ASSOCIATION OF AETIOLOGY, PRESENTATION AND POST-OPERATIVE COMPLICATIONS OF POST-TRAUMATIC PERIPHERAL ARTERY PSEUDOANEURYSM

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ABSTRACT

Objective: *To describe post traumatic pseudoaneurysms and its association to causes, presentation and conventional surgical treatment modalities.*

Material and Methods: *This Descriptive study carried out in the Department of Cardiovascular Surgery, Lady Reading Hospital, Peshawar from January 2003 to December 2007. Patients with associated arteriovenous fistula were excluded from this study. All the demographics including age, sex, type of injury, site, associated complications operative details, peri operative morbidity and mortality were prospectively recorded in a data base.*

Results: *The total number of patients was seventy five. All the patients underwent conventional surgical procedures. Reverse saphenous graft was received by 34%, 24% had end to end anastomosis, 12% had interposition synthetic graft, 8% had rent repair while 21.33% had primary ligation of the involved artery. There was no peri operative mortality. Six patients had post operative complication in the form of graft, thrombosis and or infection. Three patients had amputation, two in lower limb and one in the upper limb. Majority of them were male 90.66%. Age ranged from 7 years to 75 years. Most of the patients (77.3%) were in second to fourth decade of life. The most common cause of injury was gunshot wound (56%) followed by stab wounds (13.33%) and road traffic accidents (12%). Few cases of bomb blast (6.66%), Post cardiac catheterization (4%), glass injury (4%) and intravenous drug abusers (2.66%) were also reported. The commonest site of injury was femoral artery (37.33%).*

Conclusion: *In this study majority of patients were male with gunshot wound as commonest cause. Reverse saphenous vein graft was treatment of choice. Infection and thrombosis were the commonest post-operative complications.*

Key words: *trauma, artery, pseudoaneurysms, conventional repair.*

INTRODUCTION

Arterial aneurysms have been recognized since ancient times. One of the earliest text known, the Ebers Papyrus (2000 B.C), contains a description of traumatic aneurysms of peripheral arteries.[1]

Pseudoaneurysms are caused by trauma, iatrogenic vascular interventions, anastomotic disruption and in intravenous drug abusers.[2,3] Pseudoaneurysms are localized arterial disruption or pulsatile haemotoma that communicates with an artery through a hole in the arterial wall. The diagnosis is confirmed by various imaging techniques.[4]

In the present era trauma is a real challenge for surgeons though out the world.[5] Pseudoaneurysms are much less in the upper extremities than in the lower extremities.[6]

Prompt diagnosis and interventions are essential for its successful management. Delay allows severe disabilities in the form of thromboembolism, neurological deficit and even amputations.[7]

Currently surgery or endovascular

AGE AND SEX DISTRIBUTION

Age(years) & Sex distribution	01-10 yeas	11-20 years	21-30 years	31-40 years	40-50 years	51-60 years	61-70 years	71-80 years	Total
Male	04	15	19	18	07	03	02	01	69
Female	5.33%	20%	25.33%	24%	9.33%	4%	2.66%	1.33%	92%
Total	00	01	03	01	00	01	00	00	06
		1.33%	4%	1.33%		1.33%			8%
	04	16	22	19	07	04	02	01	75

The numbers of cases according to anatomical site is shown in table 2

Table 1

intervention is the only accepted definitive therapy for pseudoaneurysms.[8]

The aim of this study was to document the causes, presentations and conventional surgical treatment modalities of post traumatic peripheral arterial pseudoaneurysms.

MATERIAL AND METHODS

Prospective data was collected on 75 patients having post traumatic pseudoaneurysms between January 2003 and December 2007 in the department of Cardiovascular Surgery Post Graduate Medical Institute Lady Reading Hospital, Peshawar, Pakistan.

The diagnostic work up consisted of routine blood investigations including screening for HBsAg, Anti HCV Anti bodies and HIV.

X-Ray chest and electrocardiography (ECG) was routinely done. All patients had Doppler duplex ultrasound. Magnetic resonance angiography and conventional angiography were done in selected patients, especially where there was diagnostic dilemma.

All the demographics including age, sex, type of injury, site, any associated complications, operative details, peri operative morbidity were prospectively recorded in a data base.

Operative Techniques:

All patients were brought to the operation room well sedated and pre medicated. ECG monitoring and pulse-oximeter were also set up to monitor the cardiac rhythm and oxygen saturation. Screened cross-matched blood was kept ready for all patients. Non invasive blood pressure recording was done in all cases. Fluid were infused during the course of surgery to compensate the loss. Blood was administered if there was significant hemorrhage.

The choice of operative procedure and consequently of operative exposure was dependent upon the localization and the size of aneurysm. As a matter of principle, it was important that

ANATOMICAL SITE

Anatomical site	Artery involved	No.	%
Neck	Carotid	02	2.66
Upper Limb			
	Subclavian	06	8
	Axillary	05	6.6
	Brachial	16	21.33
	Radial	02	2.66
	Ulnar	01	1.33
Abdomen			
	Internal iliac	02	2.66
	External iliac	01	1.33
Lower Limb			
	Femoral	28	37.33
	Popliteal	11	14.66
	Ant. Tibial	01	1.33

Table 2

THE ETIOLOGY OF INJURIES

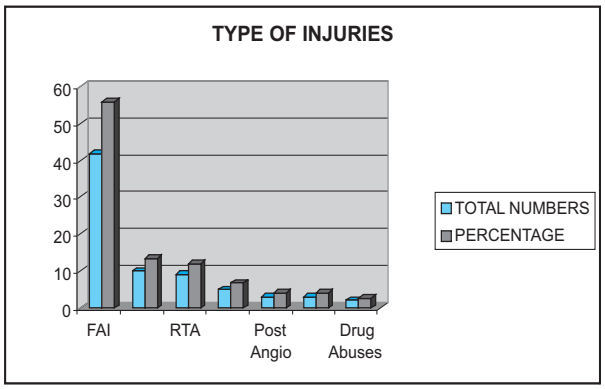

Fig. 1

exposure be as generous as possible for repairs, with low risk. Before applying clamps, heparin was given according to the weight of the patient. To avoid embolization, manipulation of the aneurysm was kept to an absolute minimum. Before completing the distal anastomosis, the outflow was controlled by vascular clamp.

In the postoperative intensive care unit, limb viability, volume and type of peripheral pulses, signs of wound bleeding, blow out of anastomosis and signs of ischemia (cyanosis, motor deficit and impaired cutaneous sensation) were observed. Continuous intravenous heparin infusion was given for 2 to 3 days.

Oral dual antiplatelets agents (Salicylic acid and Clopidogrel) were started from day 1. Supportive therapy and broad spectrum antibiotics, to prevent infection, were given. In case of early occlusion immediate re-exploration was done to prevent further ischemia and to know about the cause of failure. In the follow-up period, the patients were called for the first visit after two weeks, then at one and a half months and 3 months later thereafter. Post operative antiplatelets were given to all patients for one year.

RESULTS

In this study, 75 patients were included. Most of the patients (n=58/75; 77.3%) in our study were in their second to fourth decade of life. The oldest patient was 75 years old gentleman and the youngest a 7 years old child. The average age was 29 years. The longest history in our study was 15 years, who presented to us with pseudoaneurysms of left popliteal artery due to stab wound. 53.33% patients had lower limb pseudoaneurysms versus 40% in upper limb. Carotid aneurysm was noted in 2.66% while both in internal and external iliacs were involved in 3.99%.

The most common type of injury was fire arm accounting for 42 cases (56%) followed by stab wound in 10 cases (13.33%), Road traffic accident in 9 cases (12%), bomb blast in 5 cases (6.66%), post cardiac catheterization in 3 cases (4%) glass injury in 3cases (4%) and intravenous drug abusers 2 cases (2.66%). The distribution of age and sex along with percentages is shown in table 1.

Depending upon the situation, different methods of repair were adopted. In eighteen patients (24%) end to end anastomosis was done. Six patients had rent repair, three in femoral and three in brachial artery. Majority of the patients

POSTOPERATIVE COMPLICATIONS

Site	Primary Mode of Treatment	Post op day	Complication	Management	Outcome
Femoral Artery	Inter position synthetic Graft	15th	Infection	Ligation	Amputation
Axillary	Reverse vein graft	7th	Thrombosis/ Infection	Ligation with No Good back flow	Good Pulses
Axillary Artery	Synthetic graft	2nd	Thrombosis	Synthetic Graft replaced with vein graft	Good Pulses
Brachial	Reverse vein graft	4th	Thrombosis	Saphenous vein graft (SVG) replaced with synthetic graft	Good Pulses
Popliteal	Reverse vein graft	10th	Infection	Ligation	Amputation
Subclavian	Inter position synthetic Graft	5th	Infection	Ligation	Amputation

Table 3

i.e. 26(34.66%) had reverse saphenous vein graft. Nine patients were managed by putting a synthetic vascular graft between the two ends. Sixteen patients (21.33%) had ligation of involved artery. Among these sixteen patients, four patients had ligation due to anastomosis blow out.

There was no intra operative and postoperative mortality. One patient (1.33%) had intra operative cardiac arrest due to bleeding, who was successfully resuscitated.

Complications were seen in 6 patients (8%). Two (2.66%) in Axillary artery site and one each (1.33%) in femoral, popliteal, brachial and subclavian artery (Table 3).

Three amputations were done. One due to femoral artery ligation, one due to popliteal artery ligation and one left upper limb disarticulation due to subclavian artery ligation.

DISCUSSION

The incidence of civilian violence is on the rise in our society in the last few years. We report 75 cases of pseudoaneurysms in 4 years period as compared to 60 cases in 10 years by other researchers in the sub continent.[9]

Most of the published data shows higher frequency of pseudoaneurysms in lower extremities as compared to the upper ones.[10] Our finding well correlated with these studies. In our study 53.33% patients had lower limb pseudoaneurysms versus 40% in upper limb.

Fire arm injuries are the leading cause of the Pseudoaneurysms because of increasing civilian violence in society.[11] The mechanism of injury resulting into peripheral vascular injury and later on aneurysm formation is reported differently by different workers. Mattox KL et al[12] reported in a series of over 4,459 patients of vascular trauma, maximum cause of injury by gun shot (55%), followed by stab injury (36%), and then by blunt trauma (9%). Khan J et al,[13] reported in a series of 354 vascular trauma cases, fire arm injury in 81.35% cases. Other false aneurysms of arteries can occur with blunt injury in the form of fractures and dislocation of joints. Their presentation varies with anatomical sites. Pseudoaneurysms are also found in intravenous drug abusers.[9, 11, 14-16]

We reported pseudoaneurysms secondary to fire arm injury in 56% of cases while stab injury leading to Pseudoaneurysms was noted only in 13.33%.

Since, the beginning of Percutaneous vascular procedures in late 1970's, Pseudoaneurysms remained a frequent finding in vascular interventional practice. It occurs in 0.1% to 0.2 % and in 3.5% to 5.5% in diagnostic and in interventional procedures respectively.[17, 18] In our study 4% of the patients had post interventional Pseudoaneurysms.

Every pseudoaneurysm is associated with some sort of complications. This complication varies dramatically depending on the site and etiology of the aneurysm.[19] Where left untreated, Pseudoaneurysms can be complicated by thrombosis, distal embolization or rupture. It is generally accepted that these sequels are unusual if the aneurysm is less than 2cm in diameter and asymptomatic. Since the morbidity of emergent operation far exceeds that of elective repair, early diagnosis and treatment are the standard of care. The preferred method is the resection of aneurysms and then establishing the continuity of vessels with either synthetic graft or autologous venous graft.[2,9,20, 21]

Regardless of the etiology, the principles for aneurysm surgery are the same. The life threatening lesions should be addressed first, followed by limb threatening lesions. The surgical principles are also the same for aneurysms in any location. The aneurysm must be excluded from the circulation and arterial circulation restored. However, expanding aneurysms may cause adhesions and indurations of the surrounding by the exerting compressive force, so that extensive dissection can pose a danger to adjacent structures. Therefore, it is a peculiarity of surgery of aneurysms that complete dissection can be abandoned. In many cases, partial resection is sufficient and reconstruction may be performed by "inlay" techniques or bypass procedures.[9, 22,23]

Apart from the conventional surgical approach which is still considered to yield the best results,[24] the introduction of endovascular repair of aneurysm is one of the major developments in vascular surgery. The naval methods of therapies for Pseudoaneurysms include sonographically guided compression, percutaneous sonographically guided injection of thrombin into Pseudoaneurysms, obstruction with a percutaneous balloon, coil embolization or placement of stent graft.[25-28] As all these new modalities are not available in our setup due to financial constrains or lack of expertise, we repair the Pseudoaneurysm according to the conventional techniques.

In our study 59 patients (81%) were manage by vascular repair. In 24 % of cases end to end anastomosis was done. Rent repair was performed in 8%. Majority of the patients 34.66% received reversed saphenous vein graft while synthetic interposition graft was put in 12% of the cases. Ligation was done primarily in 13 patients (17.33%). Three patients had ligation, one each of

femoral, popliteal and subclavian artery in redo surgery cases. Decision of ligation was made according to the following factors.

- Dual routes of blood supply e.g. in forearm and in leg.
- Good flow of blood from distal stump.
- Contaminated / infected site.

It was assumed that keeping all these factors in mind, there would be less chances of vascular insufficiency after ligation. In our series only 4% of the patient had amputations.

In conclusion, this study demonstrates that the most common cause of traumatic pseudoaneurysm is firearm injuries due to civilian violence in our society. The most common site is femoral artery due to its long course and anatomical location.

Vascular repair should be done at first instance. Saphenous vein graft is the best tool for repair procedures. Post operative complications like vascular insufficiency and anastomosis blow out should be managed immediately.

CONCLUSION

In this study majority of patients were male with fire arm wound as commonest cause. Reverse saphenous vein graft was applied in maximum number of cases. Commonest post operative complications were infection and thrombosis.

REFERENCES

1. Hiatt JR, Hiatt N. Blood Letting in ancient and modern times. Contemp Surg 1996; 48: 164- 8.
2. Ceviz, M, Ates A, Unlu Y, Ozyazicioglu A, Yekeler I, Becit N, et al. Surgical treatment of traumatic Pseudoaneurysm and arteriovenous fistulae. Turk J Vasc Surg 2000; 3: 28 – 30.
3. Qiao ZR, Shi D. Surgical treatment of complicated traumatic aneurysm and arteriovenous fistula. Chin J Traumatol 2003; 6: 213 – 7.
4. Martina L, Tahir T. Iatrogenic Pseudoaneurysm of femoral artery: case literature review. Clin Med Res 2003; 1: 243 – 7.
5. Hussain ST, Aslam S, Khan RA, Mannan P, Khan J, Collin J. An observational study of 256 cases of vascular trauma in the North Western Province of Pakistan. Ann R Coll Surg Engl 2001; 83: 388-91
6. Nehler MR, Taylor LM, Porter JM. Iatrogenic vascular trauma. Semin Vasc Surg 1998; 11: 283-93.
7. Nugud OO, Hedges AR. Axillary artery Pseudoaneurysm. Int J Clin Pract 2001; 55: 494-9.
8. Paulson EK, Sheafor DH, Kliewer MA, Nelson RC, Eisenberg LB, Sebatian MW, et al. Treatment of Iatrogenic femoral Pseudoaneurysm comparison of US- guided Thrombin injection with compression repair. Radiology 2000; 215: 403-8.
9. Darbari A, Tandon S, Chandra G, Dwivedi SK, Kumar A, Gupta A. Post traumatic peripheral arterial Pseudoaneurysm; Our experience. Ind J Thorac Cardiovasc Surg 2006; 22: 182-7.
10. Nepolitano AM, Nepolitano L, Francomano F, Colalongo C, Ucchino S. Aneurysms of subclavian artery: Clinical experience. Ann Ital Clin 1998; 69: 311-6.
11. Kakar BK, Babar KM, Khan A, Naeem A, Khan I. Surgical experience of post traumatic Pseudoaneurysm of the brachial artery at a tertiary care hospital. J Pak Med Assoc 2006; 56: 409 – 11.
12. Mattox KL, Feliciano DV, Burch J. Five thousands seven hundred and six cardiovascular injuries in 4459 patients epidemiological evaluation from 1958 to 1988. Ann Surg 1989; 209: 698-705.
13. Khan J, Aslam S, Khan RA, Ahmed T, Rehman K, Hamid A, et al. Vascular trauma experience at Lady Reading Hospital, Peshawar. J Postgrad Med Inst 1999; 14: 26-35.
14. Nehler MR, Taylor LM, Porter JM. Iatrogenic vascular trauma. Semin Vasc Surg 1998; 11: 283-93.
15. Kumar S, Agnihotri SK, Khanna SK. Brachial artery Pseudoaneurysm following blood donation. Transfusion 1995; 35: 791-2.
16. Tetik O, Yetkin U, Yilik L, Ozsoyler I, Gurbuz A. Right axillary Pseudoaneurysm causing permanent neurological damage at right upper limb: A case report. Turk J Vasc Surg 2002; 2: 102 – 4.
17. Cronenwett JL, Krupski WC. Over view – arterial Aneurysms. In; Rutherford RB(ed) vascular surgery: 5th Ed, Vol. 2, Philadelphia, WB Saunders. 2000; pp 1241-5.
18. Paulson EK, Sheafor DH, Kliewer MA, Nelson RC, Eisenberg LB, Sebastian MW, et al. Treatment of Iatrogenic femoral Pseudoaneurysm comparison of US- guided Thrombin injection with compression repair. Radiology 2000; 215:403-8.

19. Yetkin U, Gurbuz A. Post traumatic Pseudoaneurysm of brachial artery and its surgical treatment. Tex Heart Inst J 2003; 30: 293 -7.

20. Erkut B, Karapolat S, Kaygin MA, Unlu Y. Surgical treatment of post traumatic Pseudoaneurysm and arteriovenous fistula due to gunshot injury. Turk Journal Trauma Emergency 2007; 13: 248-50.

21. Chen L, Qu X, Peng S. Surgical treatment of post traumatic Pseudoaneurysms. Chin J Tramatol 2000; 3: 163-5.

22. Davidovic L, Lotina S, Vojnovic B, Kostic D, Cinara I, Cvetkovic S, et al. Post tramatic AV fistulae & Pseudoaneurysms. J Cardiovasc Surg 1997; 38: 645-51.

23. Crawford DL, Yuschak JV, McCombs PR. Pseudoaneurysms of the brachial artery from blunt trauma. J Trauma 1997; 42:327-9.

24. Jacob T, Hingorani A, Ascher E. Popliteal artery aneurysms. Eur J Vasc Surg 2001; 22: 77-85.

25. Fellmeth BD, Roberts AC, Boookstein JJ, Freischlag JA, Forsythe JR, Buckner NK, etal. Post angiographic femoral injuries: non surgical repair with US-guided compression. Radiology 1991; 178: 629-30.

26. Morgan R, Belli M. Current treatment methods for Post Catheterization Pseudoaneurysms. J Vasc Interv Radiol 2003; 14: 697-710.

27. Friedman SG, Pellerito S. Scher L, Faust G, Burke B, Safa T. Ultrasounded-guided thrombin injection is the treatment choice for femoral Pseudoaneurysms. Arch Surg 2002; 137: 462-4.

28. Pezzulo JA Wallach MT. Successful percutaneous thrombin injection of a brachial artery Pseudoaneurysms in a neonate. Am J Roentgenol 2002; 178: 244-5.

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