In Hospital Management and Outcome of Iotrogenic Femoral Pseudo-aneurysm in emergency department of Vascular Surgery of NICVD

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ABSTRACT

Background:
A pseudo aneurysm is a condition arising from disruption in arterial wall with blood dissecting into the tissues around the damaged artery creating a sack that communicates with the arterial lumen. A pseudo aneurysm is distinct from true aneurysm which results from dilatation of all layers of arterial wall. Pseudo aneurysms are usually due to injury to arterial wall. Its increasing incidence is usually due to percutaneous arterial intervention for coronary and vascular interventional and diagnostic procedures as well as use of arterial route by drug abusers. Most common and easily approachable route has made the femoral artery site of pseudo aneurysm formation following different procedures.

Objective:
To find out the etiology beyond the pseudo aneurysms, its diagnosis based on clinical and radiological examination, management of different pseudo aneurysm and post-operative complications including morbidity or mortality of this condition.

Patients and Methods:
25 patients with iotrogenic femoral pseudo aneurysm resulting from drug abuse and 15 patients with iotrogenic femoral pseudo aneurysm after femoral catheterization for coronary and peripheral artery angiogram admitted into the vascular surgery emergency department from 2017 to 2018 was taken for study. Excision of sack followed by direct repair, repair with patch angioplasty, excision of damaged intervening portion followed by end to end anastomosis with venous or PTFE tube are the usual methods followed.

Results:
Iotrogenic femoral pseudo aneurysm resulting after femoral catheterization for percutaneous coronary intervention or peripheral vascular intervention was managed by direct repair with or without patch angioplasty without any postoperative morbidity or mortality. But femoral pseudo aneurysm resulting from drug abusers were managed by intervening PTFE tube graft or ligation of femoral artery with resultant loss of limb in some cases. Some drug abusers later presented with severe claudication pain and needed re vascularization with extra anatomic bypass. Some presented with acute limb ischaemia for which revascularization was attempted but failed up with above knee amputation.

Conclusion:
Pseudo aneurysms carry a high risk of morbidity and mortality. So precautions must be taken to highest order during and after procedure and physicians must be familiar with the clinical findings and potential treatment options.

Key words: Iotrogenic femoral pseudo aneurysm, Duplex Ultrasound Studies (DUS), Percutaneous arterial Catheterization, Ultrasound Guided Thrombin Injection (UGTI).

INTRODUCTION

Pseudoaneurysms are typically the result of traumatic arterial injury. With the increasing utilisation of percutaneous arterial interventions worldwide, iatrogenic arterial injury has become the predominant cause of pseudoaneurysm formation. The highest incidence of iatrogenic pseudoaneurysm formation is observed in the common femoral artery as a result of inadequate seal of the arterial puncture site following catheterisation procedures. It is reported that femoral pseudoaneurysms occur in up to 0.2% of diagnostic and 8% of interventional procedures.[2] Approach to the management of a pseudoaneurysm depends on its anatomical location.

Aetiology for Iotrogenic femoral pseudo aneurysms can be broadly categorized into procedural and patient factors.

Procedural factors include low femoral puncture, inadvertent catheterization of the superficial femoral artery or profunda artery, interventional rather than diagnostic procedures and inadequate compression following removal of the sheath. Patients factor include obesity and need for anticoagulation post-procedure[2]. Femoral iotrogenic pseudo aneurysms usually present with pain and swelling in affected groin, along with a palpable mass which may be pulsatile with a thrill or bruit. In slim patients diagnosis can be made clinically but obese patients need further investigation. Small pseudo aneurysms usually resolve spontaneously without intervention. Pseudo Aneurysm which persist may enlarge and lead to complications related to compression of adjacent

femoral vein, nerve and overlying skin. This can lead to leg swelling, deep vein thrombosis, compressive neoropathy and skin necrosis. Although rare, pseudo aneurysm may also expand and eventually rupture[3].

Duplex ultrasonography (DUS) is the modality of choice for diagnosis of femoral pseudo aneurysm particularly in centers with a dedicated vascular ultrasound laboratory[4]. DUS has also been reported to have a sensitivity of 94% and a specificity of 97% in the detection of femoral pseudo aneurysm[5].

There are different modalities of treatment for iotrogenic femoral pseudo aneurysms like ultrasound guided compression, percutaneous ultrasound guided thrombin injection and open surgical repair[6,7].

Ultrasound-Guided Compression (UGC) of pseudoaneurysms to induce thrombosis of the aneurysm sac was proposed as an alternative to surgery by Fellmeth et al in 1991[9]. Principles of UGC involve locating the aneurysm sac using the ultrasound transducer and applying enough pressure to stop flow within the sac, but maintain flow in the affected artery[5]. Flow within the sac is reassessed at 10 - 20 minute intervals until thrombosis is achieved[1]. Unfortunately, efficacy of this technique is limited, with success rates between 62% - 86%[1,2]. Compression times can also be lengthy. This occupies vascular ultrasound laboratory resources and can be uncomfortable for both the patient and clinician[10].

Open surgical repair is considered the gold standard of iotrogenic femoral pseudo aneurysms as the arterial defect is repaired definitely. Principle steps of OSR involve obtaining proximal and distal control of the affected artery evacuating the aneurysm sack and repairing the defect in arterial wall (Either by primary closure or patch closure)[11]. End to end anastomosis and in some cases with PTFE tube graft done. These procedures are usually reserved for iotrogenic femoral pseudo aneurysms caused by percutaneous coronary or peripheral vascular intervention.

Previously published studies have documented rates of thrombosis between 86 - 100% (the majority successful on the first attempt)[2]. The procedure has the advantage of being relatively quick and simple. The most serious complication of UGTI is distal arterial embolisation, which is a relatively rare outcome (less than 2% in reported series). If this occurs, intra-arterial thrombolysis may be undertaken[14].

METHODOLOGY

Study Design: Prospective Observational Study

Place: National Institute of Cardiovascular Diseases (NICVD)

Period of Study: January 2017 upto December 2018.

Study Population: The study was carried out in 40 patients with iotrogenic femoral pseudo aneurysm fulfilling the inclusion and exclusion criteria.

Inclusion Criteria: Patient presenting with iotrogenic femoral pseudo aneurysm.

Exclusion Criteria: Patients with pseudo aneurysms from other parts of the body were excluded.

After spinal anesthesia skin was prepared from umbilicus upto knee joint of the affected site, longitudinal incision (15 cm) in the inguinal crease half above the inguinal crease and half below crease was given. Control of the proximal and distal part of the femoral artery taken.

RESULTS

A total number of 40 patients (all male) admitted in NICVD with iotrogenic femoral pseudo aneurysms during 2017 and 2018 were studied.

Out of 40, 15 patients (37.5%) presented following percutaneous coronary and peripheral vascular diagnostic and interventional procedures. Out of 15, 9 (60%) resulted from percutaneous coronary intervention and 6 (40%) from peripheral vascular diagnostic and interventional procedures.

Out of 15, 12 were situated in the right side and three were in the left.

Out of 9 patients 3 (33%) of them accounted for interventional procedure and 6 (66%) of them for diagnostic procedures.

Patch angioplasty was done in 5 cases and direct repair in 10 cases. No peri-operative mortality was recorded. Post-operative superficial wound infection was treated by local dressing and parentral antibiotics after Culture and sensitivity tests.

The drug abusers made the bulk of the patients with 25 (62.5%) patients presenting with infected pulsatile groin swelling, (n = 21), bleeding groin swelling (n=3) and non-pulsating groin swelling (n=1).

Out of 25, 21 were on the right side and 4 in left side.

Direct ligation was done in 20 patients, 1 patient died following rupture of pseudo aneurysm and 3 patients suffered from acute limb ischaemia and revascularized urgently but all of them end by above knee amputaion. There was one mortality but two patients presented with severe lower limb ischaemia and were discharged with advice for orthopaedic care.

DISCUSSION

Most common and easily approachable route accounts for femoral route leading to vascular complication. TAVRIS et al 2007 described an overall 3.4% rate of vascular complication following diagnostic cardiac catheterization. Involvement of arteries include CFA (n=21, 52.5%) and SFA (n = 19, 47.5%).

The presentation of iotrogenic femoral pseudo aneurysms ranges from swelling and bruise, infected tender swelling at groin and bleeding from infected site at groin. Clinical examination may reveal thrill or bruit, pulsatile hematoma or marked tenderness at the sight of arterial puncture. Femoral pseudo aneurysm by its size and location can compress adjacent nerve and veins giving rise to neoropathy, limb swelling due to impaired drainage and ischaemic pain. Necrosis of overlaying skin with infection may lead to rupture of aneurysm with fatal outcome. Repeated puncture attempts usually lead to arterial injury so puncture should be precise and accurate.

Duplex ultrasound distinguishes femoral pseudo aneurysm from hematoma or arterio venous fistula and gives precise anatomical information.

Infected femoral pseudo aneurysms are commonly seen in the intravenous drug using population arising from repeated non-sterile needle groin punctures as part of the pursuit of easy peripheral venous access. The aneurysmal abscess carries with it a significant risk of sepsis, rupture, limb loss and death[14]. One of our patient died following rupture of infected pseudo aneurysm.

Primary repair is not recommended as appropriate surgical management by some authors because of ongoing infection and destruction of the arterial wall usually results in secondary haemorrhage and infection (Geordiadis GS et al. Surg 2005:75:1005-10)[14]. Ligation was done in 20 cases out of 25.

Ligation alone without revascularization maybe associated with subsequent intermittent claudication and limb amputation. Furthermore arterial reconstruction with a synthetic or venous conduit is limited because of a contaminated field and often the non-availability of autogenous venous graft. Ligation is the optimal management for infected pseudo-aneurysms because it is simple, cost effective and safe.

In case of ruptured iotrogenic femoral pseudo aneurysms control is taken first in the external iliac artery, followed by evacuation of the ruptured sack and ligation of common femoral, superficial femoral and deep femoral artery inside the wound and continued dressing advised.

Study Limitation:

1. Single Center Study
2. Small Number of study patients because other pseudo aneurysms located in different parts of the body have been excluded from the study group.

CONCLUSION

The ever increasing number of iotrogenic femoral pseudo aneurysm is due to progressive uptake of percutaneous arterial intervention for cardio vascular disease and increasing social menace of intravenous drug abusers. Procedure and aseptic measure must be as per standard protocol being aware of the potential for pseudo aneurysm formation. Ligation of iotrogenic femoral pseudo aneurysm is an effective, safe and simple management but primary repair with preservation of the native vessel is appropriate if infection is limited. Morbidity and mortality is more in iotrogenic femoral pseudo aneurysm due to drug abusers than percutaneous coronary and vascular interventions.

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