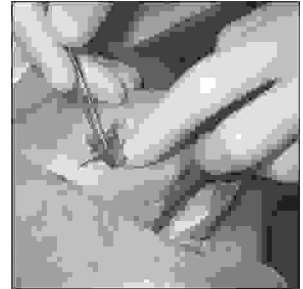


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PERIPHERAL VASCULAR INJURIES; EPIDEMIOLOGY AND MANAGEMENT



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SUMMARY... tmfarani@yahoo.com, chowhan04@yahoo.com. **Introduction:** Peripheral vascular injuries constitute 4-6% major trauma. Although uncommon the complication of hemorrhage and Ischemia can be limb threatening and life threatening. Rapid diagnosis and appropriate treatment is therefore essential. Delay allows irreversible Ischemic injury to take place and encourages propagation of intravascular thrombosis, which results in eventual loss of function or even limb itself. **Objective:** (I) To collect data about different aspect of epidemiology and management of Peripheral vascular injuries. (II) To study the relationship between latent period for revascularization and outcome of surgery. **Design:** Non interventional observational study. **Setting:** C M H Kohat. **Period:** From 01 Jan 2004 to 31 Dec 2006. **Material & Methods:** Total of 46 cases of all age and sex groups was included in the study. Only those patients were included who had vascular injury to extremities whether direct (penetrating, blunt) or indirect (associated with fracture and dislocations) injuries. Relevant history was obtained from the patients themselves and from their relatives or witnesses. Relevant physical examination was performed. Necessary investigations were done. Patients were treated according to standard protocol. **Results:** The peripheral vascular injuries were more common in 21-40 years of age group (69%) and among male(82%). Vascular trauma caused by the firearm injuries (60.86%) was the most common cause, other being road traffic accidents (26.08%) and blunt trauma (13.04%). The most common clinical presentation was shock and paresthesia (50%). Most off the patient reached hospital within 6-12 hours (47%), and belongs to rural areas (69%). Frequency of involvement of vessels was femoral artery (41%) and brachial artery (23%). Types of vascular injuries were , laceration to the vessel wall (56%) and loss of vessel wall segment (17%). End-to-end anastomosis was most common (78%) .others being interposition reverse vein graft (13%) and direct suturing of vessel wall (8.7%)Amputation rate was highest in cases where revascularization occurred after more than 12 hour (71%). Common complications after repair were residual edema (17%) and infection (6%). Overall mortality rate was 4 % and morbidity rate was 28%. **Conclusion:** All cases of peripheral vascular injuries should be surgically explored. Revascularization should be achieved within 12 hours. Patients presenting late or with crush injuries may need

amputation.

Key words: Epidemiology, Vascular trauma, Shock, Firearm injuries.

INTRODUCTION

Peripheral vascular injuries constitute 4-6% of major trauma. Although uncommon the complications of hemorrhage and ischemia can be limb threatening and life threatening. Rapid diagnosis and appropriate treatment is therefore essential. Delay allows irreversible ischemic injury to take place and encourages propagation of intravascular thrombosis, which results in eventual loss of function or even limb itself¹. The mechanism of injury can be direct or indirect. Direct variety includes blunt trauma and penetrating injuries like gunshot and stab wounds. In indirect group fractures and dislocations due to road traffic accidents are the common causes of vascular injuries. Penetrating and blunt injuries to arteries are major cause of morbidity and mortality in the trauma patients. The results are more promising in case of penetrating injuries when compared with blunt trauma². When repair is possible operative procedures include lateral repair, end-to-end anastomosis, and interposition of autogenous vein graft or prosthetic graft. Repair depends upon type of injury. There are three types of injuries lateral wall injury, complete transection and segment loss of vessel. In an ideal setting the patient must reach the hospital within six hours to obtain the promising results. The shortened transportation time, repair of associated venous injuries and availability of experienced surgeon all contribute towards a successful outcome³. Associated extensive soft tissue injury, bony injury or avulsed nerve may make the limb useless even in setting of a successful repair. The liberal use of fasciotomy in the injured extremity is imperative in reducing post operative oedema and compartment syndrome. Knowing the key signs of ischaemia, parasthesia, pallor, pain, paralysis, and pulselessness will help in preventing limb loss. Successful management of traumatic vascular injuries depend upon a high index of suspicion, aggressive resuscitation and prompt surgery⁴. In emergency practice no special investigations are necessary and a selective policy for use of

angiography can be followed⁵. There are difficulties in obtaining emergency arteriograms in vascular trauma even in the best centers in the world and routine arteriographic evaluation of patients with trauma to the extremities has been declining in popularity⁶. A diminished or absent distal pulse, a history of persistent arterial bleeding, a large or expanding hematoma, major hemorrhage with hypotension, an injury to anatomically related nerves or a bruit, alone or in combination are useful in the diagnostic evaluation⁷. Urgent amputation of the limb is indicated when perfusion of limb can not be resorted for sepsis and for a limb which is so severely injured that can be no prospect for return of any function⁸. Venous trauma has been neglected for long the reason being absence of significant short and long term problems and inaccurate analysis of the venous trauma⁹. Some authors have achieved best results with simple ligation, other consider the issue controversial. The type, severity and location of the injury all are important. The role of interposition vein graft or synthetic graft in venous injury is not well established. The rate of post operative oedema following ligation of vein is variable. Hardin did not observe long term sequelae in these cases¹⁰, while Sullivan had many patients with long term venous insufficiency¹¹. The role of heparin or dextran in increasing the patency of venous repair is still not well defined¹².

MATERIAL AND METHODS

Patient with trauma to the extremity whether direct or indirect admitted in CMH Kohat, were studied for vascular injuries. All the patients of vascular injuries of every age and sex group were included in the present study. A total of 46 patients were studied. Relevant history was obtained from the patient themselves and also from their relatives or witnesses. In case of penetrating trauma victims were enquired about the size of stabbing weapon or caliber of the gun and distance from which the firearm was discharged. In case of road

traffic accident and blunt trauma, history was taken regarding the time, mode of injury, position of the patient and speed of the vehicle. Presenting complaints of the patients especially of severe hemorrhage, pain paresthesia, and paralysis were recorded. Physical examination was done by recording of vital sign like Pulse, Blood pressure, Temperature and respiratory rate was strictly maintained. Careful examination of the injured extremity was done and special attention was given to establish the diagnosis. Diminished or absent pulse. Major hemorrhage with hypo-tension. Large or expanding haematoma. Bruit at or distal to injury. Anatomically related neurological defect. Proximity of injury to major vessel. We diagnosed vascular injuries on clinical ground and to some extent with Doppler ultrasonography in doubtful cases. Associated fractures were diagnosed clinically and confirmed radiologically. Hb % estimation was done in every case. In all patients with suspected vascular injury, exploration was done. Method adopted for repair were according the type of vascular injury and includes end-to-end anastomosis, direct suturing of vessel wall and interposition reverse vein graft where segment loss was more than 6-8 cm. Graft was taken from the great saphenous vein of contra lateral side. Fasciotomies were performed in those cases which were operated after 12 hours or had gross oedema of limb. The main nerves were repaired primarily in clean cases and repair was deferred for 6-8 weeks in contaminated cases.

INCLUSION CRITERIA

All patients of every age and sex group Those patients who had vascular injury of the extremity

EXCLUSION CRITERIA

All patients who had severely crushed limbs in whom there was no prospect of return of function. Heavily contaminated wounds

RESULTS

Patient with trauma to the extremity whether blunt, stab or gunshot admitted in CMH Kohat, were evaluated for the peripheral vascular injuries. The results of various observation were recorded in the form of tables. A total

of 46 cases of peripheral vascular injuries were included in the present study. Although no age was found to be safe yet the peak occurrence was noted between 21-40 years of age (69.55%), mean age in male was noted to be 29 years while in females it was 26 years (table I). Out of 46 patient of peripheral vascular injuries, 38(82.6%) were male and 8(17.3%) were female with sex ratio of 4.5:1 (table-II).

Age (year)	No. of Pts	%age
0-10	02	4.34%
11-20	05	10.86%
21-30	20	43.47%
30-40	12	26.08%
40-50	04	8.69%
51 onward	03	6.52%
Total	46	100%

Aetiological factors were firearm injuries in 28(60.86%), road traffic accident seen in 12(26.08%), blunt trauma seen in 4(8.69%) and injury due to sharp instruments seen in 2(4.34%), (table-III). We have also calculated the time interval between injury and hospital arrival. 39 patients (84.78%) reached hospital within 12 hours and 7 patients reached after 12 hours.

Sex	No. of pts	%age
Males	38	82.60%
Females	08	17.40%
Total	46	100%

In our study 32 patients (69.57%) were evacuated from rural area and 14(30.43%) were from urban area. Frequency of vessels involved in the upper limb was brachial artery in 11(23%) and axillary artery in 6(13%) patients. In the lower limb femoral artery was involved in

19(41%) and popliteal artery in 10(21%) patients (table IV). Most common pattern of vascular injury which we encountered was laceration of the vessel wall with or without thrombus formation in 26 patients (56.52%). Loss of vessel wall segment was found in 8 patients (17.39%), complete transaction of vessel wall in 6(13%) patients and compression of vessel in situ in 4(8.7%) patients.

Mechanism of injury	No of pts	%age
Firearm injuries	28	60.86%
Road Traffic accident	12	26.8%
Blunt trauma	04	8.86%
Injury due to sharp instruments	02	4.34%
Total	46	100%

Partial cut of the vessel wall was found in 2(4.3%) patients (table V). Method used for vascular repair were end-to-end anastomosis in 36(78.20%) patients, interposition reverse vein graft in 6(13.04%) patients and direct suturing of vessel wall in 4(8.7%) patients (table VI).

Vessel involved	No of pts	%age
UPPER LIMB		
Axillary artery	6	13.04%
Brachial artery	11	23.91%
LOWER LIMB		
Femoral artery	19	41.30%
Popliteal artery	10	21.73%
Total	46	100%

Rib fractures were found in 5(10.86%) patients and injury to long bones in 4(8.69%) patients, these fractures were fixed prior to vascular repair. Radial nerve injury was found in 2(4.34%) patients and median nerve injury in

2(4.34%) patients. All of these injuries were repaired after 8 weeks. Associated venous trauma included popliteal vein injury in 3(6.50%) patients and femoral vein injury in 1(2.17%) patient. These veins were ligated. Among post operative complications residual oedema was present in 8(17.39%) patients and infection in 3(6.25%) patients.

Pattern of injury	No of pts	%age
Laceration of vessel wall with or without thrombus formation	26	56.52%
Loss of vessel wall segment	08	17.39%
Complete transaction of vessel wall	06	13.04%
Compression of vessel in situ	04	8.70%
Partial cut of vessel wall	02	4.34%
Total	46	100%

Method of repair	No of pts	%age
End to anastomosis	36	78.26%
Interposition reverse vein graft	06	13.04%
Direct suturing of vessel wall	04	8.70%
Total	46	100%

Residual oedema was treated successfully by conservative measures and infection with antibiotics. Haemorrhage occurred in 2(4.34%) patients, while acute renal failure developed in 2(4.34%) patients, both these complications were managed accordingly. One patient (2.17%) had thrombosis which ultimately resulted in amputation (table VII).

Time interval between injury and revascularization was directly proportional to the rate of amputation. In most of the patients 39(87.75) revascularization was restored within 6-12 hours and out of them 8(20.51%) patients required amputation. Seven (15.45%) patients arrived

after 12 hours and 5(79.49) of them required amputation.

Complications	No of pts	%age
Residual oedema	08	17.39%
Wound infection	03	6.52%
Hemorrhage	02	4.34%
Acute renal failure	02	4.34%
Thrombosis	01	2.17%
Total	16	34.76%

DISCUSSION

Vascular injuries are major cause of morbidity and mortality in trauma patients and have the highest resuscitation priority after the airway and breathing have been protected. The most important and critical prognostic factor is time of presentation since injury. Our main aim of this study was to see epidemiology and management of peripheral vascular injuries, secondly to study the relationship between latent period for revascularization and outcome of surgery. The age group most prone to get peripheral vascular injury observed in our study was between 21-40 (69.55%). Similar finding have been reported by Hood and associates in their study age group was 25-40 years (65%)¹³. Knudson and associates found in 42 cases that most commonly affected group was between 20-40 years age (60%)¹⁴. Large number of cases in this age group can be explained by the fact that persons in this age group are at their peak of their activity and are subjected to the hazards of accidents and injuries. In our study we observed that males are more vulnerable to sustain peripheral vascular injury. Out of 46 cases 38 (82.60%). The firearm injury is the most frequent aetiology of peripheral vascular injury. Frykberg ER. et al studied 65 victims of vascular injury caused by firearm in a one year period representing 58% of vascular trauma¹⁵.

In our study most of patients reached hospital between 6-12 hours 39(84.78%) patients. In recent study carried out at Nishter Hospital Multan in which 52 patients of

peripheral vascular trauma similar results were observed. 18(34%) patients were operated within 8 hours of injury and in 34(65%) patients revascularization occurred after 8 hours¹⁶. Brachial artery was most commonly affected in upper limb (23%) and femoral artery in lower extremity (41%). These observations are similar to the study of Nassoura et al, who described a study of 101 patients in whom femoral artery injury 40% was most common¹⁷.

Common pattern of vascular injury that were found in our study were laceration of vessel wall with or without thrombosis formation in 26(56.52%) patients, loss of vessel wall segment in 8(17.39) patients, Savage and Walker observed in their study of vascular trauma, a rise of 40(60%) patients had laceration of vessel wall and 10(15%) patients were having loss of vessel wall segment¹⁸. Method of vascular repair adopted were end-to-end anastomosis in 36(78.26%) patients, interposition reverse vein graft in 6(13.04%) cases and direct suturing of vessel in 4(8.70%) cases. Hughes reported in his study on the primary repair of wound of major arteries that end-to-end anastomosis was most common method¹⁹. Vanway described that interposition reverse vein graft is usually needed in cases where vascular injury is associated with blunt trauma²⁰. In our study most common associated injury was fracture of ribs and long bones in 9(19.59%) cases. Rich in Vietnam reported thousand cases out of 310(31%) had associated fracture of long bones or ribs²¹. Other associated injury was popliteal vein injury in 3(6.5%) cases. Drost et al concluded in his study that popliteal vein injury was common in lower extremity vascular trauma²². Residual oedema was most commonly encountered post operative complication (17.39%) which was treated conservatively by elevation and compression bandage. It was due to combined effect of trauma and surgery, moreover in most of our cases we ligated veins. Wound infection and haemorrhage were the next common complications occurring in 3(6.5%) and 2(4.34%) patients respectively. Thrombosis was found in only in 1(2.17%) patient. Smith and associates reported that thrombosis is more common after vascular repair,²³ but in our study only 1 patient developed thrombosis. Rate of amputation was 71.42% when revascularization established after 12

hours but it dropped to 28.58%, when arterial repair was accomplished in 6-12 hours period. Fryberg and associates noted that gangrene was rare if repair done within 6 hours but occurred in 50% cases if repair was delayed for 12 hours²⁴. Where as in study of Nishter Hospital in 52 patients were studied showed that 61.56% cases reached the hospital after 8 hour and in these amputation rate was 38.46%. The rate of amputation was 5% when repair was accomplished within 8 hours.¹⁶

CONCLUSION

All cases of peripheral vascular injuries should be surgically explored. Every effort should be made to achieve revascularization within 12 hours. Patients presenting late or with crush injuries should under go amputation.

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