripheral aneurysms with adequate collaterals is effective, safe, simple, and is the most appropriate method of dealing with these challenging cases.

In Behcet's disease we found that peripheral aneurysms were more frequent than occlusion, and arterial punctures have to be avoided, and non-invasive technique as duplex sonography, CT or MRI should be performed instead.

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