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Evaluation of Vascular Trauma in Imam Educational Hospital in Northwest Iran

[1]Seyyed Javad Mousavi, [2]Peyman Mikaili and [1]Karim Yazdani
[1]General Surgery Ward of Imam Hospital, [2]Department of Pharmacology, Faculty of Medicine,
Urmia University of Medical Sciences, Ogun State, Nigeria

Abstract: One of the surgical emergencies is vascular trauma which it should be managed by vascular surgery as soon as possible. The delay in referring the patient to surgery ward will cause the involved organ to be failed. In general, vascular traumas are divided into two types of penetrating and blunt traumas. The aim of this study is evaluating the profile of indications of vascular surgeries in northwest Iran. In this study, during 3 years, 33 patients were referred to this center and underwent vascular trauma surgery. The mean ages of involvement were between 20-40 years old. About 30 patients (90%) were male and 3 cases (10%) were female. The high rates of trauma were due to blunt type and the car accident was in the first rank. The highest rate of involvement occurred in posterior limb (20 cases). Of 33 patients with vascular trauma, 14 cases underwent vascular surgery in 6 h after the trauma. The rest referred and underwent surgery with >6 h delay. According to the results of this study, the researchers showed that the delay in referring the patient to surgery ward will cause the involved organ to be failed in higher rate in comparison to the rest.

Key words: Vascular trauma, surgery, arterial injuries, eveluation, surgical emergency, Iran

INTRODUCTION

The vascular trauma is one of the surgical emergencies which it should be managed by vascular surgery as soon as possible. The delay in referring the patient to surgery ward will cause the involved organ to be failed. In some cases, this may cause severe hemorrhage and it may lead to hypovolemic shock and finally end to death.

Treating the vascular injuries based on the experiences of the surgeries of the wounded soldiers during the war of Iran and Iraq and also because of the developments in the treatment of atherosclerosis, all have led to decrease the injuries to the patients, in comparison to the previous years. In general, the cause of this decrease is the faster transport of the traumatic patient to the center of repair vascular surgery, improvements in blood replacement techniques and elective usage of angiography (Johansen *et al*., 1991). In general, vascular traumas are divided into two types of penetrating and blunt traumas.

The former which is the most common cause of vascular injury are due to sharp pointed things, broken glasses, iatrogenic injuries in surgical operations and also gun-shot wounds. The vascular trauma causes more secondary injuries such as laceration and extensive injuries to the vasculature and also infection of the surrounding tissues. The causes of the blunt vascular traumas include car accidents which are today increasingly augments and this type of trauma accompanies fracture and luxation of the surrounding bones. However, the trauma may directly cause to injury to the vessels but almost of the vascular injuries occur indirectly and secondary to fracture of adjacent bones. This condition occurs especially in the bone fractures in proximity to the joints. It is due to the relatively fixed position of the vessels in these areas. This position makes them susceptible and exposed to the compressive forces.

The vessel injuries due to trauma are divided into two groups: partial and complete injuries. The surgical treatments of vascular trauma are different from other types of vascular surgeries because these traumatic patients are unstable for their homeostatic failure and suffering hypovolemia, hypothermia and hypoxemia. The signs of the vascular injury are: absent pulse, paleness, pain, hypothermia, numbness and paresis (Bladergroen *et al*., 1989).

The aim of this study is evaluating the profile of indications of vascular surgeries in Northwest Iran.

MATERIALS AND METHODS

In this study during 3 years, 33 patients were referred to this center and underwent vascular trauma surgery. All medical documents of the patients were evaluated for different pertaining items. The resulted data were summarized and descriptively analyzed by Microsoft Excel software.

Corresponding Author: Seyyed Javad Mousavi, General Surgery Ward of Imam Hospital, Urmia University of Medical Sciences, Ogun State, Nigeria

RESULTS AND DISCUSSION

All of these 33 patients with vascular trauma had arterial injuries. About 8 cases in addition to arterial injuries had venous injuries. Of total 33 cases, 19 of them were due to blunt trauma and 14 cases were due to of penetrating traumas. The patients' vascular injuries due to the trauma were evaluated for different aspects such as: the etiology, the type of the trauma (penetrating or blunt), the involvement extent of the surrounding tissue or related limbs, the type of injured arteries and/or veins in the limbs, bone fractures and adjacent nervous injuries.

The data were summarized and analyzed for deducing explicit conclusion and providing a relatively clear profile of the condition of the patient. The mean ages of involvement were between 20-40 years old. About 30 patients (90%) were male and 3 cases (10%) were female. The high rates of trauma were due to blunt type and the car accident was in the first rank. Gun-shot trauma has the highest percentage in the penetrating or blunt types (Table 1).

The highest rate of involvement occurred in posterior limb (20 cases) and the rest occurred in the anterior limbs. The artery most involved in the hind-limb was popliteal and in forelimb was brachial artery (Table 2 and 3). The high rate of bone fracture and peripheral nervous injuries occurred in the femur bone and also in ulnar and median nerves, respectively. Of the veins, popliteal vein was in the first rank in injured veins.

Of 33 patients with vascular trauma, 14 cases underwent vascular surgery in 6 h after the trauma. The rest referred and underwent surgery with >6 h delay. Of all cases, three patients underwent vascular surgery for 3 times, 3 other cases for twice and the rest underwent vascular surgery only once. While 6 traumatic patients in order to prevent the compartment syndrome, underwent prophylactic fasciotomy.

The patients whom were referred in <6 h to the hospital, the prognosis was good and the successfulness of the surgical operation was 100%. This rate for referring between 6-12 h was 97% and for >12 h, the prognosis was bad. Of the total 33 patients, only one case underwent metatarsal amputation because of distal gangrene of injured site. None of the referred patients underwent angiography for locating the exact vascular injury location before the surgical operation.

Unfortunately, two patients because of the delay in transporting to the surgery ward and also having shock and extensive emboli due to bone fractures were expired. Vascular traumas include two types: partial and complete lacerations. In the complete type, the vessel has been completely detached and the proximal part has been dislocated from the distal part and the extensive and bright bleeding occurs. But in the partial lesions, a part of the artery remains intact there is still a surviving blood supply for the downstream organs. The bleeding is usually finished either by the spontaneous clotting or hemostatic interventions. Hence, in these cases locating injured part is difficult.

Using patient's history, physical examination and radiological documents, the practitioner may locate the vascular lesion. The guiding clues for the physician for diagnosis and locating the lesion site of vascular injuries are: knee luxation, bright and red arterial bleeding in the injured area, blood stains in the patient's cloths during transport or on the car in accidents may be helpful. Also general signs are as: hypothermia, tachycardia, paleness, wet skin due to sweating, pulse absence, pain

Table 1: Summarizing the results of this study about the etiologies of penetrating and blunt traumas and their frequencies

Traumas/Cases	Accidents	Fall down	Gun shot	Knife wounds	Broken glass wounds	Stab/pointed things	Total
Numbers	16.00	3.00	7.00	3.00	2.00	2.00	33
Percentage	57.57	9.09	21.21	9.09	6.06	6.06	100

Table 2: Comparison the rate and frequencies of the artery involvement in the forelimb

Traumas/Involved arteries	Accidents	Fall down	Gun shot	Knife wounds	Broken glass wounds	Stab/pointed things	Total	Percentage
Axillary	-	-	-	-	1	-	1	3.03
Brachial	1	2	-	3	-	-	6	18.18
Radial	-	-	-	-	-	2	2	6.06
Subclavian	3	-	1	-	-	-	4	12.12
Total	4	2	1	3	1	2	13	39.39

Table 3: Comparison the rate and frequencies of the artery involvement in the hind-limb

Traumas/Involved arteries	Accidents	Fall down	Gun shot	Broken glass wounds	Total	Percentage
Femor	3.00	-	3.00	-	6	18.18
Popliteal	6.00	1.00	2.00	-	9	27.27
AT, PT aa.	3.00	-	1.00	-	4	12.12
Dorsal pedis	-	-	-	1.00	1	3.03
Sum	12.00	1.00	6.00	1.00	20	60.61
Percentage	36.36	3.03	18.18	3.03	-	-

and coldness, numbness and paresis. Shock is present in almost vascular injury victims. Usually its severity is related to bleeding amount from injured artery. The complications depend to the bleeding severity and other lesions. Paresthesia and paralysis are the most important signs. Because paresthesia and nervous dysfunction infer presence of the tissue ischemia and it wars that if the blood supply is not immediately resume, the gangrene process progresses.

However in vascular trauma, the nerves may be separately injured and this is the etiology of paresthesia. In traumatic patients, the pulse absence in one limb ant its presence in the opposite one should lead us immediately to presume an arterial injury. In penetrating wounds, bright and red bleeding, although in slight amount, should be immediately assumed as arterial injury (Wall *et al*., 1994; Cryer *et al*., 1990).

The muscles are split into compartments bound by strong and relatively unyielding membranes of fibrous tissue (deep fascia) which also attach to bone, in effect wrapping up the different muscle groups. Every compartment has a blood and nerve supply. Compartment syndrome arises when the pressure inside this enclosed space increases to the point where it interferes with the blood supply to the structures. A cascade of injury follows, with disruption to the metabolic processes of the muscle, cell death and leakage of fluid from capillaries which further increases the excessive pressure (Torella *et al*., 2003).

The surgery of vascular trauma is different from other vascular surgeries for several reasons; these traumatic patients suffer homeostasis failure and often are with hypovolemia, hypothermia, hypoxemia and hyperkalemia accompanied with acidosis.

CONCLUSION

According to the results of this study, it is conculded that the delay in referring the patient to surgery ward will cause the involved organ to be failed in higher rate in comparison to the rest.

RECOMMENDATIONS

The following measurements should be done for treating these patients: firstly, rapid transporting the victims to hospital and within 2-4 h the definite therapy or intervention should be done on the injured site of the patient. Secondly, extensive and integral debridement of the traumatic wounds with antibiotic therapy and secondary wound draping (bandage) will control the infection. And finally, usage of modern techniques and instrumentations by the vascular surgeon will cause to prevent the gangrene due to large artery ligature.

This also in return will prevent probable organ amputations. It seems that more studies should be done for elucidating the exact mechanisms involved in the vascular injury and the ways to minimize the complications of the vascular surgery (Brewster *et al*., 2003; Chaikof *et al*., 2002).

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