

Original Article

Outcome of Vascular Trauma at Pakistan Institute of Medical Sciences, Islamabad

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Background: Vascular trauma is a common cause of mortality and morbidity worldwide. Its incidence has increased considerably during last 40 years. There are few accurate quantitative data available presently on the nature and outcome of these injuries. The present study was undertaken to analyze the outcome of vascular trauma.

Study Design: Descriptive study

Study Place and Duration: It conducted at Surgical Unit IV, Pakistan Institute of Medical Sciences, Islamabad from June 2007 to December 2009.

Materials and Methods: All 32 patients who suffered a vascular injury requiring surgical intervention were included. Primary vascular repair was carried out where possible; if not interposition vein graft was placed. Early liberal fasciotomy was considered as and when required. Patients with isolated venous trauma and patients with obviously unsalvageable lower extremity injury requiring primary amputation were excluded from the study.

Results: There were 28 males and 4 females with mean age of 25 ± 3 years. Firearm injuries account for 60% of all cases, followed by road traffic accidents injuries. The femoral artery was the most frequently injured, constituting 25% of all cases. Interposition vein graft was done in 19 (59.4%) patients and primary end-to-end anastomosis was done in 9 (28.1%) patients. Lateral repair was done in 3 (9.4%) patients while in one (3.1%) patient prosthetic graft was used. Limb amputation rate was 6.25% and mortality rate was 15.6%.

Conclusion: Vascular trauma represents a small percentage of all surgical admissions and almost all such patients require surgical intervention. Firearm injury was most common mechanism involved. A properly staffed trauma center providing a multidisciplinary approach for such vascular injuries can lead to an improved outcome.

Keywords: Vascular trauma, Revascularization, Trauma.

Introduction

Trauma is the leading cause of mortality and disability during first four decades of life and third most common cause of death overall.¹ Vascular injuries comprise 3% of all civilian trauma and is most common cause of mortality and morbidity worldwide.² Mechanism of injury vary greatly depending upon geographical area.^{3,4,5} However different mechanisms include penetrating trauma, gunshot wounds and road traffic accidents. Peripheral injuries account for 80% of all cases of vascular trauma.⁶ The lower extremity is

involved in two-third of all patients with vascular trauma.⁷

There are different options for the surgical revascularization of traumatized vessels. Vascular ligation was the only option for the management of patients presenting with vascular injuries in world war I.^{8,9} Surgeons performed the first successful arterial repair with preservation of the lumen. Saphenous vein graft was used in 1907.^{5,7} If not recognized and treated rapidly, injuries to major arteries, veins, and nerves may have disastrous consequences resulting in loss of life or limb.

There are few accurate quantitative data available presently on nature and outcome of these injuries.¹⁰ This study was carried out to audit the cause of injury, treatment and outcome of vascular trauma operated upon for vascular surgery in our setup.

Material and Methods

This was a descriptive study conducted in surgical unit IV, PIMS, Islamabad. All patients undergoing operative treatment for vascular trauma from June 2007 to December 2009 were studied. Patient with vascular injuries which don't require operative intervention and iatrogenic injuries were not included. Patient information was obtained from operative logbooks and patient medical records. The cause of injury, vessel involved, intervention done complication and outcome was recorded. Patients were initially resuscitated in emergency reception and patients having hard signs on clinical examination like pain, pallor, pulselessness, paresthesia, pulsatile bleeding and large or expanding hematoma were transferred directly to emergency theater and explored while patients having soft signs like relatively diminished but palpable pulse, non expanding hematoma were subjected to vascular Doppler before exploration. All patients received third generation cephalosporin at induction of anesthesia. All fractures were fixed before vascular repair by orthopedics department. The injured vessel was exposed after proximal and distal control of bleeding. Extent of injury was accessed. Patients with >2.5cm segmental loss were revascularized by reverse saphenous vein graft. Thorough debridement of wound was done. Different surgical procedures like direct end to end anastomosis, saphenous vein graft interposition and lateral repair were performed for revascularization. Heparin was instilled locally and each patient also received anticoagulant therapy postoperatively in the form of heparin, clopidogrel and aspirin to decrease the chance of postoperative thrombus formation. Fasciotomy was performed in most of the patients whenever indicated. Post operative monitoring was done in all patients for impending ischemia, hemorrhage and sepsis. The data was analyzed through SPSS version 16 and various descriptive statistics used to calculate frequencies, percentages, means and standard deviation. The numerical data such as age expressed as Mean $\pm$ Standard deviation while the categorical data such as gender, vessel involved, revascularization procedure and outcome expressed as frequency and percentages.

Results

There were 32 patients operated on for vascular injuries during two and half year study period. There were 28 male (87.5%) and 4 females (12.5%) with mean age of 25 year (ranges from 22 to 28 year). The patients were received in accident and emergency department between 30min to 24 hrs after the injury. Firearm injury was the most common etiological factor while road traffic accidents ranked second among the mode of trauma. There was only 1 patient with stab injury. Femoral artery was most common vessel involved (25%). **Table I** shows the distribution of vessels involved.

16 patients had successful outcome of vascular repair and were discharged, Out of 16 patients 11 patients present within 12 hr and 5 patients after 12 hr. 9 patients had associated nerve injury leading to neurological deficit. The amputation rate was 6.25% in vascular trauma and was not influenced by type of injury, type of repair or presence of associated nerve injury, however associated skeletal trauma increased the amputation rate another important factor influencing the amputation rate was delay in revascularization from time of injury

Table I: Distribution of vessels

	No	Percentage
Femoral artery	8	25%
Brachial artery	7	22%
Subclavian artery	4	12.5%
Popliteal artery	4	12.5%
Axillary artery	4	12.5%
IVC	2	6.30%
Other	3	9.40%

Various revascularization procedures used were shown in **Table II**

Table II: Revascularization procedure

	No	Percentage
Interposition vein graft	19	59.4%
End to end anastomosis	9	28.1%
Lateral repair	3	9.40%
Prosthetic graft	1	3.12%

Associated injuries were shown in **Table III**.

Table III: Associated Injury

	No
Skeletal fractures	10
Nerve injuries	9
Abdominal injuries	5
Chest injuries	4
Head injury	1

Table IV: Outcome of patients

	no	Present in 12hr		Later than 12hr		p-value
		no	%	no	%	
Full recovery	16	11	69	5	31	0.004
Amputation	2	—	—	2	—	—
Sepsis rel. death	2	—	—	2	—	—

2 patients developed wound infection which was managed conservatively by daily dressing of wound. Four patients develop chest infection which was treated by chest physiotherapy and antibiotics. 5 patients expires despite effective initial management 3 patients expires around day 12 and 2 patients around day 8 and in both of these patients cause of death was sepsis/ARDS giving mortality rate of 15.62%.

Discussion

Vascular injuries pose a serious threat to life and limb of injured.¹¹ Mechanism and pattern of vascular injury varied between different population worlds wide. A study showed that extremity vessel injuries are seen in young men, aged between 20 and 40.¹⁰ This was also observed in our study with 87.5% males. Firearm injuries were the most common mode of injury in our study which is similar to a study from USA where majority of cases were because of firearm.³ In contrast to this, there are studies from UK, Sweden and Thailand where the mechanism of injury was road traffic accident.^{5,11}

Lower limb was the commonly affected area with either the femoral or popliteal vessel involved in our study. This result was in comparison to study conducted at university of Florida which showed that lower extremities were involved in two thirds of all patients with vascular injuries.¹³

Murphy performed the first successful vascular end to end anastomosis in man in 1896.¹³ Because of improvement in vascular repair techniques, accompanied by progress in anesthesia, blood transfusion and use of antibiotics, there was successful repair in vascular injuries in Korean conflict as compared to that during world war II.^{14,15}

Interposition with vein graft was most commonly performed procedure as direct anastomosis was not attempted where there was contusion of vessel or when such anastomosis may be under tension with post operative soft tissue swelling.¹⁰ A cardinal operative principle in managing vascular trauma is to obtain proximal and distal control of injured vessel before entering the surrounding hematoma.¹⁶ Early recognition

of vascular injury is must for successful outcome. Diagnosis is usually by critical clinical assessment aided by Doppler whenever necessary. We used all the standard techniques for management of vascular injuries.

As previously reported^{17,18,19} the significant factor associated with increased limb loss is the time lapse between injury and operation, as there is progression of muscle ischemia and small vessel thrombosis that prevent successful outcome of repair. Time is the prime factor in determining the final outcome of vascular repair.^{20,21} This was true in our patients as well. Patients reporting within 12 hours of injury had better overall results as compared to those presenting in after six hours.^{5,22} This may be because of war like situations till recently that has enabled higher authorities to maximize their efficacy, leading to earliest possible actions for the patients, saving their limbs and lives.

Conclusion

Firearm injury is the most common mechanism involved. Prevention of such injuries, through control of civilian violence and road traffic accidents, remains an ideal. Vascular injuries require prompt resuscitation, revascularization and proper technique of repair in order to improve the limb/life survival.

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