

Management of Major Vascular Injuries



Neck, Extremities, and Other Things that Bleed

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KEYWORDS

- Neck trauma • Vascular injury • Vascular trauma • Blunt cerebrovascular
- Computed tomography angiography • Tourniquet

KEY POINTS

- Clinical guidelines from the Western Trauma Association should be used to screen for blunt cerebrovascular injuries in patients at risk so that antiplatelet, antithrombotic, or endovascular treatments can be initiated to reduce the risk of stroke.
- Patients with deep penetrating neck injuries and no indications for immediate surgery can be worked up with a careful physical examination and computed tomography–based angiography regardless of the zone of injury.
- Because the time to reperfusion is the major determinant of limb salvage in patients with extremity arterial injuries, emergency physicians' primary responsibility is to make the diagnosis.
- The arterial pressure index is a highly sensitive and specific physical examination maneuver for diagnosing extremity arterial injuries and should be performed in all patients with high-risk injuries or clinical concern for vascular injury.
- Appropriately applied tourniquets are a useful means of temporarily controlling peripheral arterial hemorrhage when direct pressure and wound packing have failed.

INTRODUCTION

Patients with major vascular injuries represent a significant clinical challenge to emergency physicians whether in a small community hospital, a high-volume urban trauma center, or on the battlefield. Such injuries may be clinically obvious and dramatic or

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present with minimal initial clinical findings and subsequently progress to limb-threatening ischemia if not identified. Several types of vascular injuries have been described in the settings of blunt or penetrating trauma (**Box 1**).¹⁻³

There have been numerous advances in the management of vascular trauma over the past several decades, including the advent of computed tomography (CT) with angiography (CT-A),^{4,5} the resurgence of prehospital tourniquets,^{6,7} the establishment of damage control resuscitation principles,^{8,9} as well as greater reliance on endovascular therapies.^{5,10} This article discusses practical and, wherever possible, evidence-based strategies for managing patients with significant vascular injuries. Potential pitfalls and opportunities are highlighted throughout, as are areas of clinical equipoise and controversy. Because it is not possible to cover the full spectrum of vascular trauma in this short article, the authors have chosen to focus on the resuscitation, diagnosis, and definitive management of those vascular injuries that are common, rapidly lethal, or associated with significant morbidity. This article comprises 3 parts:

1. The diagnosis and management of blunt and penetrating injuries to the neck vessels.
2. Diagnostic issues in extremity vascular injuries.
3. The perspective of vascular surgeons in managing peripheral vascular injuries.

PART I: VASCULAR INJURIES IN THE NECK

Injuries to the major neck vessels (the carotid and vertebral arteries) are among the most common injuries of all major vessels.³ Whether caused by blunt or penetrating mechanisms, these injuries can cause severe neurologic sequelae or lead to rapid exsanguination.

Pathophysiology of Blunt Cerebrovascular Injuries

Blunt injuries to the carotid arteries tend to be caused by the application of shear forces via one of 4 mechanisms (**Box 2**).

In contrast, vertebral artery injuries are caused by variable directions and patterns of shear force, including hyperextension and hyperflexion.¹¹ Fractures of the upper cervical spine (C1 to C3), especially to the foramen transversarium,¹² and facet joint dislocations are particularly associated with blunt injuries to the vertebral vessels.¹¹

Most blunt cerebrovascular injuries are caused by motor vehicle collisions,^{11,13} but there is a diversity of causes, including sporting injuries, falls, and even trivial-appearing trauma such as chiropractic manipulation or shaving.¹⁴

Box 1

Types of vascular injury

Vasospasm

External compression

Contusion

Intimal disruption

Subintimal or intimal hematoma

Focal wall defects with pseudoaneurysm or hemorrhage

Laceration

Transection

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