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SURGICAL OPTIONS IN THE TREATMENT OF PERIPHERAL PSEUDO ANEURYSM

Surgery

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ABSTRACT

Objective: To study the various surgical options in the treatment of peripheral pseudo aneurysm.

Methods: It's a retrospective study of the patients who underwent different modality of surgical treatment for pseudo aneurysm of peripheral arteries due to various etiology ,during the period 2015 to till date at Government Kilpauk Medical College Hospital,Chennai,India.Total of 16 patients ,Male 11(68.75 %) and Female 5 (31.25%) were enrolled in this study.Visceral pseudoaneurysm and Hemodialysis (AV Fistula) access pseudoaneurysm are excluded .The age group were between 17 years to 56 years and all underwent prompt surgical treatment.

Results: A total of 16 pseudoaneurysm patients involving various arterial bed , namely Common carotid 1(one), Infrarenal aorta 1(one), External iliac artery 1(one),Superficial femoral artery 4(four),Profunda femoris 2(two), Popliteal artery 1(one), Anterior tibial artery 2(two),Tibioperoneal trunk1(one) Brachial artery 1(one), Radial artery 1(one) and Ulnar artery 1(one), were treated. The surgical options are, resection and reconstruction 5 patients (31.25%), resection and primary repair 10 patients (62.5%), and ligation with resection 1patient (6.25%).Postoperatively there was no complications or mortality.

Conclusion: Pseudoaneurysm is a both life threatening and limb threatening vascular problem and it has to diagnosed without time delay and prompt intervention is essential to prevent subsequent complications.

KEYWORDS

Pseudoaneurysm , Reconstruction.

INTRODUCTION

Pseudoaneurysm is defined as pulsating,encapsulated hematoma in communication with the lumen of breached artery.The external wall of aneurismal sac, consists of outer arterial layer,perivascular tissues,blood clot or layer of reactive fibrosis.Pseudoaneurysm can develop as a result of trauma,infection,inflammation,tumor erosion, anastomotic dehiscence at prior surgical anastomosis or following percutaneous endovascular interventional procedures. Pseudoaneurysm is mostly saccular and can be life threatening due to rupture and bleed or limb threatening due to thrombosis and distal embolisation.Carotid pseudoaneurysm can lead to stroke due to mural thrombosis and cerebral embolisation. It commonly present as pulsatile mass with localized tenderness. Diagnosis by color doppler scanning has sensitivity and specificity of 95%.This study highlights the pseudoaneurysm of various peripheral arteries we have treated by different vascular surgical techniques .

MATERIALS AND METHODS

- Study Design :Retrospective Study
- Study Centre : Govt. Kilpauk Medical College Hospital, Chennai, India.
- Study Duration : 2015 to Till date
- Study Procedure: 16(sixteen) patients , Male 11 and Female 5 patients,who underwent treatment for peripheral artery pseudoaneurysm were enrolled and the clinical presentation and surgical methods adopted to treat them were analysed.

RESULTS

Total 16(sixteen) cases of peripheral arterial pseudoaneurysm due to following etiology

TABLE 1 Traumatic pseudoaneurysm 2(12.5%)

Pseudoaneurysm	Etiology	Number	Surgical options
Common carotid	Traumatic(penetrating injury)	1	Resection and interposition grafting
Radial artery	Trauma(penetrating injury)	1	Resection and repair

TABLE 2 Anastomotic pseudoaneurysm, 1(6.25%)

Pseudoaneurysm	Etiology	Number	Surgical options
Infrarenal aorta	Anastomotic disruption(post aortoiliac bypass)	1	Aortic Ligation and Axillo-bifemoral bypass

TABLE 3 Mycotic pseudoaneurysm 3(18.75%)

Pseudoaneurysm	Etiology	Number	Surgical options
External iliac artery	Mycotic (post renal transplant) Fungal (Candida)	1	Resection and interposition grafting
Superficial femoral artery	Mycotic (post septic arthritis) Bacterial (Streptococci)	1	Resection and interposition grafting
Ulnar artery	Mycotic (post HIV infection)	1	Ligation and excision

TABLE 4 Pseudoaneurysm due to Osteochondroma ,1(6.25%)

Pseudoaneurysm	Etiology	Number	Surgical options
Popliteal artery	Osteochondroma distal femur	1	Resection and interposition grafting

TABLE 5 Pseudoaneurysm post - percutaneous cathetrisation, 5(31.25%)

Pseudoaneurysm	Etiology	Number	Surgical options
Superficial femoral artery	Post femoral catheterisation(coronary intervention)	3	Resection and primary repair
Profunda femoris artery	Post femoral catheterisation (coronary intervention)	2	Resection and repair

TABLE 5 Pseudoaneurysm – Iatrogenic,4 (25%)

Pseudoaneurysm	Etiology	Number	Surgical options
Anterior tibial artery	Iatrogenic (Post ortho fixation)	2	Resection and repair
Tibioperoneal trunk	Iatrogenic (Post ortho fixation)	1	Resection and repair
Brachial artery	Iatrogenic - accidental puncture during intravenous cannulation	1	Resection and repair

Figure 1. Computed tomogram showing left common carotid artery pseudoaneurysm

Figure 2. Showing dissection of left common carotid artery pseudoaneurysm

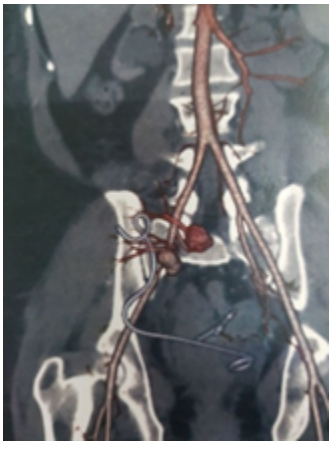

Figure 3.Computed tomogram showing right external iliac artery pseudoaneurysm(mycotic)

Figure 4. Right external iliac artery pseudoaneurysm resected and reconstructed with thigh vein graft

Figure 5. Right superficial femoral artery pseudoaneurysm (mycotic)

Figure 6. Right superficial femoral artery pseudoaneurysm excision and reconstruction with vein graft

Figure 7. Showing Computed tomogram angiography of left popliteal artery pseudoaneurysm(osteochondroma erosion)

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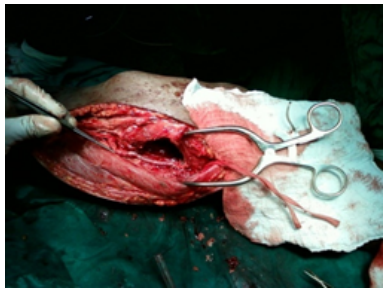

Figure 8. Showing left proximal popliteal artery pseudoaneurysm excision and reconstruction with saphenous vein graft.

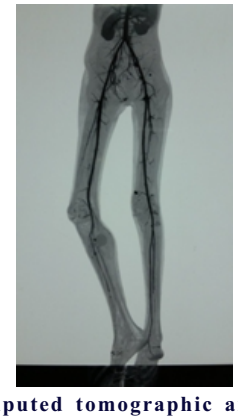

Figure 9.Computed tomographic angiogram of right

Tibioperoneal trunk with pseudoaneurysm(iatrogenic).

Figure 10. Operative picture of right Tibioperoneal trunk pseudoaneurysm repair under tourniquet control

DISCUSSION

Common carotid pseudoaneurysm (Traumatic): In comparison to other locations pseudoaneurysms of the carotid artery are quite rare and almost always the result of blunt or penetrating trauma . In literature aneurysm of extracranial carotid artery, incidence is of <1%of all aneurysm .In our case the patient presented as pulsatile swelling in left anterior neck with scar over the swelling and associated right hemiparesis . Patient had recent history of penetrating neck injury for which he underwent suturing elsewhere.Initial carotid Doppler revealed pseudoaneurysm with localized thrombus and hence computed tomogram angiogram of neck vessel and circle of willis taken which confirmed the pseudoaneurysm involving left common carotid artery Figure (1).His tomogram scan of brain parenchyma showed infarction of middle cerebral artery region .Patient was treated for hemiparesis as per the advise of neurologist with antiplatelet.Since the pseudoaneurysm was non-expanding and non-infective we planned elective surgical repair,after two weeks of neurological stabilization.As the pseudoaneurysm has mural thrombus endovascular option is deferred.Under general anesthesia ,by longitudinal skin incision anterior to sternocleidomastoid, proximal and distal control taken.After systemic heparinisation carotids clamped Figure (2) and pseudoaneurysm resected .There was good backbleed from distal carotid stump and hence shunt was not used. The defect after excising pseudoaneurysm in the carotid artery was reconstructed using 6mm polytetraflouroehthylene graft to match the carotid diameter.Postoperative period was uneventful and advised antiplatelet agents.

Infrarenal aortic pseudoaneurysm(Anastomotic): Most common cause of anastomotic aneurysm ,appears to be degeneration of the native artery wall,leading to weakening,fragmentation and eventual dehiscence of the intact suture line. Literature says incidence is of <1% to 1.3 %. In our case patient presented with severe abdominal pain and hypotension,with past history of aorto right –uniliac polytetraflouroethylene graft(PTFE) bypass for peripheral vascular disease.Patient was resuscitated and stabilized .Screening by computed tomogram scan abdomen revealed infra renal aortic pseudoaneurysm with leak at the graft anastomotic site.Patient was taken up for emergency exploration. Under general anesthesia abdomen opened by midline incision.Supraceliac aortic control taken.Retroperitoneum incised.Left renal vein looped.After proximal and distal clamping of aorta,pseudoaneurysm was excised and since the tissues was unhealthy and looked friable ,we ligated the infrarenal aortic defect with 3/0 prolene.Povidone iodine saline irrigation of peritoneal cavity done.Lower limb perfusion was established by extra-anatomic Axillo Bi- femoral bypass in the same sitting using ringed PTFE graft .Postoperative period was uneventful.

liac artey pseudoaneurysm(Mycotic): Literature says , the Iliac artery pseudo aneurysm incidence is of 3 %- 18 %. We had a case of right external iliac artery multiple pseudoaneurysm, along with internal iliac artery pseudoaneurysm , following thirty five days after cadaver renal transplantation with double renal artery anastamosis to right external iliac artery and internal iliac artery each.Patient presented with lower abdominal pain , fever and graft kidney dysfunction.On investigation with Doppler scanning revealed multiple pseudoaneurysm of right external iliac artery and internal iliac artery which was confirmed by angiogram Figuer(3).Patient was taken up for surgery and by right Gibson pelvic incision ,retroperitoneal approach,subcapsular nephrectomy was done along with ligation of right internal iliac artery and excision of external iliac artery pseudoaneurysm.The defect in right external iliac artery was reconstructed with interposition grafting using thigh saphenous vein Figure(4).Postoperative period was uneventful except for hemodialysis,and the distal peripheral pulse in right lower limb resumed normal.Aneurysm sac tissue culture report came out be fungal infection (candida species) and amphotericin B treatment was started.

Superficial femoral artery pseudoaneurysm(Mycotic) : Osler introduced the term mycotic aneurysm in 1885 which is associated with bacterial endocarditis.These were noted to have the appearance of 'fresh fungus vegetations".However the majority of mycotic aneurysm are caused by bacteria.Infection can cause both true and false aneurysm. Infected (mycotic) pseudoaneurysm may be due to primary vessel wall infection or infection secondary to adjacent septic focus. It can also be due to septic emboli from infective endocarditis.Hematogenous spread of infection into vasovasorum of arterial wall is the common pathogenesis. Infection results in vasculitis with lymphocytic infiltration in the area of the vaso vasorum. As vessel become inflamed ,the elastic fibres of media are destroyed thus forming pseudoaneurysm.Infection easily distrupt arterial wall and expand rapidly leading to rupture.Mycotic aneurysm incidence accounts for 2.6% and the common location of mycotic aneurysm is femoral artery 38% and aorta 31% and the most common microorganism is staphylococcus aureus and salmonella.In this study, a male patient aged 17 years,presented with painful and pulsatile swelling Figure (5) over right medial mid thigh ,following a recent right knee arthrotomy for septic arthritis.Previous knee, tissue fluid culture was gram positive diplococcic (streptococcus pneumonia).On examination ,there was scar over knee,with features of pseudoaneurysm thigh .Doppler scanning showed large pseudoaneurysm involving superficial femoral artery .Since it's a huge aneurysm with severe pain ,patient taken up for emergency surgery based on Doppler findings.Under spinal anesthesia ,common femoral artery and proximal popliteal artery control taken.Pseudoaneurysm was dissected and resected.The defect is reconstructed by interposition reverse saphenous vein graft Figure (6).Postoperative period uneventful.Patient was advised extended oral penicillin therapy .

Pseudoaneurysm following percutaneous cathetrisation of groin: Incidence of post cathetrisation pseudoaneurysm is 0.05% to 8 %.It usually present within 24hours to 48 hours.Generally it's due to low puncture which injures superficial femoral artery or profunda femoris artery branching point.Since these segments lie below the femoral bone head ,adequate postpuncture compreesion is not possible ,resulting in pseudoaneurysm.We came across three(3) supercial femoral artery pseudoaneurysm and two(2) profunda femoris artery pseudoaneurysm following percutaneous cathetrisation procedure for coronary intervention.All presented within 48 to 72 hours of puncture ,as pulsatile swelling.All of them managed by surgical resection and primary repair .The technique we follow is direct incision over the pseudoaneurysm sac ,and once the hematoma is evacuated the hole in the artery can be viewed which will be controlled by finger compression and by quick dissection of proximal and distal to sac, the vessel clamped after heparinisation and defect sutured with prolene.Proximal control above inguinal ligament occasionally needed.All patient responded well without any postoperative complications.In the above cases the patient was on anticoagulant therapy for coronary intervention and hence ultrasound compression therapy and thrombin injection therapy was deferred .

Poplietal pseudo aneurysm secondary to osteochondroma: Osteochondroma is the most common benign bone tumour frequently occurring in distal femur,which can sometimes cause vascular complications.The incidence of osteochondroma is 1% of population and the prevalence is more in young males.The complications of osteochondroma is of 4% and out of this 60% is of pseudoaneurysm of adjacent arteries.During the growth phase of osteochondroma ,they are covered with soft cartilage cap,which later undergo ossification and become firm and rigid bone spur leading to complications.Paul reported first popliteal pseudoaneurysm in 1953.In our case the patient

of aged 28 years, male presented with large painful swelling of left lower thigh medial aspect .On examination distal pulse were diminished .Radiography of knee showed osteochondroma of distal femur.Angioevaluation revealed proximal popliteal artery pseudoaneurysm Figure (7).Patient was taken up for surgey.By medial knee and thigh incision ,paseudoaneurysm was approached and after proximal and distal control pseudoaneurysm was resected.The osteochndroma was also excised by ortho team who joined us during the procedure. Pseudoaneurysm has developed from a small hole 2mm in popliteal artery due to erosion by osteochondroma spur. The resultant defect in popliteal artery was reconstructed using interposition vein graft Figure (8) with good outcome.

Pseudo aneurysm of Ulnar artery (HIV vasculopathy): Arterial aneurysm associated with (HIV)human immunodeficiency virus were first described in 1989by Dupont et al.The incidence of vasculitis due to HIV is 1 %.Vasculitis can results in aneurysm.We report a case, 24 year male ,with history of human immunodefieciency viral infection ,presented with painful pulsatile swelling over left forearm .On Doppler scanning revealed ulnar artery pseudoaneurysm with normal radial artery and palmar arch. Patient underwent ligation and excision of pseudoaneurysm under tourniquet control.Postoperative period uneventful.Patient was advised to continue antiretroviral therapy.

Pseudo aneurysm of Tibioperoneal artery (Iatrogenic): We report two cases of anterior tibial artery pseudoaneurysm and one case of tibioperoneal trunk pseudoaneurysm ,following orthopaedic internal fixation procedure.Patients presented with painful pulsatile mass near the implant area .Clinical examination showed intact distal pulse in foot and the Doppler scan confirmed it.All the patients underwent resection and repair of rent in the artery under tourniquet control.All the pseudoaneurysm sac had a small fibrous hole indicating ,neck of sac,which was sutured with prolene within the aneurismal sac.Tourniquet released after the procedure .Aneurysm sac tissues were debrided.Outcome was good in all the cases.

Pseudo aneurysm of Radial artery (Traumatic): One patient presented with painful and pulsatile swelling left forearm with history of trauma (penetrating injury) for which he underwent suturing of wound elsewhere.Ulnar pulse was normal and palmar arch was complete..Doppler scan confirmed pseudoaneurysm and we managed it by resection and primary repair of pseudoaneurysm under tourniquet control.Tourniquet removed after procedure and the post operative period uneventful.

CONCLUSION

Pseudo aneurysm can occur in any vascular bed due to various etiology and can be life threatening .It should be diagnosed in time and to be treated early to prevent subsequent complications. In this study of total 16 (sixteen) cases, 10 patients (62.5%) was treated by resection and primary repair , 5 patients (31.25%) was treated by resection and reconstruction and 1 patient (6.25%) was treated by ligation of involved artery and excision of pseudoaneurysm.In the current endovascular era, all pseudoaneurysm cases, are not suitable for endovascular treatment and still open conventional vascular surgery has, key role in the treatment of pseudoaneurysm with good outcome.

Conflict of interest: Nil

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