Vascular Injury In Civilian Trauma

A Study

Submitted for Partial Fulfilment of Master Degree
In General Surgery

By

Hamdy Abdel Azeem Abo El Neel
M.B.,B.CH.

Under Supervision Of

Prof. Dr./ Ali Saddek Sabbour
Professor of General & Vascular Surgery
Faculty of Medicine - Ain Shams University

Ass. Prof. Dr./ Ahmed Farouk Abd El Mohsen
Assistant Professor of General & Vascular Surgery
Faculty of Medicine - Ain Shams University

Dr./ Mohamed Abd El Monem Abd El Salam Rizk
Lecturer of General & Vascular Surgery
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
٢٠١٣

بسم الله الرحمن الرحيم
قَالُوا سُبْحَانكَ لاَ عِلِمَ لَنَا إِلاّ مَا
عَلّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

سورة البقرة آية (٣٢)

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LIST OF ABBREVIATIONS

ABI	: Ankle-brachial index
ACS	: Abdominal compartment syndrome
ALS	: Advanced life support
BAI	: Blunt aortic injury
BCVI	: Blunt cerebrovascular injury
CBF	: Cerebral blood flow
CCA	: Common carotid artery
CFD	: Color-flow duplex
CIA	: Common iliac artery
CIV	: Common iliac veins
CSFD	: Cerebrospinal fluid drainage
CT	: Computed tomography
CTA	: Computed tomographic angiography
DSA	: Digital subtraction angiography
EC-IC	: Extracranial-to-intracranial
ePTFE	: Expanded polytetrafluoroethylene
FA-FV	: Femoral artery–femoral vein
GCS	: Glasgow Coma Scale
IADI	: Intra-arterial drug injection
IAP	: Intra-abdominal pressure
ICA	: Internal carotid artery
ICU	: Intensive care unit
IMA	: Inferior mesenteric artery
IVC	: Inferior vena cava
KE	: Kinetic energy
LA-FA	: Left atrium–femoral artery bypass
M	: Mass
MASH	: Mobile Army Surgical Hospital
MDCT	: Multidetector CT
MRA	: Magnetic resonance angiography
MRI	: Magnetic resonance imaging
PTFE	: Polytetrafluoroethylene

LIST OF ABBREVIATIONS (CONT.)

SCM	: Sternocleidomastoid muscle
SMA	: Superior mesenteric artery
SMV	: Superior mesenteric vein
SPECT	: Single-photon emission computed tomography
TEE	: Transesophageal echocardiography
TEVAR	: Thoracic endovascular aortic repair
V	: Velocity
VAIs	: Vertebral artery injuries
YPLL	: Years of productive life lost

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INTRODUCTION

Peripheral vascular injuries account for ٨٠٪ of all cases of vascular trauma, and the great majority of patients are young males. Most of the injuries involve the lower extremities. The most common injury mechanism is cut and stab wounds (٣٩,٣%) ***(Randall et al., ٢٠٠٩).*** But there is a regional difference e.g. in Australia, Most injuries are caused by high-velocity weapons (٧٠٪ to ٨٠٪), followed by stab wounds (١٠٪ to ١٥٪) and blunt trauma (٥٪ to ١٠٪). The incidence of vascular trauma in the military is comparable to that in the civilian population and varies from ٠,٢٪ to ٤٪ of injured patients ***(Gupta et al., ٢٠٠١).***

In the civilian setting, although a penetrating mechanism predominates, the relative incidence of blunt injuries increases ***(Frykberg, ١٩٩٦).*** The Most common arterial injuries are partial lacerations and complete transections. In general, complete transections lead to retraction and thrombosis of proximal and distal ends of the vessel with subsequent ischemia. in contrast, partial lacerations cause persistent bleeding or pseudo aneurysm formation. Partial lacerations as well as contusions may be accompanied by intimal flaps which may progress to thrombosis. Small Arterial contusions with limited intimal flaps may not cause distal hemodynamic compromise and may be undiagnosed. Concomitant arterial and venous injuries may lead to arteriovenous fistula formation ***(Dennis et al., ١٩٩٨).***

Extremity arterial injuries have varied clinical presentations. A minority of patients present with obvious clinical evidence, or hard signs, of an arterial disruption, such as pulsatile external bleeding, an enlarging hematoma, absent distal pulses, or an ischemic limb. For patients with overt signs of arterial injury, immediate surgical exploration in the operating room, without further diagnostic testing, is preferred. When arteriography is required, an intraoperative arteriogram is usually sufficient to identify the location and extent of injury and guide the surgical repair ***(Patel et al., ٢٠١٠).***

Greater than ٩٠٪ of injuries to the great vessels of the thorax are caused by penetrating trauma. Gunshots, stab wounds, shrapnel, and even iatrogenic misadventures are frequently reported causes ***(Mattox et al., ١٩٨٩).***

In the thorax, The innominate artery, pulmonary veins, venae cavae, and thoracic aorta (most common) are susceptible to blunt injury. Aortic blunt injuries usually involve the proximal descending aorta, but injuries to other segments such as the ascending aorta or transverse arch (١٠٪ to ١٤٪), mid–distal descending aorta (١٢٪), and even multiple sites (١٣٪ to ١٨٪) have been reported ***(Williams et al, ١٩٩٤).***

Blunt carotid artery disruption accounts for about ٣٪ to ١٠٪ of all carotid injuries. The most commonly injured structures in the neck are the blood vessels. The incidence of major vascular trauma following a penetrating neck injury is ٢٠٪ ***(Beitsch et al., ١٩٩٤)***.

Many patients with major abdominal vascular injuries die at the scene and never reach medical care. Of the patients who are transported to hospitals, about ١٤٪ lose vital signs during transportation or in the emergency department. The clinical presentation depends on the injured vessel, the size and type of the injury, the presence of associated injuries, and time elapsed since the injury ***(Asensio et al., ٢٠٠٠).***

Selective digital subtraction angiography (DSA) is the diagnostic “gold standard” for screening patients with suspected arterial injury. DSA has several limitations that make it a difficult diagnostic tool. First and foremost, it is an invasive procedure with technical limitations and a complication profile ***(Biffl et al., ١٩٩٨).***

Computed tomography is the modern workhorse for trauma evaluation and should be the initial diagnostic step in patients with penetrating injuries but no hard signs of vascular or aerodigestive injury. Contrasted axial imaging with reformatting software allows an exact determination of the injury track, vascular injuries, proximity to the aerodigestive organs, spinal fractures and cord involvement, computed tomographic angiography (CTA) has a ٩٠٪ sensitivity and ١٠٠٪ specificity for vascular injuries that require treatment ***(Nunez et al., ٢٠٠٤).***

Noninvasive vascular imaging, color-flow duplex (CFD) ultrasonography has been suggested as a substitute for or complement to arteriography. CFD has several obvious