(Brachial artery injury)

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I would like to convey my thanks to my dear father and mother for support, patience and encouragement

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Abstract

Background: The brachial artery is the most frequently injured artery in the upper extremity. Its injury accounts for approximately 28% of all vascular injuries . mainly affecting people between 15 and 40 years of age. Uncontrolled bleeding is a leading cause of death. In civilian and military trauma, exsanguination account for approximately 40% of mortality .

Aim of study: To identify the most common cause of the brachial artery injury.

Method: data collected retrospectively on 25 patients diagnosed to have brachial artery injury at AL-Imamain AL-Kadhymain teaching hospital in Baghdad from 2017 to 2018.factures evaluated included demographic data , location of injury , causes of injury, associated injury, type of treatment and complication.

Result: there were 21 males and 4 females with mean age of 28.5 years .the majority of injury caused by blast injury 52%. Anastomoses was possible in 13 patients (52%),whereas 10 patients (40%) required vein interposition grafting and 2 patients (8%) required ligation .the amputation rate was 4% and the mortality rate was 4%.the associated injury which shown that 55 % present Present with venous injury , 40 % with nerve injury and 45% fracture humerus .

Conclusion: From the present study it can be concluded that , The most common cause of brachial artery injury was the blast injury .venous injury was common associated injury of brachial artery . The main victims of brachial artery injury are young males.

Introduction

The brachial artery is the most frequently injured artery in the upper extremity. Its injury accounts for approximately 28% of all vascular injuries [(1)]. It is mainly affecting younge people between 15 and 40 years of age [(2)]. Uncontrolled bleeding is a leading cause of death. In civilian and military trauma, exsanguination account for approximately 40% of mortality [(2)].In recent years, the limb salvage rate has reached nearly 100% because of early diagnosis, increased surgical experience, and development in the treatment[(1)].

The brachial artery [(3)] provides the main arterial supply to the arm .It begins at the inferior border of teres major , and ends in the cubital fossa opposite the neck of the radius where, under cover of the bicipital aponeurosis ,it divides into the radial and ulnar arteries. It then passes anterior to the medial supra-epicondyle ridge and trochlea of the humerus . As it passes inferolaterally , the brachial artery accompanies the median nerve , which crosses anterior to the artery.

The main branches of the brachial artery are:

- the profunda brachii artery ,it is the largest branch of artery and has the most superior origin ,accompanies the radial nerve along the radial groove as it passes posteriorly around the shaft of the humerus.

-The superior ulnar collateral artery ,it arises from medial aspect of brachial artery near the middle of the arm and accompanies the ulnar nerve posterior to the medial epicondyle of the humerus . Here it anastomoses with the posterior ulnar recurrent artery and the inferior ulnar collateral artery.

- the inferior ulnar collateral artery , which arises from brachial artery , 5cm proximal to the elbow crease and it then passes inferiomedially anterior to the medial epicondyle of the humerus .

-The humeral nutrient artery , It arises from the brachial artery around the middle of the arm, and enters the nutrient canal on the anteriomedial surface of the humerus.

- The radial artery is the more direct continuation of the brachial artery, arising about 1 cm below the bend of the elbow coursing along the radius bone, reaching the hand. There are three main parts of the radial artery: one in the forearm, one at the wrist, and one in the hand.

- The ulnar artery is the larger of the two distal branches of the brachial artery. It begins at the level of the neck of the radius, passing downward and medially, reaching the ulnar side of the forearm. When it reaches the wrist, it crosses lateral to the pisiform bone and gives off a deep branch, which continues across the palm as the superficial palmar arc.

Basically , injury to an artery can result in rupture, occlusion or both. Rupture lead to bleeding , Ischemia and false aneurysm. The other less common consequence of rupture occurs when the artery and parallel vein are each breached with a resulting arteriovenous fistula , whose classical physical finding is the machine bruit. This condition , if sufficiently large , can result in high out put heart failure [(4)]. Partial rupture may or may not be associated with intimal flap and dissection or after complete transection , or extrinsic as a result of fracture and compression , results in ischemia of the tissues [(5)].

There are different types of brachial vessel injuries . Penetrating trauma remains the predominant cause for the majority of brachial artery injuries that may result in complete cut of the artery. The morbidity and mortality of penetrating vascular injury is dependent on the velocity and energy content of the trauma [(6-7)] .External bleeding is more common the vascular injury usually diagnosed earlier . All cases of penetrating trauma and significant bleeding near major arteries should be explored with the suspicion of arterial injury and with preparation for its repair as part of wound debridement even in the absence of signs of distal ischemia this well lower the risk of subsequent false aneurysm or fistula.

Blunt and penetrating trauma each has its associated pathological correlates. Diagnosis of blunt injury is more often delayed. Vascular injury as a result of blunt trauma to extremities [8] is usually associated with fractures. Even in west 2/3 of these cases can be diagnosed on clinical basis alone [9]. In North India[10], with a low risk of personal violence , blunt injuries , mostly motor vehicle accidents , account for 84% of vascular injuries . Whereas Medellin ,Columbia [11] 93% of vascular injuries are penetrating and in Georgia[12] they represent 85% of the total.

Clinically , the clinical signs have usually been divided into hard signs , which are definite indication of arterial injury and soft signs, which may indicate arterial injuries. Hard signs are made up of pulsatile bleeding , expanding hematoma , absent distal pulse , cold and pale limb , palpable thrill , and audible bruit . the presence of hard signs of vascular injury mandates immediate operative intervention Usually the site of injury is obvious , and angiography is unnecessary . If in doubt, the angiography can be performed emergently on the operating room . Unnecessary interventions and investigations should be avoided to minimize the delay to definitive care [13-14].

The initial management [15-16] of the patients was conducted according to the principles of the advanced trauma and life support (ATLS) guidelines for trauma management . For patients presenting with hard signs of penetrating vascular injury, prompt surgical intervention without further diagnostic evaluation was used. Patients with blunt arterial injury or with penetrating injuries with clinical soft signs (cold extremity, color change, nonexpanding hematoma) underwent plain upper extremity radiography and Doppler ultrasonography .The indications for fasciotomy were clinically evident or impending compartment syndrome, massive swelling in the upper limb, ischemia lasting more than 6 hours and any motor or sensory deficits. In all patients with associated bone fracture, fixation of bone is mandatory and done before brachial artery repair to protect vascular anastomosis, but when ever signs or ischemia or fixation was delayed more than 6 hours, vascular repair should be done first . Successful repair was assessed by the return of radial and ulnar pulses at the end of the operation. Patients with more severe soft tissue and muscle injuries were treated with thorough debridement of all grossly nonviable

tissue, with removal of foreign bodies and copious irrigation with isotonic saline solution . In vessels that are transected, Primary arterial repair or end-to-end anastomosis was preferred whenever possible; otherwise, the interposition saphenous vein graft using either reversed autologous vein or PTFE may be used. In complex injuries , bypass procedures may be required after ligation of major arteries , these may need to be extra-anatomic to provide tissue coverage in major vessel.

In some cases , patient may be too unstable fore complex vascular reconstruction . In these cases ,vessels may be simple ligated (external carotid , subclavian , internal iliac artery may be ligated with little sequelae and virtually all veins other than the suprarenal IVC and portal vein can be ligated).

Packing can be used for venous bleeding but it is unlikely to stop arterial bleeding. Rarely , amputation may be required for the unsalvageable limb.

The complications are include thrombosis , secondary heamorrhage, false aneurysm , AV fistula , Compartment syndrome, ischemic muscular contracture and distal vascular insufficiency [17] .

the Aim of study :

To identify the most common causes of the brachial artery injury.

Materials & Method :

Study design

A retrospective study

Study setting and timing

The study was carried out in AL-Imamain AL-Kadhymain teaching hospital in Baghdad from 2017 to 2018 . data collecting from October2018 to March2019.

Study population

All the records of the patients who admitted to the hospital and diagnosed as a case of brachial artery injury were reviewed.

Sampling

The sample consisted of records of 25 patients taken from AL-Imamain AL- Kadhymain teaching hospital in Baghdad.

Data collection:

The records were reviewed and the following informations were collected:

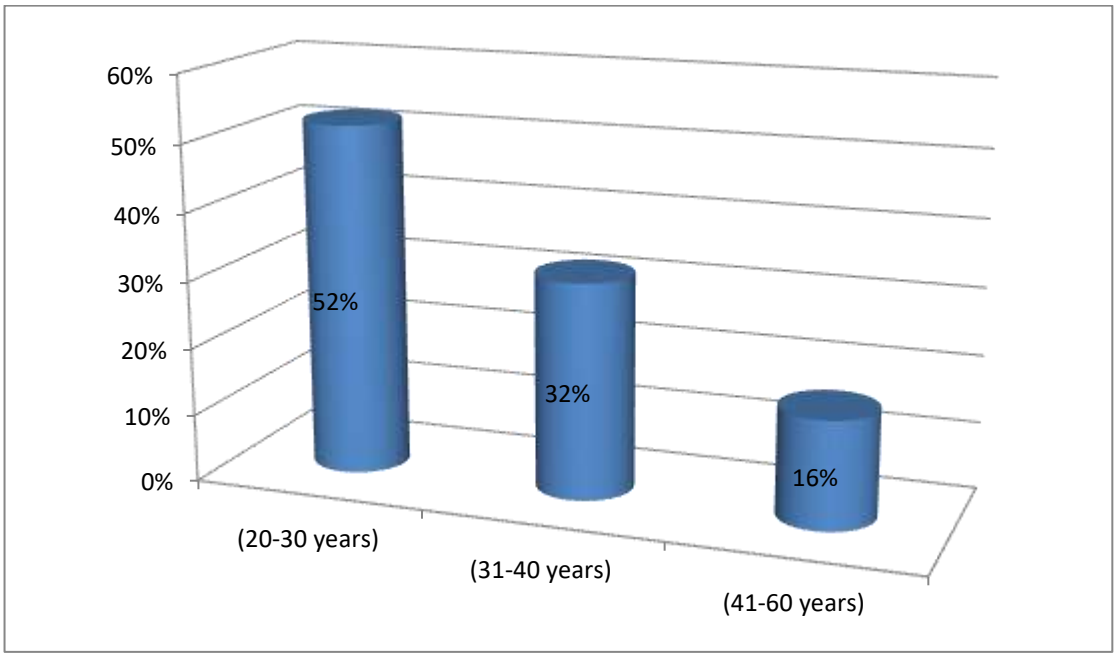
- Age
- Sex
- Cause of injury
- Side of injury
- Associated injury
- Treatment applied
- Complication

Results:

The brachial artery injury was observed in 25 patients. According to age we divided the data into three group , the first age group range from (20-30) years which involve 13 patients about 52% and it is the most group affected , the second group (31-40) years old which involve 8 patients (32%) and the third one from (41-50) years old have 4 patients (16%) . The mean of age was 28.5 years old ((as shown table 1 & graph 1)) .

Table(1) : age group distribution.

Age group		
	Frequency	Percent
20-30	13	52%
31-40	8	32%
41-50	4	16%
Total	25	100%

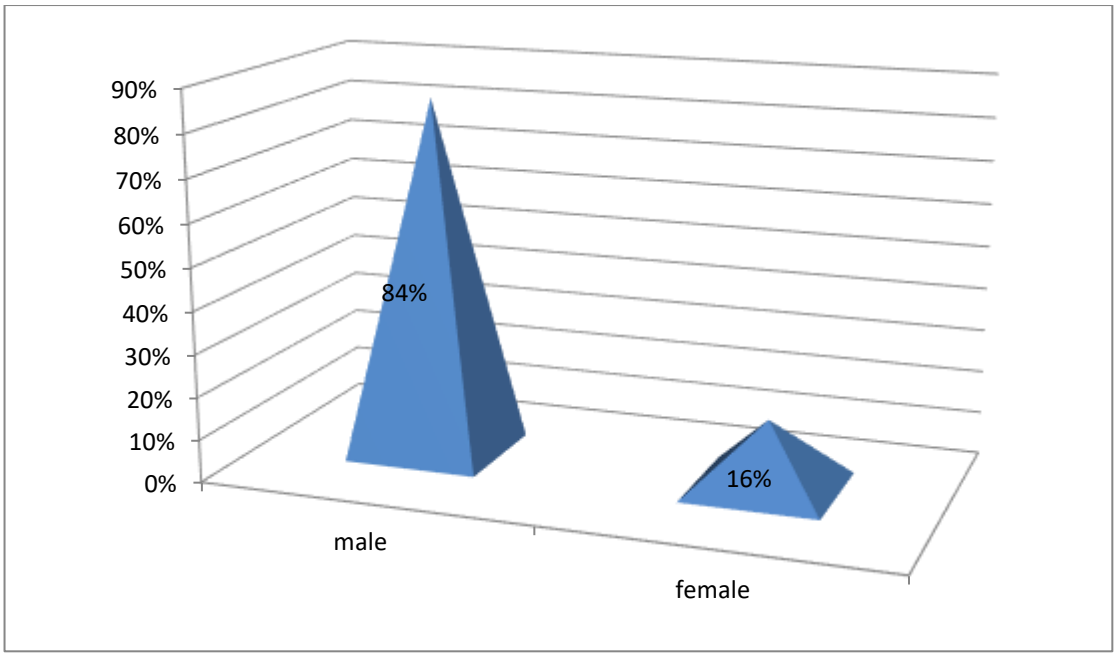


Graph (1): age groups

The study shown that 21 out of 25 patients were male (84%) and 4 were female (16%) , ((as shown in table (2) &graph (2))).

Table(2) : gender predilection.

Gender		
	Frequency	Percent
Male	21	84%
Female	4	16%
Total	25	100%

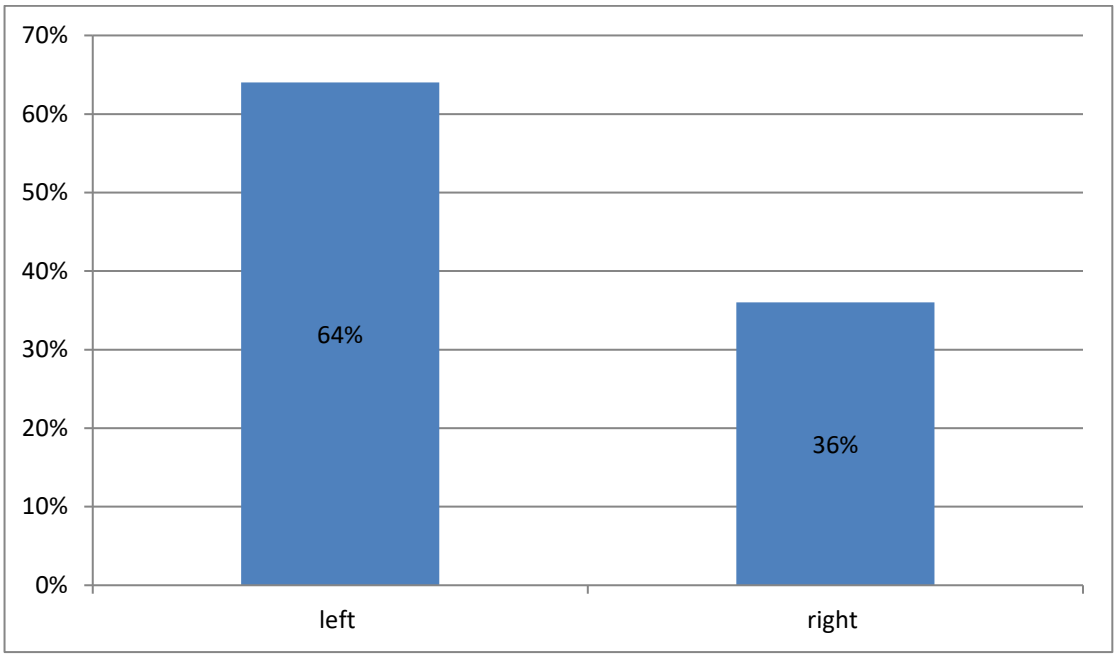


Graph (2): gender predilection

According to the site of injury , The left upper limb was more frequently affected as it was involved in 16 patients (64%) and the right side in 9 patients (36%) ,((as shown in table (3) and graph (3))).

Table(3) : site of injury.

Site of injury		
	Frequency	Percent
Left	16	64%
Right	9	36%
Total	25	100%

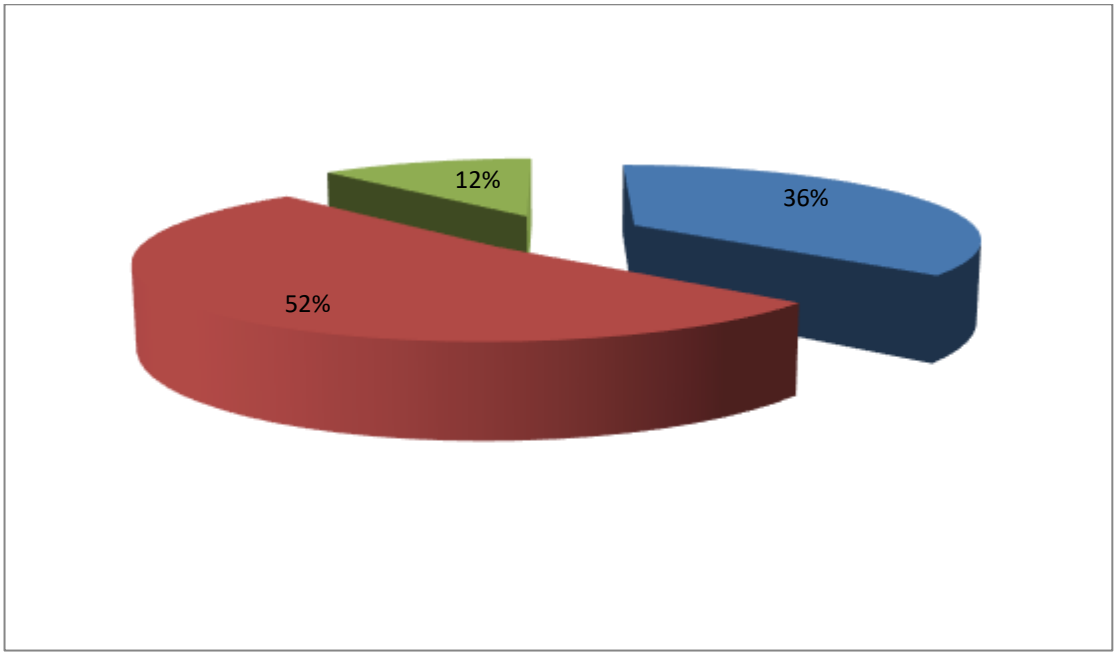


Graph (3): site of injury

The more frequent injury was blast injury (52%) while bullet (36%) and shell(12%) , ((as shown in table (4) &graph (4))).

Table(4): cause of injury

Cause of injury		
	Frequency	Percent
Bullet	9	36 %
Blast	13	52%
Shell	3	12%
Total	25	100%



Graph (4) causes of injury

The distribution of the patients according to site and type of injured artery and mechanism of injury are was an autogenous vein interposition graft in 8 patients(40%), Anastomoses in 13 patients (52%), and ligation in 2 patients(8%).

Table(5): type of treatment

Type of treatment		
	Frequency	Percent
I.V fluid	25	100%
Blood transfusion	25	100%
Antibiotic	25	100%
End to end anastomoses	13	52%
Vein graft interposition	10	40%
Ligation	2	8%
Total	25	100.0%

The last parameter in our study is the associated injury which shown that 20 patients with brachial artery injury have local associated injuries some were mixed injuries . brachial artery injuries are associated with many local and general injuries ((as shown in Table (6))).

Table (6) : Associated injury

Associated injury		Frequency	Percent
General	Chest injury	4	66.66%
	Head injury	1	16.66%
	Abdominal injury	1	16.66%
Total		6	100%
Local	Fracture humerus	9	45%
	Venous injury	11	55%
	Nerve injury	8	40%
Total		20	100%

In the hospital mortality rate was 4% (1 patients), one patient died during their hospital stay . the cause of death was multiple injury , vascular repair was successful in 24 out of the 25 patients (96%) in whom it was attempted . None of these patients had any residual vascular compromise from arterial injury . The rate of amputation about 4% .

Discussion:

Brachial artery injury is one of the most vascular injuries at AL-Imamian AL-Kadhymain teaching hospital .This figure goes with study by (Usama)[18] and (Perry and Feliciano)studies[19-20].

In our study we found males represent the bulk of cases (84%) and this is because they are more active and more exposed to violence than female and this similar to study done in Iran by (Moini ,Majid..et al)[21].

According to age groups divided the first group (20-30) years are the most commonly affected , similar to the study done in Iraq by (Usama)[18].

In this study, blast injury was the commonest cause of brachial artery injury followed by bullet and then shell wound, , this figure different hum Schroeder study where vascular injury caused by fracture of humerus (RTA) in 57%, contusion in 33% and penetrating in 10%[22],and other study show that stab injury more common (74%) (Moini ,Majid..et al)[21]. in reports from the USA [7]) , penetrating trauma , it was found as high as 70-93% ,and in as low as 14-43% in reports from UK [23].

Surgical treatment in our study include, Anastomoses (52%), an autogenous vein interposition graft (40%) and ligation (8%). while in Penkov study, 45% of cases used autogenous grafts and End-to end anastomos presented 55% [24] and other study by (Usama)[18] . Ligation is an option in the treatment of vascular injury especially as a life saving measures but it is associated with significantly great morbidity.

vein injury represented the commonest associated injuries in our study (55%) then fracture humerus (45%) fixation of bone is mandatory and done before brachial artery repair to protect vascular anastomosis, but when ever signs or ischemia or fixation was delayed more than 6 hours, vascular repair should be done first[15-16] and nerve(40%) , this similar to the study by (Usama)[18] , while in Iran the nerve injure presented more (Moini ,Majid..et al)[21].

The diagnosis of vascular injuries is based on clinical feature and physical examination and Doppler ultrasonography , angiography may be used to confirm the vascular injury, especially in patients with associated orthopedic injury.

In this study mortality rate was 4% , one patient died during their hospital stay . the cause of death was head injury , similar in (Usama)[18] study. So these injuries have a priority in the management of the patient over brachial artery repair that made prognosis of vascular repair very poor. Morbidity of brachial artery injury was present vascular repair was successful in 24 out of the 25 patients (96%) . The rate of amputation in our study about 4% .

Conclusion :

From the present study it can be concluded that :

- The most common cause of brachial artery injury was the blast injury.
- venous injury was common associated injury of brachial artery .
- The main victims of brachial artery injury are young males because they are more active and more exposed to violence than female .

Recommendation:

-there should be a statistics division with full patient statistics and Computers with patients information to follow up and should be arranged by health doctors.

Reference:

1. Ergunes, Kazim, et al. "Traumatic brachial artery injuries." Texas Heart Institute Journal 33.1 (2006): 31.

2. Razmadze A. Vascular injuries of the limbs: a fifteen-year Georgian experience. European Journal of Vascular & Endovascular Surgery 1999 ; 18(3) : 235_239 . (146kb)

3. Moore clinical oriented anatomy, Kieth L .Moore, Arthur F. Dalley, Anne, M.R. Agur, seventh edition, 2009,upper limb, page(670_820). Torono ,Ontario ,Canada.

4. Durakoglugil ME ,Kaya MG ,Boyaci B , Cengel A. High output heart failure 8 months after an acquired arteriovenous fistula. Japanese Heart Journal 2003 ; 44 (5):805_809. (104kb)

5. Chabter 10: Wounds of Limbs . In: Dufour D , Kromann Jensen S, Owen-Smith M, Salmela J, Stening GF, Zetterstrom B,editors. Surgery for victims of war. Geneva: International Committee of the Red Cross,1998: 83-87 . (719kb)

6. Wolf YG, Rivkind A. Vascular trauma in high-velocity gunshot wounds and shrapnel-blast injuries in Israel . Surgical Clinics of North America 2002 ; 82(1):237_244.(177 kb)

7. Subber SWeal . Contrast Arteriography (excerpt) . In: Rutherford RB, editor. Vascular Surgery . Philadelphia: W.B. Saunders Company , 1995: 195-202 (3054kb)

8. Rozycki GS, Tremblay LN, Feliciano DV. McClelland WB. Blunt vascular trauma in the extremity: diagnosis , management , and outcome . Journal of Trauma-injury Infection & Critical Care 2003 : 55(5):814-824. (153kb)

9. Milas ZL, Dodson TF, Ricketts RR. blunt trauma resulting in major arterial injuries . American Surgeon 2004 ; 70(5): 443-447. (1139kb)

10. Razmadze A. Vascular injuries of the limbs: a fifteen-year Georgian experience. European Journal of Vascular & Endovascular Surgery 1999 ; 18(3) : 235_239 . (146kb)

11. Sugrue M, Caldwell EM, Damours SK, Crozier JA, Deane SA. Vascular injury in Australia . Surgical Clinics of North America 2002: 82(1):211-219. (89kb)

12. Asfar S, Al Ali J, Safar H, AL Bader M, Farid E, Ali A et al. 155 vascular of injuries : a retrospective study in Kuwait , 1992-2000 . European Journal of Surgery 2002; 168(11):626-630. (861kb)

13. Rutherford R B, vascular surgery. W.B Saunders 1995.p713-735

14.Callow A.D, Ernst CB. Vascular surgery theory and practices .Application and lange 1995.p985-1037

15. Ekim, Hasan, and Mustafa Tuncer. "Management of traumatic brachial artery injuries: a report on 49 patients." Annals of Saudi medicine 29.2 (2009): 105.

16. Churchill pocket book surgery , Andrew T Raftey , Micheal S Belbridge . Marcus JD Wagstaff , 4th edition , 2011, peripheral vascular disease , page 320 , Edinburgh , London.

17. Perry, Malcolm O. "Complications of missed arterial injuries." Journal of vascular surgery 17.2 (1993): 399-407.

18.Usama K Kerdi. Brachial artery injury analysis of 80 case. Kufa Med. Journal 2009.VOL .12.No1.

19. Flamigan, B.P. [ed]: Civilian vascular trauma. Philadelphia, Lea, Febiger, 1992.

20_ Perry, M.O: The management of acute vascular injury. Baltimore, Williams & Wilkins, 1981.

21_ Moini, Majid, et al. "Outcome of delayed brachial artery repair in patients with traumatic brachial artery injury: prospective study." *international journal of surgery* 6.1 (2008): 20-22.

22_ Bitsch M, Hensle MK, Schroedert V. traumatic lesions of axillary and brachial artery. Uqeskr Laeger 1994: 156: 3890-3.

23_Visser PA, Hermreck AS, Pierce GE, Thomas JH, Hardin CA. Prognosis of nerve injuries incurred during acute trauma to peripheral arteries .Am J Surg 1980;140:596-9.

24_ Andreev A, Kavarakv T, Pankov P. Management of acute arterial trauma of the upper extremities. Eur. J. Vasc. Surg. 1992; 69: 593-8.