

# **Vascular Injury In Civilian Trauma**

A Study

*Submitted for Partial Fulfilment of Master Degree  
In General Surgery*

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A decorative frame with a central yellow oval and four green lobes, each containing intricate floral and geometric patterns in green, pink, and orange.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ  
قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا  
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

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## **LIST OF ABBREVIATIONS**

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

## **LIST OF ABBREVIATIONS (CONT.)**

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

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## INTRODUCTION

Peripheral vascular injuries account for 8.7% 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 (39.3%) (*Randall et al., 2009*). But there is a regional difference e.g. in Australia, Most injuries are caused by high-velocity weapons (9.7% to 8.7%), followed by stab wounds (1.7% to 1.5%) and blunt trauma (0% to 1.7%). The incidence of vascular trauma in the military is comparable to that in the civilian population and varies from 0.2% to 4% of injured patients (*Gupta et al., 2001*).

In the civilian setting, although a penetrating mechanism predominates, the relative incidence of blunt injuries increases (*Frykberg, 1997*). 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., 1994*).

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., 2010*).

Greater than 90% 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., 1989*).

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 (10% to 14%), mid-distal descending aorta (12%), and even multiple sites (13% to 18%) have been reported (*Williams et al., 1994*).

Blunt carotid artery disruption accounts for about 3% to 10% 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 20% (*Beitsch et al., 1994*).

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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 14% 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., 2000*).

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., 1994*).

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 90% sensitivity and 100% specificity for vascular injuries that require treatment (*Nunez et al., 2004*).

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