

Peripheral Vascular Trauma – A Review of 50 Cases

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Vascular trauma has become a common surgical emergency now a days. Early identification, prompt resuscitation and effective vascular repair are the mainstays in the limb salvage approach to these injuries. A review of 50 cases of vascular trauma cases parting from 1995 to 1997 in surgical emergencies of Mayo Hospital, Lahore. Fifty patients with peripheral arterial trauma were included out of which 14(28%) were blunt injuries and 36(72%) were penetrating injuries. Firearm penetrating injuries were the commonest 29(83%). End-to-end anastomosis was the most common procedure employed for repair of vascular injuries 17(34%). Failure rate in our series was 3(6%) resulting in limb loss.

KEYWORDS: .Vascular trauma

Vascular injuries are now more commonly seen surgical emergencies than they used to be about 20-25 years ago¹. The pattern of such injuries is more or less the same, except that firearm penetrating injuries constitute a major bulk of these cases signifying deterioration of social norms in our society. Active and judicious management of such injuries results in a much better outcome in the form of limb salvage.

Identification and treatment within 6-8 hours of injury are the most important factors determining the outcome of management of these injuries. Meanwhile crushing injury involvement of popliteal artery and/or its branches, associated injuries (fractures, nerves and venous injuries) and coexistence of peripheral occlusive arterial disease are poor prognostic criteria for the limb salvage approach^{1,2}.

Material and methods

In this study, conducted over a period of two years in the Surgical Department of Mayo Hospital Lahore, every case of peripheral arterial injury was included. These patients were divided into two groups according to the presence of specific signs. Those with overt signs of arterial injury – “hard signs” – (absent or diminished distal pulses, active haemorrhage, expanding haematoma, bruit/thrill and distal ischaemia) were placed in Group A^{1,2}. Patients with equivocal or “soft signs” (small stable haematoma, injury to anatomically related nerve, unexplained hypotension, proximity of injury to a major vessel) were included in Group B^{1,2}. Patients in Group A were promptly resuscitated and taken straight to the emergency theatre. Group specific blood transfusions were given. Blood complete, urine analysis, blood urea and electrolytes were done. X-rays to exclude associated fractures were taken where indicated.

Group B patients were thoroughly examined monitored and investigated to confirm the presence of vascular injury. Various investigations like Doppler arterial pressure measurements and arteriography were performed in patients with equivocal or “soft signs”.

Chemoprophylaxis was achieved by third

generation cephalosporins in all patients with vascular trauma. Group A patients and those of Group B who needed exploration, operation was carried out under general anaesthesia. A generous incision along the vessel was made to expose the injured vessel and to achieve proximal and distal control. The arterial injury was managed according to the site, extent and severity of injury. Various procedures, undertaken during this study were ligation, lateral repair, end to end anastomosis, venous graft, prosthetic graft and, in some cases, arteriotomy with thromboembolectomy.

The wound was thoroughly washed with normal saline after necessary repair. Redivac suction drainage was routinely employed. Fasciotomy and wound closure was selectively performed. In the postoperative period, patients were routinely subjected to anticoagulation and antibiotics. The postoperative course was closely monitored and the complications were recorded and managed.

Results

Fifty patients were included in this study, comprising of 42(84%) males and 8(16%) females. The ages ranged from 6-60 with a mean of 24 years. Most of the patients were young adults ranging from 20-39 years presenting within 8 hours after injury, The interval between injury and presentation ranged from ½ hour to 24 hours, average being 4 hours. Patients were grouped according to haemodynamic stability as stable or unstable patients at the time of presentation; 38(76%) were unstable haemodynamically with a pulse rate of more than 100-140 per minute and B.P. either not recordable or systolic pressure less than 80mmHg as shown in Table 1.

Table 1 Haemodynamic stability in patients with vascular injury.

Group	No. of pts.	%age
A-Stable	12	24
B-Unstable	38	76

The pattern of injury was as shown in table 2. -The most common vessel involved was the common femoral artery

13(26%) followed by the brachial 11(22%). Incidence of the vessels involved and the type of surgical technique adopted is shown in Table 3. In patients with signs and symptoms of 'compartment syndrome' (i.e. distal ischaemia, edema of forearm/leg and tenderness) fasciotomy (either single or multiple) was performed as shown in Table 4.

Table 2. Pattern of injuries.

Mode of injury	n=	%age
I- Blunt	14	28
II-Penetrating	36	72%
a. Firearms	29	----83%
b. Stabs	7	----17%

Table 3

Name of vessels	n=	%age	Ligation	Arteriotomy & thromboem olectomy	Lateral repair	End-to-end anastomosis	Vein graft	Prosthetic graft
LOWER LIMB								
Common femoral	13	26		1	3	6	2	1
Sup. Femoral	10	20	2	-	1	4	2	-
Profunda femoris	2	4	2	-	-	-	-	-
Popliteal	6	12	-	3	-	1	2	-
Ant. Tibial	1	2	1	-	-	-	-	-
Post tibial	1	2	1	-	-	-	-	-
UPPER LIMB								
Axillary	1	2	-	-	1	-	-	-
Brachial	11	22	-	1	2	5	3	-
Radial	3	6	2	-	-	1	-	-
Ulnar	1	4	2	-	-	-	-	-

Table 4 Number of fasciotomies

	N=	%age	None	Single	Multiple
Upper limb	17	34	11	1	5
Lower limb	33	66	10	1	22

Eleven patients (22%) had associated venous injuries. Seven out of these were ligated and 4 repaired. Thirteen patients (26%) had associated fractures managed by external fixators (in 5 patients), back slab (5 pts) and pin & plaster (3 pts). Three patients (6%) had associated nerve injuries, 2(66%) repaired primarily and one secondarily. Twenty one (42%) patients had associated soft tissue injuries (Table 5).

Table 5. Associated injuries

Associated injuries	n=	%age	Management
Venous injury	11	22	7-Ligation 4-Repair
# of long bones	13	26	5-Ext fixator 5-Back slabs 3-Pin plaster with windows
Abdominal	3	6	Exp. Laparotomy
Nerve	3	6	2-Primary repair 1-Secondary repair
Soft tissues	21	42	14-Debridement & primary closure 7-Debridement and secondary closure

In the post operative period, 34(68%) patients made uneventful recovery while 16(32%) patients had the

following complications; wound infection (14), sensory loss (5), motor loss (5), thrombosis after repair (4), amputation (3), secondary haemorrhage (2), pseudoaneurysm (2) and AV fistula formation (2) (Table 6)

Table 6 Complications

Complications	n=	%age
None	34	68
Wound infection	14	28
Secondary haemorrhage	2	4
Thrombosis	4	8
Pseudoaneurysm	2	4
A.V. fistula	1	2
Sensory loss	5	2
Motor loss	5	10
Amputations	3	6

The reasons for amputation in the 3 patients were blow out of arterial repair, delay in repair and incomplete fasciotomy.

Discussion

The incidence of vascular trauma varies in different parts of the world. It is relatively uncommon in the U.K¹ which is in marked contrast to North America and Northern Ireland² where such injuries are every day occurrence. Mattox et al² have shown an increase from 27 cases to 213 cases per year from early 1960's to 1987 in their series of 4459 patients of civilian vascular injuries managed in a single trauma centre. In our study, 84% patients were

males of younger age group, which is similar to the pattern seen in our study.

The mechanism of injury again is variable and is also changing with time^{1,2}. In the North American study, 90% of the cases were due to penetrating injuries, which is quite consistent with our study. The incidence of penetrating injuries in this study was 36(72%), blunt trauma accounting for the rest of 14(28%) cases, as shown in Table 1. However, the experience from U.K. seems quite different from ours, where accidents accounted for 77% of injuries and stabs for the remaining 23%. Interestingly there were no firearm vascular injuries¹.

The distribution of injuries is interesting and varies from one center to the other. In a large series from N. America², truncal injuries accounted for 66%, abdominal vascular injuries 33.7% and lower limb injuries including the groin only 19%. Another study from U.K.¹ highlights brachial artery injury in 30% cases and superficial femoral in 15%. In our study, common femoral and superficial femoral artery was injured in 46%(23) cases followed by the brachial in 22% (Table 2).

Most of our patients reported in the emergency after a mean period of about 4 hours ranging from half an hour to 24 hours. This seems more than quoted in most of the vascular injury studies^{2,3,4}. The role of angiography in establishing vascular injuries is limited due to limitations imposed by time and associated complicating injuries. In protracted blunt injuries early use of angiography may help to avoid amputations secondary to missed or delayed injuries⁵. Arteriography is mainly performed in patients with doubtful signs (soft signs) and where the injury lies in proximity to a major vessel⁶.

In recent years, Duplex ultrasonography has emerged as a reliable method of diagnosis in patients with potential vascular injury⁶. The Doppler arterial pressure index, if more than 50% of the brachial, obviates the need for arteriography of a suspected vascular injury⁸. Meissner et al have recommended a combination of physical examination, Doppler arterial pressure measurement and Duplex sonography to be the optimal screening method for a potential vascular injury^{8,9}. However, in our setting, with most of the patients belonging to a poor socioeconomic status and meager hospital resources, we have found the approach of direct exploration to be the best, method in excluding the vascular injury.

The role of venous repair in civilian trauma remains controversial. Most of the venous repairs will thrombose in the early postoperative period, especially if an interposition vein graft is used¹⁴. However, this does not adversely influence limb salvage. In our study, there were 11(22%) cases of associated venous injury and 7(64%) were safely ligated without any ill effects.

Obstruction to venous drainage is a major factor in the development of compartment syndrome in dual vascular injuries of the lower limb. Fasciotomy plays an important part in limb salvage. It is recommended in all patients with compartment syndrome, popliteal vascular injuries and combined arterial and venous injuries. A

liberal use of fasciotomy is recommended in all the cases rather than simple observation or its selective application in spite of the fact that fasciotomy considerably prolongs hospital stay¹⁶.

In good trauma centers limb salvage is virtually guaranteed when arterial injury is associated with a stab or gunshot wound. The outcome in such cases is better because of minimal injury to surrounding soft tissues. Such an injury is uniformly suspected, deliberately sought and expeditiously repaired⁷. In our study, the amputation rate was 3(6%) with comparison to another study by Javeed et al¹⁸ where the amputation rate was 16.07%. The most significant factors for failure are delay in reaching hospital, delayed repair, inadequate fasciotomies and poor surgical technique.

Availability of properly trained vascular surgeon in the main city trauma center has become the need of the day. We suggest that these centres should be more adequately equipped to deal with cases of vascular trauma. Proper vascular instruments, Fogarty catheters and suture materials must be readily available to handle such vascular emergencies.

Strict adherence to firearm legislation and prevention of road-traffic accidents will also help reduce the incidence and frequency of such major injuries.

We conclude that an early diagnosis with prompt resuscitation and adequate repair accompanied with liberal fasciotomies will result in a better approach towards limb salvage in vascular trauma patients.

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