

Outcome of Surgical intervention in vascular injuries in Al-Fallujah General Hospital \ 2010

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Abstract :

Background: Vascular trauma is one of the most challenging aspects in the care of the injured patient, presenting a unique array of problems in diagnosis , decision – making & surgical technique ⁽¹⁾.The focus of contemporary trauma surgery is the need to maintain correct priorities , the first of which is to save the patient's life ⁽¹⁾.

Objective & Aim: To focus on the incident, mechanism of injury, management & outcome of vascular injury.

Materials & Methods: This is a descriptive study of 56 cases presented with vascular trauma referred to thoracic & vascular ward in Al-Fallujah General Hospital (FGH), over a period of one year (1st of January 2010- last day of same year). In the diagnosis of vascular injury we depended mostly on physical examination because the site of injury was usually obvious, and in doubtful cases, specific investigations were not available. Some of the patients were stable at presentation, and others were presented with severe bleeding and in shock state .All of patients were resuscitated in the casualty unit that includes control of hemorrhage and volume replacement. All of them were explored at the operative theatre, when vascular injury was dealt with, either by simple or complicated procedures.

Results: Out of the 56 patients operated upon. The most common mechanism of injury seen was penetrating in 51 (90.9%). Non-penetrating in 5 (9.1%) patients. The surgical intervention within 6 hrs in 41 (73.21%) patients. 43 (68.25 %) cases were associated with extremities vessel as 24 (38.09%) cases with upper limbs including radial artery most vessel injured ,then brachial & ulnar artery. 19 (30.15%) cases with lower limbs were the femoral artery most vessel injured. While truncal vessel in 20 (31.74%) cases & intercostal vessel more injured. The vascular intervention includes ligation in 34 procedures (53.96%) to save life rather than to save limb as a priority especially in non-end artery , end to end anastomosis in 14(22.22%) , graft interposition in 8 (12.69%) cases & lateral repair in 7(11.11%) cases (7 patients had 2 vascular injuries) . The results of surgical intervention were good. Thoracotomy was needed in 7 (12.5%) patients , Intercostal arteries injury was found in all .Only 2 (3.57%) patient dead. Two (3.57%) cases ended with above knee amputation due to delay presentation after injury.

Key words: Vascular trauma, outcome, Fallujah, Iraq.

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Introduction:

Vascular injury has two main consequences; hemorrhage & ischemia. Unrecognized & uncontrolled hemorrhage can rapidly lead to the demise of the trauma patient⁽²⁾. Unrecognized & untreated ischemia can lead to limb loss, stroke, bowel necrosis & multiple organ

failure⁽²⁾. Bleeding may be obvious with visible arterial or venous hemorrhage, or it may be concealed. Ischemia results from an acute interruption of flow of blood to a limb or organ. Skeletal muscle can be rendered ischemic for 3-6 hours and still recover function ⁽³⁾. Peripheral nerves are more sensitive to ischemia. If arterial

supply is restored to ischemic tissue, the sudden release of inflammatory mediators, lactic acid, potassium & other intracellular materials into circulation can cause a profound myocardial depression, generalized vasodilatation & initiate a systemic inflammatory response⁽⁴⁾. The diagnosis of significant vascular injury rests almost entirely on the physical examination⁽⁵⁾. The presence of hard signs of vascular injury mandates immediate action. These signs include pulsatile bleeding, expanding hematoma, absent distal pulses, cold pale limb, palpable thrill and audible bruit. Diagnostic adjuncts include pulse oximetry, Doppler ultrasound and angiography⁽⁶⁾.

25% of injured peripheral arteries have palpable pulses on initial presentation, thus a palpable pulse does not exclude significant proximal arterial injury because it may represent a transmitted pulsation through a blood clot⁽⁷⁾.

For the patient with vascular trauma, the damage control concept allows a sharp distinction between two categories of vascular repairs: simple repairs are rapid & include ligation, lateral repair, & shunt insertion; complex repairs are time-consuming & include patch angioplasty, end-to-end anastomosis, & graft interposition⁽¹⁾.

Simple repairs are feasible even under adverse physiologic circumstances, whereas complex repairs are usually not. However, the decision is not to restore vessel continuity which may force the surgeon to accept tissue loss (such as a kidney in renal artery injury or even a limb in iliac artery injury) in order to save the patient's life.⁽¹⁾

Herein lies the fundamental difference between the two major types of vascular trauma: truncal vascular trauma is usually an immediate threat to life, whereas injury of an extremity vessel is more often a threat to the viability of the limb. Many patients with vascular trauma are critically ill, & while the control of hemorrhage is life-saving & usually rapid, vascular reconstructions are often not.

Thus management decisions in vascular trauma require experience & judgment because all that is technically feasible which is not always in the patient's best interest⁽⁸⁾.

Materials & Methods:

This is a descriptive study of 56 cases presented with vascular trauma referred from Fallujah district or other parts of Al-Anbar Governorate to thoracic & vascular unit in Al-Fallujah General Hospital (FGH), over a period of one year (January 2010-December 2010.)

The data collected included age, gender, date of admission, time of injury, mechanism of injury as short history from the patients or from their relatives.

In diagnosis of vascular injury, we depend entirely on physical examination because the site of injury is usually obvious and in doubtful cases specific investigations are not available. Some of the patients were stable at presentation & others were presented with severe bleeding and in shock state.

All of them were resuscitated in the casualty unit and this includes hemorrhage control & volume replacement. Initially, free hemorrhage is usually controlled by direct pressure over the site of bleeding, using digital pressure, dressing, or an instrument such as sponge forceps, avoiding blind clamping vessel, while tourniquets have been avoided in this study.

Manual compression of the external bleeding site maintained until proximal & distal control are obtained in the operating room. All of the patients explored at the operative theatre, & the vascular repair was done.

In the limbs & neck injury, control is obtained using standard methods of vascular exposure. Vascular control in the chest depends on correct selection of incision, whereas in the abdomen, the key is adequate visceral mobilization.

The types of suture material which were used include (5\0, 6\0 or 7\0 Nylon or Prolen (depends on availability of sutures) for repair & silk for ligation.

Results:

Out of the 56 patients operated upon, there were 50 males (89.28%) & 6

females (10.71%) (Fig. 1) ,& their aged range between 12 to 65 years, mean age is 28.6. (Fig.2).

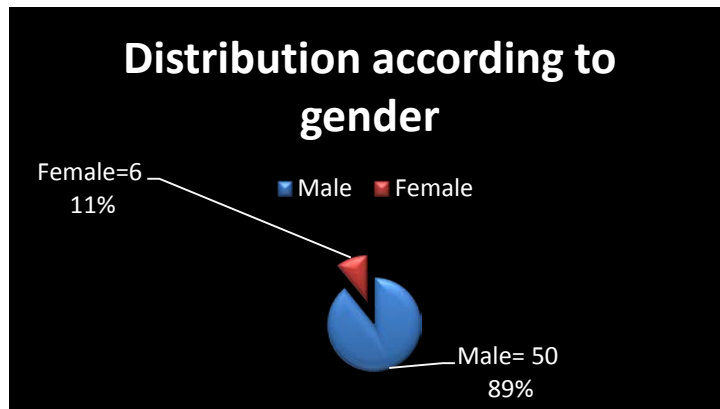


Figure (1) Frequency & distribution of cases according to gender

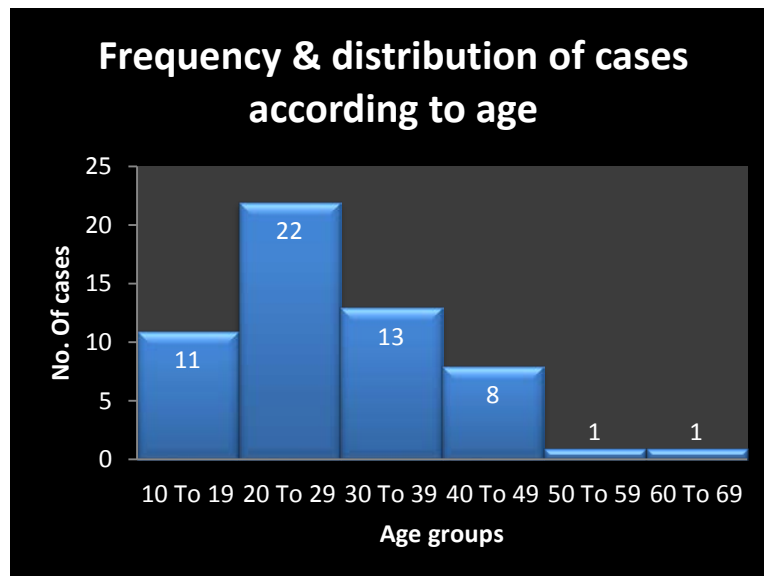


Figure (2) Frequency & distribution of cases according to age .

The most common mechanism of injury seen was penetrating 51 (90.9%) cases as Bullet 18 (35.29 %), Blast injury 13 (25.90 %) ,stab 9 (17.64 %) & other 11 (21.56 %). (Fig.3).

Non-penetrating 5 (9.1%) cases as blunt in 3 (75%) case & crush in one (25%) case (Fig.4).

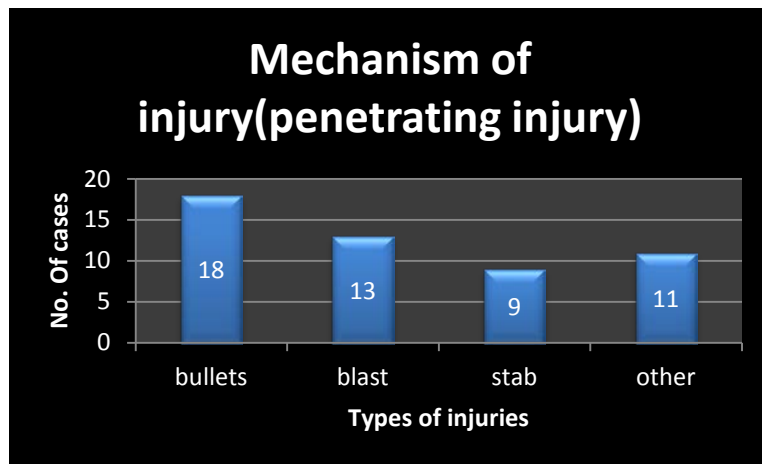


Figure (3) Frequency & distribution of cases according to Mechanism of injury (penetrating injury).

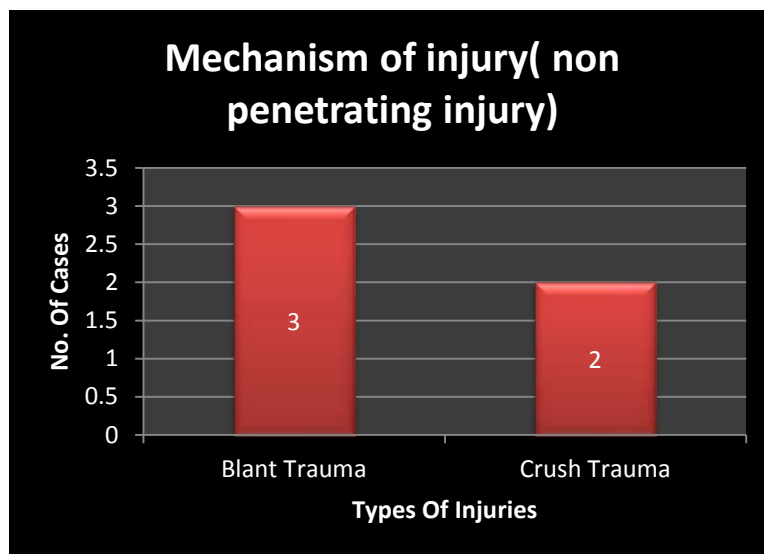


Figure (4) Frequency & distribution of cases according to Mechanism of injury (non-penetrating injury).

The vascular intervention includes ligation in 34 (60.71%), end to end anastomosis in 14(25%) , graft interposition in 8 (14.28%) cases & lateral repair in 7(12.5%) cases (7 cases associated with 2 vascular injury (Fig.5).

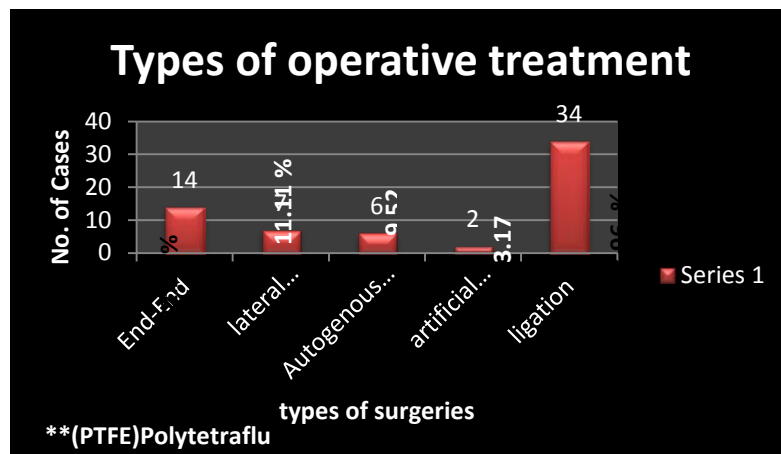


Fig (5): Frequency and distribution of operative treatment

The results of surgical intervention were good. 7 (12.5 %) severe cases needed thoracotomy, 3 cases are due to blast injury , another 3 cases are due to stab wound & 1 case is due to fall on sharp metallic rod .In all these cases there were an injury to the intercostals artery , 6 cases male & only one female .

Only 2 (3.57%) patients died, the first was due to irreversible shock & 2nd was due to shock & acute renal failure . 2(3.57%) cases ended with above knee amputation due to delayed presentation after injury.

Table (1) Frequency & distribution of cases according to time between injury & surgical intervention.

Time	Number	%
Within 1 st 6hours	41	73.21 %
After 6 hours	15	26.78 %
Total	56	100 %

After exploration ,the type of surgical treatment was based on the type of arterial injury & the length of the injured segment table (2).

Table (2) Frequency & distribution of cases depend on type of injury.

Type of injury	Number	%
Completely severed	44*	69.84 %
Partially severed	15	23.80%
Non severed	4	6.34%
Total	63	100%

* 7 cases associated with 2 vascular injury

Table (3) Frequency & distribution of cases depend on types of vascular trauma: truncal or extremity vessel

Type vascular trauma	no	%
Extremity		
A. upper part	24	38.09 %
B. lower part	19	30.15 %
Truncal vessel	20	31.74 %
Total	63	100%

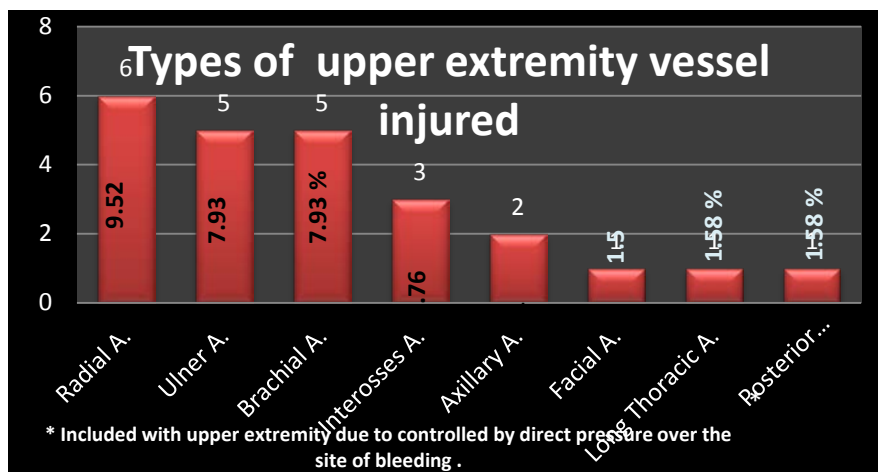


Fig (6):Frequency and distribution of upper extremity vessel injured

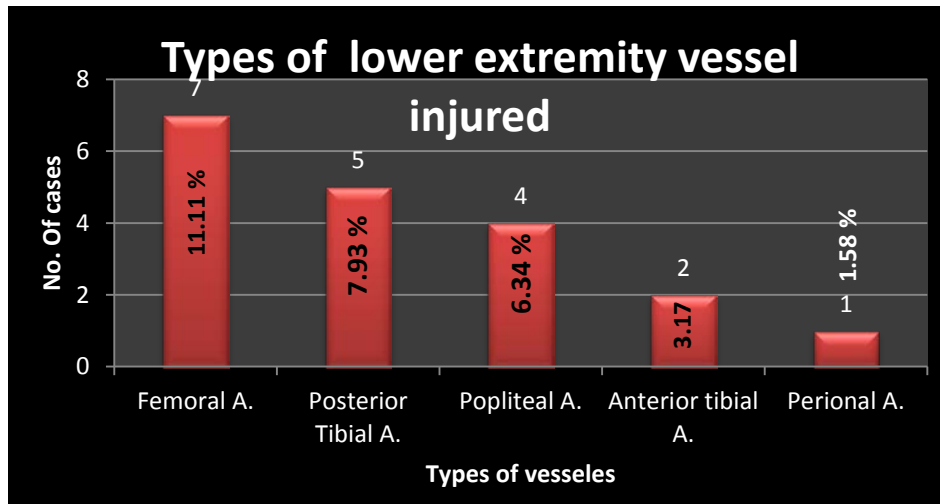


Fig (6):Frequency and distribution of upper extremity vessel injured

Table (4) Frequency & distribution of cases depend on types of Truncal vessel injured

Type of vessel (Truncal vessel)	no	%
1. Intercostals vessel	7	11.11 %
2. external iliac artery	4	6.34 %
3. Internal jugular vein	3	4.76 %
1. Common carotid artery	2	3.17 %
1. subclavian artery	2	3.17 %
2. Internal iliac artery	1	1.58 %
3. external iliac vein	1	1.58 %
Total	20 out of 63	31.74 out of 63

Table (5) heparin used .

Route used	Number of cases	%
Local	16	28.57 %
Systemic	11	19.64 %
Non used	29	51.78 %
Total	56	100 %

For most of the patients ,follow up was conducted for about one month post-surgery, after that small number continued the follow up, other were lost due to our circumstances.

Discussion:

The diagnosis & treatment of vascular injuries in extremity are often one of the greatest challenges a surgeon may encounter⁽⁹⁾.

The vascular injury is not uncommon in Iraqi society and most commonly occur due to bomb explosion⁽¹⁰⁾.

Males represent the bulk of the cases 89.28% and this is because they are more active & more exposed to violence than females (10.71%) , which also explain why young people are more prone to injury than other different age groups from 12-65 years.

The affected vessels include extremities vessel 43(68.25%) vessels in form, 24 (38.09%)upper extremity & 19 (30.15%) lower extremity , truncal vessels in 20 (31.74%) cases.

Besides penetrating injuries , bullet injury (accounts for 35.29%) was the commonest cause of injury fig (3) & this can be attributed to the local circumstances of violence in our country ,blast shells 25.9%, stab injury 17.64 % ,other type of penetrating 21.56% & is less common occur due to non-penetrating injury 9.1% as blunt in 5.35% & crush in 3.57%.

The time between the injury & intervention was critical in life saving & limb salvaging ,most of our patients 41(73.21%) were presented within 6 hours from injury & surgical intervention done shortly after admission .

Methods of surgical intervention include ligation ,resection both ends of injured vessels & end to end anastomosis, or with an interposition of graft & lateral repair .

Ligation is an option for the treatment of vascular injury especially as a life saving measures but it is associated with significantly great morbidity .

Risk of amputation with ligation of brachial artery above profunda is 55% , while with ligation below the profunda is 25% ⁽¹¹⁾ . We had this experience (ligation of brachial artery below profunda) in two case without bad sequel.

Thoracotomy was done in 7 patient, all of them with intercostals artery injury the decision depend on clinical examination as vital sign & chest tube drainage as a guide for indication of thoracotomy

The post-operative complications include simple wound infection that occur in 18 (28.57%) of cases & severe infection specially occur after big lacerating injury occur in 2 (3.57%) patients which lead to dehiscence of anastomosis suture line & severe bleeding 7 & 10 days after operation which mandates ligation of affected artery & end with above knee amputation . In reported study of American intervention in Iraq and Afghanistan, the amputation rate was 8% after vascular repair ⁽¹²⁾ .

Post-operative death occurs in two cases 3.57% out of 56 . The death after vascular injury to extremities in Australia is in a range of 5%.⁽¹²⁾.

Systemic heparin was used in 11 (19.64 %) patients ,while local heparin as diluted to discourage local clot formation in 16 (28.57%) patients & no heparin was used in other 29 (51.78%) patients.

Repair of venous injury in extremities is preferred to decrease ischemia ⁽¹³⁾.

In our series the associated injuries were delt with ligation except in 5 cases we did repair by simple procedure as lateral repair. .

Tourniquet application was not used in control bleeding .The tourniquet causes a more venous bleeding ,more edema because of the venous obstruction as well as jeopardizing the arterial flow& collateral circulation that can lead to irreversible ischemic changes which was the cause of amputation in such case.

Therefore the tourniquet is only indicated in severe crushing injury with hopeless limb ⁽¹⁴⁾ .

Because of the unavailability of tool for arteriography in our hospital & urgency of the cases , we made the immediate exploration based on physical examination ,hand Doppler & pulse oximetry mandatory.

In vascular injury associated with fractures ,the priority was depending on the onset of ischemia & availability of external fixation .

The stander method is to stabilized fracture then to repair ,in our study we did vascular repair before external fixation in some cases this is because of delay time of presentation ,until to sterilization of external fixator &other stabilization of the fracture bones was carried out using plaster of paris (pop) to protect the anastomosis.

Fasciotomy only used in one patient in this series .& it rarely indicated except in patients who arrive at the trauma unit with a tourniquet in place ⁽¹⁵⁾ .

These are good results as compared to our facilities. The proper sutures were not used, but the available sutures were used. Besides, we didn't use proper vascular clamps, but used the available vascular clamps. The magnification device was not available and vascular anastomosis even of medium size arteries such as radial artery were done under naked eye vision.

This is the first study which is done in Al-Anbar Government \ Fallujah and previously such cases were transferred to other centers because a specialist vascular surgeon was not available.

The present study concludes that outcome of surgical intervention in vascular injuries is good as compared to results of surgery of such cases in⁵⁸ developed countries in spite of simple facilities in Fallujah General Hospital.

Conclusion & Recommendation :

1. Bullets were the commonest cause of injury .
2. Clinical examination & hand held Doppler were the main tools of the diagnosis .
3. Injured deep vein can safely be ligated ;however repair was preserved to those with simple injury .
4. Systemic heparinization can be used as a good adjunct to local heparin otherwise contraindicated.
5. Vascular repair has the priority over fracture fixation.
6. There is necessity to open a center for Thoracic & Vascular in our Government & update the transport system for injured patients.
7. There is necessity to give short & long course in war , emergency & Vascular injury .

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