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A Study On Success Rate Of Different Management Options For Traumatic Peripheral Vascular Injury

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Abstract

Introduction: *Traumatic vascular injury is caused by explosions and projectiles which may affect arteries and veins of the limbs, and is common in wartime, triggering bleeding and ischemia. The increasing use of high-energy weapons in modern warfare is associated with severe vascular injuries. The peripheral arteries and veins of the extremities are among the most commonly injured vessels in both civilian and military vascular trauma. Vascular injuries are classified as contusion, intimal disruption, puncture, lateral disruption, transections with hemorrhage or occlusion, arteriovenous fistula, spam, and pseudoaneurysms. Any kind of bleeding whether inside or outside of the body is a sign of vascular trauma. Symptoms of vascular trauma include bleeding, swelling and/or pain, bruising, and a lump beneath the skin. Patients with emergency peripheral vascular injury are usually diagnosed clinically. Non-invasive tests may confirm the diagnosis and are useful in patient follow-up. Invasive tests can document the lesion and extent of disease if angioplasty, local fibrinolytic therapy, or surgical bypass is contemplated. With the change of time background, the treatment of vascular injury is also changing. Nowadays advanced medical equipment provides benefits to patients with vascular injuries. Meanwhile, traditional treatments are still playing an important role. If vascular trauma has not been treated in time, it may cause disability or even death, especially for limb vascular injury. There are several management options for traumatic peripheral vascular injury including some interventional and non-interventional therapies. The study aimed to analyze the Success Rate of different management options for traumatic peripheral vascular injury.*

Methods: *This retrospective study was carried out among fifty cases who attended the casualty block at the National Institute of Cardiovascular Disease (NICVD), with vascular injury from January 2008 to January 2009.*

Result*: A total of 50 cases were studied. These included 41 male and 9 female patients. Various types of surgical procedures were done on arteries and veins. Fogarty embolectomy was done on 15(30%) patients. All patients needed different reconstructive procedures. Fasciotomy was done on 5(10%) patients. Primary suturing was needed in 10 arteries and 16 veins. The primary anastomosis was done in 15 arteries and in 3 veins, 17 arteries needed saphenous vein grafting, 4 arteries required prosthetic grafts, and ligation was needed for 2 arteries and 9 veins. These results indicated that primary suture was the mostly done procedure. Concerning the mechanism of injury, bullet injuries were the most found type of injury which occurred in 25 (50%) patients, followed by shrapnel injuries in 15 (30%) patients, and the least cases were of blunt injuries (20%). Regarding regional distribution, the radial artery was the most affected site including 12 (24%) of patients. An equal number of patients (7,14%) came with ulnar and brachial artery injuries. Both radial and ulnar artery injuries occurred in 10 (20%) patients. Popliteal artery injury was sustained in 8 (16%) patients followed by femoral artery with inferior vena cava (IVC) injury in 3 (6%) patients. Axillary and carotid artery injury was seen in 2 (4%) and 1 (2%) patients respectively.*

Conclusion: *The purpose of surgical care is to restore perfusion in traumatic peripheral vessels. Although open surgical repair has always been the gold standard for treating vascular trauma, the application of endovascular techniques is becoming more remarkable for selected indications. This study showed emergency vascular reconstruction plays a significant role in traumatized vessels.*

Keywords: *Peripheral vessel, Ischemia, Injury, Reconstruction*

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I. INTRODUCTION

The peripheral arteries and veins of the extremities are among the most commonly injured vessels in both civilian and military vascular trauma. Blunt causes are more frequent than penetrating except during military conflicts and in certain geographic areas. Physical examination and simple bedside investigations of pulse

pressures are key in the early identification of injuries. In stable patients computed tomography angiograms (CTA) and magnetic resonance angiograms (MRA) have become the mainstay of screening and diagnosis. Early detection and treatment of compartment syndrome remain essential in the recovery of patients with significant peripheral vascular injuries.[1]. Nevertheless, diagnosing vascular injury is a challenge if the significant source of external bleeding cannot be found. The physical examination can confirm whether there is a blood vessel injury, and then determine whether surgery is needed. Doppler indices should be an integral part of the physical examination and can screen patients with proximal injuries for further studies such as duplex sonography or arteriography.[2] Immediate hemorrhage control and rapid restoration of blood flow are the primary goals of vascular trauma treatment. There are many operative treatment methods for vascular injuries, such as vascular sutures or ligation, vascular wall repair, and vascular reconstruction with blood vessel prostheses or vascular grafts. Embolization, balloon dilation, and covered stent implantation are the main endovascular procedures. Surgical operation is still the primary treatment for vascular injuries. Endovascular treatment is a promising alternative, proved to be effective, and preferred selection for patients. It is very important to determine vascular injury in the lower extremities. The signs and symptoms of vascular injury in limbs can be described as "hard" or "soft" distinguished by whether the intervention was provided in time. Hard signs include arterial bleeding, loss of pulse, expanding hematoma, bruit or thrill, and signs of ischemia. Soft signs include a history of prehospital blood loss, diminished pulse, moderate hematoma, proximity to a large vessel or bony injury, and ipsilateral neurologic deficit.[3] Hard signs indicate the need for surgical intervention.[4][5] The objectives of the treatment are relief of symptoms, lower infection, and prevention of limb loss. In the lower extremity, the goal is to maintain a bipedal gait.[6] Among the non-interventional treatments, anticoagulation therapy by heparin or thrombolysis by streptokinase, urokinase, or tissue plasminogen activator (tPA) has a great impact. The use of anticoagulation has a better prognosis for overall vascular trauma outcomes as well as a reduced risk of amputation for both lower and upper limb vascular trauma. Intravenous and catheter-directed thrombolysis with tPA is a safe and effective method in the treatment of acute arteriolar ischemia of extremities.[7][8][9] It is known that a delay of more than 8 hours increases ischemic complications in patients with arterial emboli in an extremity.[10] There is increasing use of mechanical thrombectomy devices (MTDs). Fogarty thrombectomy is one of those management options. MTDs comprise a variety of tools intended to remove, fragment, or disperse thrombus in veins, arteries, or bypass grafts. [11] Again vascular reconstruction plays a significant role in peripheral vascular injuries if indicated. 2-4% of vascular injuries need operative reconstruction. In polytraumatized patients, the rate is even 10%. Arterial vascular repair should precede venous reconstruction and orthopedic stabilization due to limb-threatening ischemia.[12] The study aimed to analyze the success rate of various types of management options in traumatic peripheral vessels.

II. OBJECTIVE

General Objective

To analyze the impact of different management options for traumatic peripheral vascular injury.

III. METHODS

This was a retrospective study and was carried out at the National Institute of Cardiovascular Disease (NICVD), with peripheral vascular injury. The study duration was from January 2008 to January 2009. A total of fifty cases were selected for this study who attended the casualty block of the hospital. The patients were divided into 2 groups such as patients coming within 6 hours of injury and patients coming after 6 hours to 24 hours of injury. Data sheets were prepared considering variables such as age, sex, clinical presentation, radiological and duplex study. The data were collected and recorded on a broadsheet. Detail history and examination were done on all patients to exclude any associated injury. The main variables included sensitivity of clinical impression, ultrasound, and radiological investigations, time lapsed between the onset of injury and revascularization, the efficacy and benefits of revascularization, morbidity, and mortality. All these data were analyzed by SPSS 10 version. All information was kept with strict confidentiality.

Inclusion Criteria

- Patients with a vascular injury who came within 24 hours of trauma.
- Patients who had given consent to participate in the study.

Exclusion Criteria

- Patients with a vascular injury who came after 24 hours of trauma.

IV. RESULTS

A total of 50 cases were studied. These included 41 male and 9 female patients. Various types of surgical procedures were done on arteries and veins. Fogarty embolectomy was done on 15(30%) patients. All patients needed different reconstructive procedures. Fasciotomy was done on 5(10%) patients**. [Table 1]** Primary suturing was needed in 10 arteries and 16 veins. The primary anastomosis was done in 15 arteries and in 3 veins, 17 arteries needed saphenous vein grafting, 4 arteries required prosthetic grafts, and ligation was needed for 2 arteries and 9 veins. These results indicated that primary suture was the mostly done procedure. [**Table 2]** Concerning the mechanism of injury bullet injuries was the most found type of injury which occurred in 25 (50%) patients, followed by shrapnel injuries in 15 (30%) patients, and the least cases were of blunt injuries (20%) [**Table 3]** Regarding regional distribution radial artery was the most affected site including 12 (24%) patients. An equal number of patients (7,14%) came with ulnar and brachial artery injuries. Both radial and ulnar artery injuries occurred in 10 (20%) patients. Popliteal artery injury was sustained in 8 (16%) patients followed by femoral artery with inferior vena cava (IVC) injury in 3 (6%) patients. Axillary and carotid artery injury was seen in 2 (4%) and 1 (2%) patients respectively. [**Table 4**]

Table 1: Surgical management options (N=50)

Name of surgery	No. of patients	%
Fogarty embolectomy	15	30
Reconstruction	50	100
Fasciotomy	05	10

Table 2: Operative procedures in patients (N=50)

Type of repairment	Number of arteries	Number of veins
Primary suturing	10	16
Primary anastomosis	15	03
Saphenous vein grafting	17	-
Prosthetic grafts	04	-
Ligation of vessels	02	09

Table 3: Mechanism of vascular injury (N=50)

Cause of injury	Number of patients	%
Bullet injuries	25	50
Shrapnel injuries	15	30
Blunt injuries	10	20

Table-4: Regional distribution (N=50)

Artery	Number of patients	%
Radial artery	12	24
Ulnar artery	7	14
Both radial and ulnar artery	10	20
Brachial artery	7	14
Axillary artery	2	4
Carotid artery	1	2
Femoral artery and IVC	3	6
Popliteal arteries.	8	16

V. DISCUSSION

Trauma is a major health problem worldwide. Vascular trauma is an important component of this critical scenario. The incidence of vascular trauma is on the rise.[13] Vascular injuries are life and limb-threatening situations demanding prompt decisions by the treating surgeon. In these critical situations, most surgeons rely on clinical evaluation, such as external hemorrhage, pulsatile hematoma, absent peripheral pulses, the sign of ischemia, and hemodynamic instability. This study has also relied on clinical parameters mentioned above. A few arteriograms had been done and they also confirmed the clinical impression. Modern but time-consuming

investigations like Pre-operative angiography, CT-Scan, Helical angiography, Magnetic resonant angiogram (MRA), and MRI are not required in the vast majority of the patient and these tests should be reserved only for doubtful cases[14][15] Modern concept of trauma management consists of immediate resuscitation followed by quick evacuation in a well-equipped hospital with modern facilities for trauma management including vascular repair and available skilled staff. Prompt vascular repair and attention to associated injuries resulted in minimum morbidity and zero mortality. The same scenario was also seen in this study. Among 50 patients, everyone underwent different types of vascular repairment in the present study. Increasing domestic violence and war situations have resulted in major advancements in the field of emergency revascularization or reconstruction. Vascular trauma management essentially entails three steps namely compression and cautery of vessels, ligation of vessels, and vascular repair. In this study, ligation was carried out on 2 vessels because of delay in presentation and the possibility of severe reperfusion injury. The complication rate in emergency revascularization has been reported in different studies to be between 10 to 18%. In this study, 10% of patients developed complications that are compatible with other studies.[16][17][18][19][20] Several percutaneous mechanical thrombectomy devices are currently being used for the treatment of acute and chronic limb-threatening ischemia. Preliminary studies on the safety, efficacy, and device limitations have spurred an interest in percutaneous techniques for thrombus debulking as a stand-alone therapy or an adjunct to pharmacologic thrombolysis. The devices have various mechanisms or combinations of mechanisms to optimize thrombus removal. [21] This study also showed the need for Fogarty embolectomy on 30% of patients which was quite relatable. Fasciotomy is usually indicated, when the tissue pressure rises to 40-45 mmHg in a patient with a diastolic blood pressure of 70mmHg and any of the signs and symptoms of compartment syndrome.[22] the complication rates for the early and late fasciotomiesd extremities were 4.5% and 54%, respectively. No significant differences in residual function or complication rate were noted with open or closed fasciotomy according to a study.[23] In this present study, the complication rate was 5% which was quite similar to other studies.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

VI. CONCLUSION

Traumatic peripheral vascular injury is a significant cause f disability or death either in civilian environments or on the battlefield. In this present study, the success rate of different management options was studied among 50 patients from January 2008 to January 2009. In this study patients presented with various ranges of signs and symptoms of vascular trauma. Physical examinations and simple bedside investigations were done in emergency cases and CTA or MRA were done on stable patients. This study showed that vascular reconstruction provided significant importance in peripheral vascular trauma. Fogarty embolectomy was also a very useful procedure regarding vascular occlusion or ischemia. Fasciotomy was done in patients who developed compartment syndromes. Early management regarding traumatic vessels plays a vital role and reduces the chances of amputation in many patients.

VII. RECOMMENDATION

Rapid diagnosis and timely surgical intervention remain the mainstay of treatment in peripheral vascular trauma. this injury is a surgical emergency. Management of vascular trauma has dramatically evolved in the past century. Immediate hemorrhage control and rapid restoration of blood flow is the primary goal of treating a vascular injury. management of vascular traumas requires a precise understanding of the pathophysiology of vascular injury. The purpose of surgical care is to restore perfusion. Ischemic time should be taken into consideration.

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