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PJBS

ISSN 1028-8880

**Pakistan
Journal of Biological Sciences**

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Arterial Injuries in Extremities Trauma, Angiographic Findings

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Abstract: At present, trauma is a common problem and regarded as the third cause of mortality in different societies. Significant part of injuries resulting from trauma is due to vascular damages. Tissue ischemia associated with vascular injuries is regarded as medical emergencies which can result in irretrievable ischemia if it continues for 6 h. Therefore, early diagnosis and quick treatment of vascular injuries are of high importance. In this cross sectional study, all trauma patients referred with possible vascular injury to angiography department of Tabriz Imam Khomeini Hospital from Apr. 2011 to Apr., 2012 underwent angiography. The results were compared with the similar studies conducted in other countries. Out of all patients, angiography detected vascular injury in 75 cases consisting of 93.7% of men and 5.3% of women. Motor vehicle (93.3%) especially motorcycles accidents were the most common cause of the damages. Leg was the most common site of trauma (62.2%) and associated fracture was seen in 86.7% of cases. Also, double fracture of leg was the most common associated fracture. Anterior tibial artery (36%) and complete arterial occlusion (62.7%) were the most common injured vessel and vascular injury, respectively. Vascular injuries are more common in young men (20-30 years old) mainly resulted from blunt trauma associated with motor vehicle especially motorcycle accidents. Leg and anterior tibial artery were introduced as the most common site and injured artery, respectively.

Key words: Trauma, ischemia, angiography

INTRODUCTION

At present, traumas are the most common cause of mortality in 1-44 years old persons and the third common cause of mortality in all ages (Patterson *et al.*, 2012). Extremities vessels especially arteries as the main blood-supplying elements are exposed to the highest rate of risk (Wallin *et al.*, 2011). Different kinds of arterial injuries result in some disorders considering extremities blood supply and tissue ischemia (Inaba *et al.*, 2011). Acute occlusion in the artery which is responsible to supply the blood required by the extremities is regarded as an emergency condition (Lee *et al.*, 2011). Early diagnosis and quick treatment is of very high importance such that early treatment blood resupply will be established and the clot dispersion to distal arteries and vascular system will be prevented (Matsumoto and Kohno, 2011). As a result, irretrievable ischemia, tissue necrosis and loss of the related organ will be prevented (West *et al.*, 2011). Generally, about 90% of peripheral vessels injuries occur in extremities. Among extremities arteries, femoral artery is the most common artery injured due to trauma (Duwayri *et al.*, 2011).

Additionally, penetrating trauma is the most common indication of angiography in extremities trauma (Hofmann *et al.*, 2011).

MATERIALS AND METHODS

In this cross sectional study, all traumatic patients suspected to vascular injuries and referred to angiography department of Tabriz Imam Khomeini Hospital from Apr. 2011 to Apr., 2012 were evaluated. Special forms including parameters of age, gender, type of trauma, site of trauma, time interval between occurring of trauma and angiography were designed and the required data was directly obtained from the patients and their fellow. The data was inserted in the forms. Then the injured extremity underwent angiography and angiographic findings including injured artery, type of arterial injury (complete arterial occlusion, effect of external pressure and spasm, artery rupture with active hemorrhage, arterial-venous fistula and pseudoaneurysm), fracture and dislocation adjacent to the vascular injury were identified and registered. The results of the study were statistically analyzed using SPSS, version 16. To

account for statistical differences in two groups, a chi-square test or Fisher's exact test was used, as appropriate. A p-value of <0.05 was considered significant.

RESULTS AND DISCUSSION

Out of referred traumatic patients, 75 cases consisting of 71 male (94.7%) and 4 female (5.3%) patients suffered from vascular injury. Mean age of the patients was 28.68±12.21 years 911-69 years old. The mean age was 27.90±11.98 and 28.68±20.92 in men and women, respectively. The highest age prevalence was seen among 20-30 years old patients. Out of 75 patients with vascular injury, there was bone fracture in 65 (86.7%) cases. Double fracture of leg (36 cases-54.4%) and femoral fracture (19 cases-29.2%) were the most common fractures associated with vascular injuries. Other cases of fracture included humerus (cases-7.7%), ribs and tibia (each of them 2 cases-3.1%) and double fracture of arm (1 case-1.5%). There was knee dislocation in 4 patients and only one of them (25%) was associated with arterial injury. Anterior tibial (36%), popliteal (22.7%), superficial femoral (21.3%), peroneal (20%), posterior tibial (10%), brachial (8%), subclavian (4%), deep femoral (2.7), radial (1.3%), ulnar (1.3%) and thoracoacromial (1.3%) arteries were the most common injured arteries. Evaluating type of vascular injuries (Table 1), it was made clear that complete artery occlusion (47 cases-62.7%) and injuries resulted from external pressure and spasm (30 cases-40%) was the most common angiographic views.

In the present study, The peak prevalence of the disease was seen in 20-30 years old patients. Therefore, gender prevalence and mean age of the study is in correspondence with similar studies in other countries. Blunt trauma resulting from motor vehicle (93%) especially motorcycle (80%) accidents and vehicle crashes (13%) were known as the most common cause in the present study. Penetrating trauma, fall and occupational trauma were seen in 2.6, 2.6 and 1.3% of cases, respectively. There was associated fracture in 86.67% of the patients in the present study. If there is associated fracture, the patients are referred to angiography with shorter time interval. The time difference is statistically meaningful. Vascular spasm and effect of external pressure are regarded as vascular injuries in cases with associated fracture. Complete artery occlusion is the vascular injury seen in other patients. It indicates to compressive effect of the fractured parts or secondary hematoma on the adjacent vessels. In this study, complete artery occlusion (62.7%), effect of external pressure and spasm (40%), artery rupture with active hemorrhage (5.3%),

Table 1: Frequency of kinds of vascular injuries

Type of vascular injury	No.	Percentage
Complete arterial occlusion	47	62.7
Effect of external pressure and spasm	30	40.0
Artery rupture with active hemorrhage	4	5.3
Arterial-venous fistula	2	2.7
Pseudoaneurysm	1	1.3

arterial-venous fistula (2.7%) and pseudoaneurysm (1.3%) were suggested as the most common angiographic findings in vascular injuries. The rate is lower in the present in comparison to the previous studies (Furmanov, 2009) and is 1.3 and 2.7%, respectively. The reason can be attributed to latency of pseudoaneurysm and fistula outburst. Out of 46 patients, 34 cases (74%) with leg vascular injury suffered from complete artery occlusion and the difference with other groups is meaningful (p = 0.011). It means that artery occlusion is more probable in leg trauma originating from less muscular volume and closer adjacency of arteries with bones.

CONCLUSION

Vascular injuries are mainly seen in men with the highest rate of prevalence in 20-30 years old patients. It can be developed due to vehicle especially motorcycle accidents. Since vehicle crashes play insignificant role in developing such injuries in other countries, it is necessary to more and exactly observe traffic regulations in this country in order to decrease incidence rate of these injuries. According to the present study, association of artery injuries with bone fractures is considerably high in comparison with other countries. Additionally, anterior tibial artery was introduced as the most common injured artery which is different from most similar studies. However, the difference can be attributed to different trauma mechanism of the patients in comparison with that of the other studies.

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