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PATTERN OF VASCULAR INJURY MANAGEMENT AMONG EMERGENCY CASES IN RELATION TO VARIOUS CAUSES

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INTRODUCTION

It is well known that patients with all types of trauma should be managed with a scientifically, well structured approach. In emergency department a perfect surgery should be carried out looking for life threatening injuries. Vascular injuries needs a primary survey for life threatening cases and when the patient get stable it is mandatory to have secondary survey.[1]

It is estimated that vascular trauma accounts about 0.2 – 4% of all traumatic injuries around the globe.[2]

Surgical treatment modalities for vascular injuries are divided according to types of injury to five types; as primary repair, end to end anastomosis, saphenous venous graft, synthetic graft and endovascular treatment.[3]

In a study by Perira et al, in 2015, it was suggested that the use of saphenous vein in femoral and popliteal artery injuries that necessities graft use.[4]

AIM

The objective of the current study is to differentiate the different pattern of vascular injuries in the emergency department according to the available facilities and materials in Azadi teaching hospital, Kirkuk.

MATERIALS AND METHODS

The current study was conducted in governmental teaching hospital in Kirkuk city at emergency department for the period from 2001 to 2012.

Study and Samples

A total of 114 injured patients (100 male) and (14) female, their ages were ranging from 5 to more than 65 years of age.

Duplex ultrasound study were not available at the time when those patients were treated, the pulses is only positive when it were felt by fingers tips.

Many cases were excluded from the study as they refuses surgery, preferred to do surgery in other cities although we explain the importance of time factor in the successfulness of the surgery, and expected complications of the delay or not to perform the surgery.

Patients were deciding to leave the hospital on their responsibilities immediately after the completion of the surgery or within short period were also excluded.

All admitted cases were included in the study as convenient sample.

Age interval was fixed at 5 years, the type of repair of injured vessels was correlated with the time of arrival, and accordingly it was divided to 5 types according to the available facilities and to the time of arrival.

The etiology of the injuries were divided according to the real cause, they were high and low velocity missiles, shells, glass and iatrogenic.

While the type of the repair was as followed
End to end anastomosis, synthetic graft, fig (4) shows synthetic graft (PTFE) used for the repair of the subclavian artery, lateral suturing, and venous graft fig 5 illustrate a venous graft (GSV) used for the replacement

of the brachial artery, while there was no endovascular treatment. Ligation was done in two cases only in specific situations.

Polytetrafluroethelene (PTFE) was used a synthetic graft in all the cases, while the long saphenous vein was used as venous graft.

Returning to the timing of operations, most cases were tackled immediately and few of them were dealt with later.

Delay in performing the surgery was due to miss diagnosis of the injury at the time of the presentation of the patient, and include cases of partially injured artery where the distal pulses were intact at the time of injury in the emergency department, and the patients presented later as a cases of arteriovenous fistula and to less extend as false aneurism fig (3) illustrates a false aneurysm of the popliteal artery. Only one patient was operated on 14 days after the injury, although the left subclavian artery was completely severed and there was no pulses distal to the injury could be felt, the pulse was returned normally after the end to end anastomosis, and the limb was completely normal.

Two patients were managed by ligation of the artery; the first one who has multiple injuries in the head and the abdomen with nerve, veins and bone injury due to multiple shells injury near an explosion, the completely severed distal right brachial artery was ligated as part of damage control surgery, fortunately, the pulse was returned back in the next days following the injury in the ICU. The other patient was 55 yr. old male presented after 8 months with partially injured artery and AV fistula and false aneurysm, the patient had severe pain and his condition was urgent, his medical situation during the general anesthesia was deteriorated as he was diabetic, hypertensive and IHD, the decision made during the surgery was to ligate the artery and the vein, the pulses were preserved after the surgery in the CCU.

RESULTS

A total of 114 injured patients were admitted to the emergency department in Azadi teaching hospital Table 1 show the ratio of male to female ratio being 7%. With ages ranging from 5 years to more than 65 years.

Table 1: Age and Gender distribution.

Age / Year	Gender Male Female
5 – 20	41 7
21 – 36	38 4
37 – 52	15 2
53 – 65	6 1
65	0 0
Total	100 14

While table 2 indicates the etiology of the injuries, the highest was bullet injuries either law or high 65/114 (65%), followed by shell 33/114(28.9%), and the lowest was caused by 2/114 (1.7%)

Table 2: Distribution of Age and Etiology.

Age / year	bullet	Shell	Glass	Stab	Blunt	Iatrogenic	Total
5 – 20	25	15	2	4	5	0	51
21 - 36	26	12	0	0	0	4	42
37 - 52	9	6	0	0	0	0	15
53 - 65	5	0	0	0	0	0	5
65	0	0	0	0	0	1	1
Total	65	33	2	4	5	5	114

Looking at table 3 it was obvious that most of the cases were treated by end to end anastomosis (50.8 %), while the lowest was managed by ligation; synthetic graft composed 30.7% while venous graft was 6.1 %.

Table 3: Type of severance of injured arteries.

Type of injury	Injured arteries						
	Common, superficial femoral	Popliteal	Brachial	Axillary	Subclavian	Carotid	Total
Complete severed	29	27	19	3	4	1	83
Partially severed	9	7	5	3			24
Non severed	2		3		1	1	7
number	40	34	27	6	5	2	114

P> 0.05

Table -3-shows the types of severance according to injured the most common affected arteries severed were completely affected 66% while the lowest was non severed type 16%.

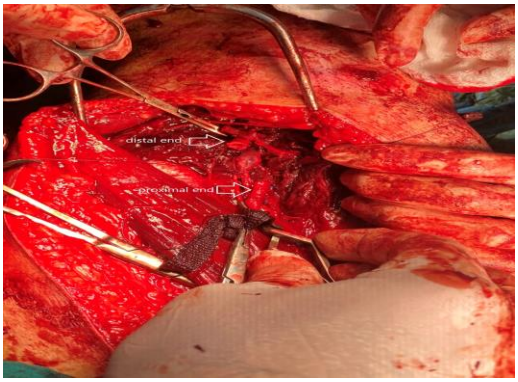

Fig. 1: Completely severed superficial femoral artery due to bullet injury.

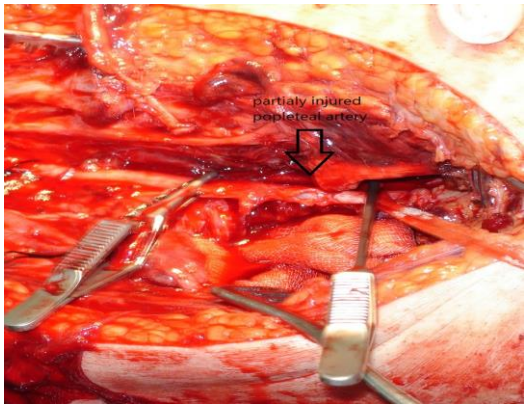

Fig. 2: Partially severed popliteal artery after a bullet injury.

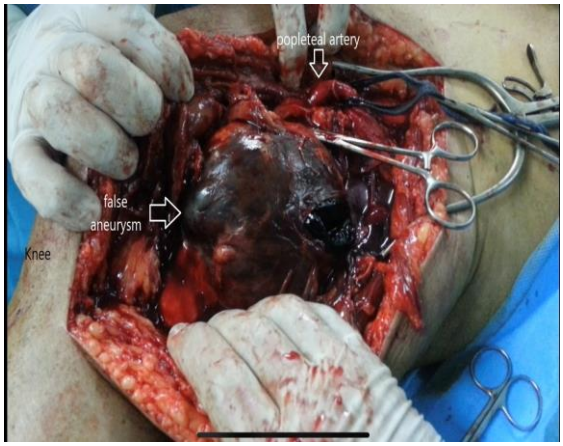

Fig. 3: False aneurysm of the popleteal artery 6 months after bullet injury.

Table 4: The correlation of time of arrival with the type of repair.

Time	End to end	Synthetic graft	Venous graft	Lateral suturing	Ligation	total
1-6 HOURS	31	22	4	6	1	64
7 – 24 HOURS	11	17	3	4	1	36
24 hour and more	11	0	0	2	0	14
Total	53	40	7	12	2	114

P> 0.05

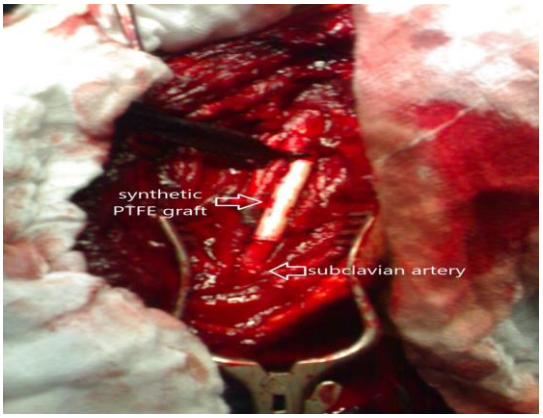

Fig. 4: Synthetic graft used for the repair of subclavian artery.

Table 5: Type of repair to the type of injury.

Type of injury	Type of repair					
	End to end	Synthetic graft	Venous graft	Lateral suturing	ligation	total
Complete severed	37	39	6		1	83
Partially severed	11			12	1	24
Non severed	5	1	1			7
number	53	40	7	12	2	114

$P < 0.05$

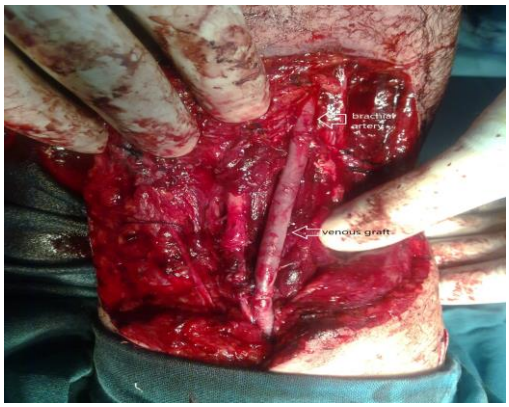

Fig. 5: venous graft (GSV) used for replacement of brachial artery.

Table 6: Effect of associated fracture on early outcome.

Type of injury	Bone fracture	Nerve injury	Both Nerve and bone	Vein injury	Time presentation more than 6 hours	Total
Number	24	42	15	106	44	111
Amputation	1		2	3	1	3

DISCUSSION

Different techniques in vascular repair may be used in various types of vascular injuries, include simple ligation, polytetrafluroethelene (PTFE) graft, patch or interposition, fasciotomy, TEVAR, short vein graft interposition and end to end anastomosis, as indicated by Kaylalor et al In the current study the procedures used as in table.[5]

Regarding general distribution, it is obvious that male had the ratio of injuries, which was identical to other studies that report higher incidence in male than female and ranged from 80 to 99 %.[6]

In relation to the type of repair of vascular injuries, vein ligation has successful effect on arterial repair in special traumatic cases; while if a major vein is ligated it may leads to extremity phlegmaqsia, while surgical repair of vein injury is one of the successful procedures for more than 100 years as well as the end to end anastomosis procedure.[7]

Concerning the time of traumatic vascular repair: malan and tattoni in 1963 had established the 6 hours rule for revascularization, to a void permanent tissue damage this hypothesis was based on experimental animal model by miller and welchin 1949.

Glass et al had demonstrated that when there was ischemia for less than 6 hours, limb salvage rate was 87%, with resultant decline in amputation rate.[8]

It is clear that traumatic limb amputation is more common among working age group adults; and it is the most common cause of all amputations in non-industrialized countries.[9]

In our study venous ligation was done in some cases of arterial injury that associated with venous injury, the early goal of our surgery in general was to avoid amputation, was achieved in 97.4% of the patients as only 3 patients was end with amputation.

Venous repair during penetrating arterial injury may be time consuming specially in the presence of other injuries, some venous injuries needs graft interposition which further complicate the repair, working in difficult situations with poor availability of the resources and in delay and multiple injured bleeding patients, venous ligation may decrease the time of the surgery and deliver the attention to more important injury in the same patient. Only 8 patients out of 114 had no venous injury associated with the arterial injury.

All the three patients who end with amputation have associated injuries, although they were tackled within acceptable time in comparison to the other patients in the study. It seems that many factors play a role in the decision of the outcome of the surgery. Associated injury like nerve, venous injury and bone fracture also has important role. Although time factor is very important in the decision of the outcome, it seems that other factors as, which artery is injured? And the site of the injury within the same artery, and some patient were discovered to have atherosclerosis that may affect the final results.

CONCLUSION

It is concluded that males are more prone to traumatic vascular injuries then females, among them younger age group had a higher impact.

Regarding the commonest cause was bullet injuries followed by shell and the lowest was glass.

Concerning the types or repair the most commonly used was end to end and the lowest was ligation. Ligation is not a method and should not be used only in very emergency situations.

The aim of all the surgery is to restore the blood flow to the distal part whatever the method used and as early as possible. Associated injuries can affects the end results of the surgery and even may endangers the life of the patients.

Venous repair should be done whenever possible, venous repair may be a time consuming in multiply injured patient, venous ligation may be done to save time and may be not affect the early outcome of the surgery.

There were no different in the early results concerning the type of the graft used whether synthetic or venous graft, this includes the restoration of the pulse after surgery, keeping in mind that synthetic graft insertion is less time consuming.

Recommendations

We recommends that precise and prompt clinical assessment of the injured site and the patient to discover all the injures and to make a plan for the best method of the surgical managements.

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