EXPERIENCE OF VASCULAR TRAUMA IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To highlight the presentation and management of various vascular injuries and their outcome.

Study Design: Descriptive study.

Place and Duration of Study: Surgical unit III, Combined Military Hospital, Rawalpindi, from September 2005 to October 2006.

Patients and Methods: Thirty nine cases of vascular trauma were referred to vascular surgeon CMH Rawalpindi, in the above mentioned period. These cases were evaluated for mechanism of injury, age, gender and time of presentation. Out of these, only thirty cases were found suitable for surgical intervention. These thirty cases were evaluated for site of vascular injury, associated injuries, type of surgery performed and the outcome.

Results: Blunt trauma was the predominant cause of vascular injuries in our study 16/39 (41%). Fourteen cases (35.8%) had gun shot wounds. Only thirty patients (76.9 %) underwent various surgical procedures. Primary end to end anastomosis was possible in only 5/30 cases (16.6%) while reversed venous graft was used in 13/30 cases (43.3%). Wound infection occurred in 2/30(6.6%) cases out of which 1 case (3.3%) ultimately had an amputation. The time period between injury and surgical intervention ranged between 1 to 20 hours for most of the vascular injuries while delayed presentation in the form of traumatic arteriovenous fistula or pseudoaneurysm was between 48 hours to 3 months.

Conclusion: There are reasonable numbers of vascular trauma cases being referred to a tertiary care hospital. Most of these cases reach us quite late due to unnecessary investigations, delayed referral and transportation. Early intervention and revascularization definitely reduces amputation and complication rate. All gunshot wounds not only require thorough surrounding soft tissue debridement but also liberal excision of traumatised vessel itself, resulting in interposition graft repair.

Key Words: Saphenous vein, Arteriovenous fistula, Pseudoaneurysm

INTRODUCTION

Vascular trauma is subject of interest not only for vascular surgeons but these cases are of concern to general as well as orthopaedic surgeons Most of the development in this field is seen in the last six decades. In World War II, most of vascular injuries were treated by ligation of these vessels resulting in amputation rate more than 40% [1]. In Korean War surgeons started repairing injured vessels and obvious reduction in amputation rate was seen [2]. With improvement in surgical technique and refinement of sutures, amputation rate fell to less than 15 % in Vietnam War [3]. In the last two decades, the amputation rate in these injuries is less than 10% in most studies [4].

In our country, where there is significant shortage of vascular surgeons, most of these cases are dealt by general surgeons or are referred to cardiovascular or plastic surgeons. These cases generally prove as additional load on these already burdened specialties. Due to lack of proper follow up and different disciplines dealing with these injuries, we have not been able to conduct a significant study.

With increasing number of trauma cases due to civil violence and motor vehicle accidents, more vascular injuries are encountered today. Unfortunately most of the victims are young people. Loss of limb or life in these cases has devastating effect on the family as well as the country. There is a dire need to review and revise our protocols for managing these casualties.

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Received: 02 Nov 2007; Accepted: 15 Sep 2009

The aim of this study is to highlight the various types of vascular injuries, their time of presentation, various modalities to treat them and their outcome.

PATIENTS AND METHOD

This study was carried out at surgical unit-III, Combined Military Hospital, Rawalpindi from September 2005 to October 2006. Thirty nine cases of vascular trauma were referred to a single vascular surgeon by either surgical registrar on duty in Trauma Centre CMH Rawalpindi or by other surgeons in various local and peripheral hospitals. Seven (17.9%) cases were too late for any vascular intervention with average reporting time of 32 hours. Primary amputation was advised in these cases as they presented with irreversible ischaemic changes. Three (7.6%) patients had accidental arterial injuries during endovascular procedures. Two (5.1%) of these cases had localized carotid arterial bleed after carotid stenting which responded well to conservative management. In one (2.5%) patient femoral artery thrombectomy with patch plasty was done. Surgical intervention was done in 30(76.9%) cases. All patients were initially assessed by surgical registrar and then by vascular surgeon. Personal particulars, age, gender, mechanism of injury, site of injury, associated injuries, time interval between injury and operation were recorded. Complete blood count, urine routine examination, blood grouping & cross match and plain X-rays of affected regions were ordered. In patients more than 40 years of age ECG was also requested. Angiography was done in stable cases where it was difficult to localize the exact site of vascular injury clinically and the patient has reported within four hours. It was also done in all cases of traumatic AVF and pseudoaneurysms. All haemodynamically unstable patients were resuscitated before operation. Inj cefuroxime, 1.5 gm (IV) 8 hourly for 24 hours in clean incised wounds, traumatic AVF and pseudoaneurysms and for at least 72 hours, in cases of gun shot wounds and extensive soft tissue injuries, was administered. Only two cases of vascular injury at wrist were done under local anaesthesia. Rests of 28 cases were operated under general anaesthesia. Operation site as well as donor site were prepared and draped. In most of the cases, proximal and distal control was achieved before exploring the site of injury. Thorough debridement of surrounding soft tissue and vessel wall itself was done where required. Whenever possible long saphenous vein from the same leg was used, otherwise, it was taken from contralateral leg. In one case, traumatised superficial femoral vein was ligated and it healthy segment was used to bridge the gap (Fig 1 & 2). In no case artificial graft was used. Just after operation distal pulses return or documentation of adequate blood flow by hand held Doppler was considered to be a successful anastomosis. Average duration of hospital admission was 8 days. Thereafter each patient was regularly followed up for at least two months. Patients were inquired about aggravation or relief of ischaemic symptoms and were examined for skin changes. Distal pulses were palpated and hand held Doppler was used in case of unconvincing pulses. Wound infection was encountered in 2/30 (6.6%) cases -one at left groin (common femoral artery) and other at left arm (brachial artery).Both turned out to be MRSA positive. They were treated with normal saline dressings twice daily. Antibiotics against MRSA were not administered as there were no systemic signs or symptoms of infection. The groin wound healed well while the patient with vein graft infection in arm had secondary haemmorhage. Extra anatomical bypass was not possible due to extensive soft tissue debridement and local spread of infection. This patient ultimately had an amputation at left mid arm level.

RESULTS

The age of patient ranged from 6 to 68 years. There were 36 (92.3%) males and only 3 (7.6%) females. Blunt trauma dominated gun shot wounds in our study (1.14:1). In six (15.3%) patients mechanism of injury was categorized as miscellaneous (Fig. 3). Out of these, four patients had sharp cut injuries from glass, electric saw, metal sheet and a knife. One had constriction injury due to his shirt sleeve entrapped in a motor belt while another had accidental injury due to penetrating injury from a metallic rod.

Associated fractures were seen in 10/30 (33.3%) cases. One patient (3.3%) had associated knee joint dislocation. Tendon injuries were associated in 2/30 (6.6%) cases while nerve injury was observed in 3/30 (10%) cases.

In 15/30 (50%) cases lower limb vessels; in 13/30 (43.3%) cases upper limb vessels and in 2/30 (6.6%) cases neck vessels were affected.

Only 6/39 (15.3%) patients reported within 6 hours, 11/39 (28.2%) between 6-12 hours, 9/39 (23%) between 12-18 hours and 13/39 (33.3%) after 18 hours (Table I).

In 12/30 (40%) cases reversed saphenous vein graft and in 1/30 (3.3%) case superficial femoral vein was used as an interposition graft. Primary end to end anastomosis was possible in only 5/30 (16.6%) cases. Fasciotomies were performed in 3/30 (10%) cases. Only 1(3.3%) vein (common femoral vein) was repaired. Details of surgical interventions are shown in Table II.

Wound infection was encountered in 2/30 (6.6%) cases. Both turned out to be MRSA positive. One out of these, one (3.3%) ultimately had an amputation at left mid arm level. All patients were followed up for at least two months. There were no graft thrombosis or ischaemic symptoms during this period. These cases were advised 4 weekly follow up in

Table 1: Time and percentage

Time	Number	Percentage
Within 6 hours	6	15.3
6 to 12 hours	11	28.2
12 to 18 hours	9	23
More than 18 hours	13	33.3

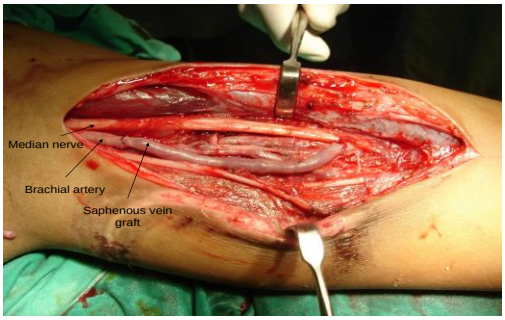

Fig. 2: Crushed brachial artery replaced with saphenous vein graft interposition

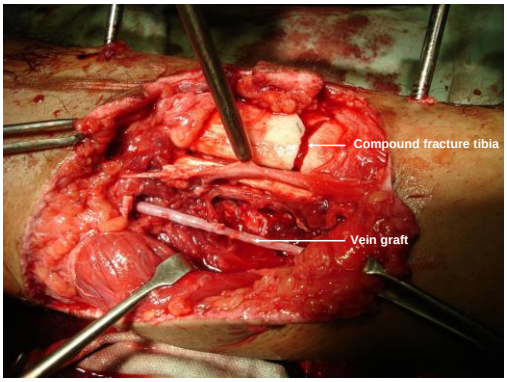

Fig. 3: Posterior tibial artery repaired with venous graft

Table 2: Surgical interventions

Injured vessel	No. of cases	Procedures performed
Superficial femoral artery	2	Reversed saphenous/superficial femoral vein graft
Anterior and posterior tibial arteries	2	Reverse saphenous vein graft
Brachial artery	5	Reverse saphenous vein graft
Popliteal artery	2	Reverse saphenous vein graft
Superficial femoral vessels(Traumatic AVF)	2	Reverse saphenous vein graft
Radial and ulnar artery(both)	3	Primary repair
Isolated ulnar artery	2	Primary repair
Isolated ulnar artery	1	Patch angioplasty
Isolated radial artery	1	Ligation
Vertebral artery pseudoaneurysm	1	Ligation and excision
Carotico-jugular fistula	1	Repair
Pseudoaneurysms(common and superficial femoral arteries)	2	Repair
Pseudoaneurysm(brachial artery)	1	Repair
Common femoral artery occlusion(post coronary angioplasty)	1	Thrombectomy/patch angioplasty
Compartment syndrome	3	Fasciotomies
Common femoral vein	1	Repair

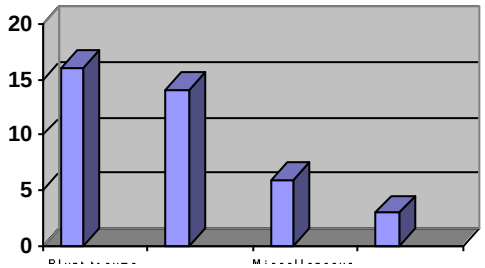

Figure 3: Mechanism of injury

nearest hospitals.

DISCUSSION

Most of the experience in vascular trauma was gained during deadly wars in the last about sixty years [1-3, 6] During Afghan war 224 extremity vascular injuries were reported in 18 months, roughly 150 per year [5]. Fasol et al reported 94 patients in 3 months (approx. 376/year) on the Thailand-Cambodia border [6]. In both studies antipersonnel mines cause the majority of civilian extremity vascular injuries [6, 7].

Incidence of vascular trauma in civil life is significantly less as compared to military conflicts. Tobin has reported 10 cases per year of extremity vascular injuries at a university teaching hospital in Australia [7]; in Tbilisi, Georgia, Razmadze reported 10.5 cases per year [8]; in Sweden, Kjellstrom and Risburg reported 8.2 cases per year [9], and in Oxford, UK, Magee et al reported 4.7 cases per year [10]. Humphrey et al reported 12.4 extremity vascular injuries per year at a rural trauma center in Missouri [11]; Feliciano et al reported 55 lower extremity vascular injuries per year at Ben Taub General Hospital in Houston, Tex [12] Iatrogenic vascular injuries have also increased in the last 5 decades as more and varied physicians access the vascular system [13].

The time lapse between injury and surgical intervention has a significant effect on outcome of a case in terms of limb salvage and avoidance of complications [14]. Best results are achieved if reperfusion is achieved within 6-8 hours [15].

Vascular injuries mainly result either from penetrating or blunt trauma. Although in war scenario penetrating injuries outnumber other causes of vascular trauma, in civil life significant number of cases due to blunt trauma are also encountered.

Arterial injuries can be repaired by different techniques depending upon the mechanism of injury, type of injury and associated injuries. It is possible to do end to end anastomosis mainly in sharp cut injuries only. Most of gunshot wounds require extensive debridement of surrounding soft tissue and vessel wall itself resulting in a gap between vessel ends that require interposition graft. Reversed long saphenous vein graft is a most commonly used conduit to bridge these gaps [16] due to its easy availability, low infection and thrombosis incidence. PTFE graft can also be used in these cases but has poor patency rates in distal vessels [17]. Although an isolated Radial or Ulnar artery injury can be treated by ligation of a single vessel [18], our policy is to repair even a single distal vessel wherever possible. The reason behind this is that one out of five patients may have an incomplete palmar arch [19]. Secondly, most of these patients are young persons who can sustain vascular trauma again in the future and there is no surety in our setup that they will get an expeditious and expert vascular help to repair the remaining single artery.

It has been shown that a substantial percentage of venous repairs will thrombose in postoperative period, especially if an interposition vein graft has been used [20]. However, limb salvage is not adversely affected by this high rate of venous repair thrombosis [21]. Clinical examination and venous duplex scan do not provide an accurate assessment of venous patency after venous repair.

We have compared our study with other civil vascular trauma series. We have received about three times more cases than other reported series [7-10]. The main reason behind this may be the fact that our hospital has been a referral center for vascular cases for a large number of hospitals for good about 15 years. In most of the reported series, penetrating trauma was the most common cause of these injuries while in our study blunt trauma was little more common than penetrating trauma. Site of

injuries in our study closely resembled most of the reported civil vascular trauma studies.

There are number of reported cases where vascular injuries have been treated by endovascular techniques like stent grafting or embolic occlusion [22]. However, there are limited indications for these modalities and still conventional repair of vascular injuries is in vogue in most of the vascular centers.

CONCLUSION

Significant number of vascular injuries present to our tertiary care hospital. The incidence of gun shot wounds was not significantly less than blunt trauma. Young males were predominantly affected by these injuries and lower limbs were affected more than upper limbs. Very less number of cervical vascular trauma and no case of thoracic or abdominal vascular injuries reached our hospital. Most probably this was due to high early mortality rates of these injuries. In almost half of the cases, venous interposition graft had to be used while primary end to end anastomosis was possible in only 16.6% of operated cases. This indicates that not only in gun shot wounds but also in blunt trauma a significant gap results between two ends of a vessel when proper debridement of a vessel is done.

Complications, especially amputation rate is fairly less if these injuries are properly managed as early as possible.

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