Eric Wahlberg
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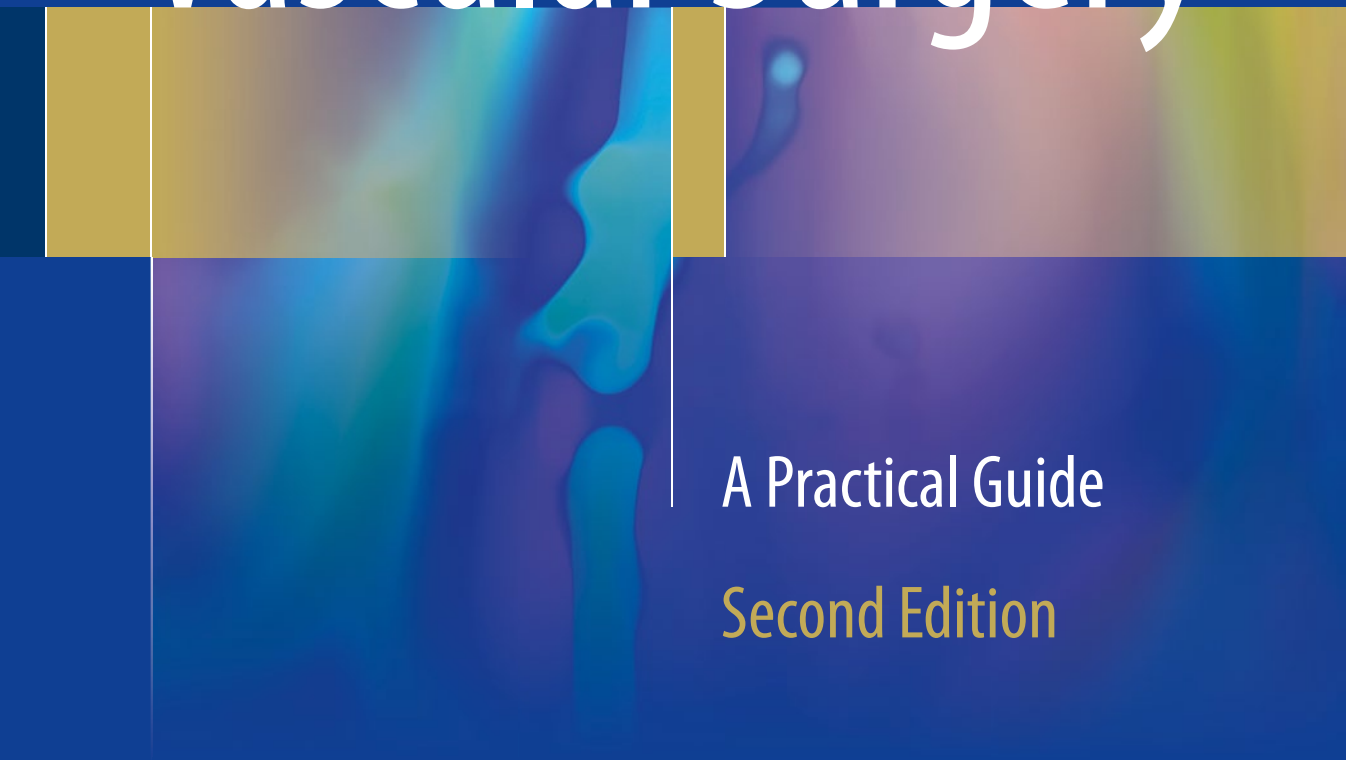
Emergency Vascular Surgery



A Practical Guide

Second Edition

Springer

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Preface

As with the first edition, the focus of the second edition of *Emergency Vascular Surgery: A Practical Guide* remains the management and initial treatment of common emergencies involving the non-cardiac vascular system. As the title implies, it is not meant to be a comprehensive textbook of the management of vascular disease nor is it aimed primarily for the experienced vascular surgery expert. Our purpose is to provide readily available and concise information that will enable surgery trainees and non-vascular surgeons to safely manage patients they may encounter in emergency departments and hospital wards. This is especially important because rapid diagnosis and treatment are mandatory for the management of the bleeding and ischaemic manifestations of vascular disease. It is also important because, as populations in most parts of the world are ageing and vascular diseases become more common, there are an insufficient number of adequately trained vascular specialists to ensure that one will always be immediately available for emergency situations.

Like the first, this edition is organised into two main sections: specific anatomic areas and general concepts. All of the chapters have been thoroughly updated with many new figures and appropriate emphasis on endovascular techniques, contemporary diagnostic studies and new pharmacologic agents. Suggested supplemental reading lists at the end of each chapter have been updated.

We appreciate and have been gratified by the feedback that we have received from trainees and practitioners who have used the first edition. This is what inspired us to undertake its revision. Hopefully this second edition will continue to serve their needs and contribute to the care of patients everywhere.

We gratefully acknowledge the assistance and encouragement of Michael Koy and the production staff at Springer-Verlag. We also acknowledge the inspiration and contributions for the first edition of Par Olofsson, a dear friend and respected colleague. Without Par, neither the first nor the second edition would have been written.

Stockholm, Sweden — Eric Wahlberg
San Francisco, CA, USA — Jerry Goldstone
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Part A

Specific Areas

Vascular Injuries to the Neck

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1.1 Summary

- Severe vascular injury after blunt neck trauma can be present even in the absence of clinical signs.
- Be liberal with CTA or duplex when cervical vessel injuries cannot be ruled out after blunt trauma.
- Associated injuries of the cervical spine, airway, and digestive tract must always be considered.
- Always stabilize the neck of patients in all types of severe cervical trauma until the entire spectrum of injuries is known.
- CTA or angiography should always be performed in penetrating injuries in zones I and III if the patient is stable.
- If available, CTA, duplex or angiography is recommended in zone II injuries in order to select patients for conservative versus surgical management.

1.2 Background

Traumatic injuries to the cervical vessels are relatively uncommon and constitute only about 5–10% of all vascular injuries. In about 25% of patients with blunt head and neck trauma, the cervical vessels are involved. The most common

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mechanism is penetrating injuries, but the incidence of blunt vascular trauma is probably underestimated because related symptoms are often vague and not recognized or absent. The patients are mostly young, and despite the low incidence, mortality and morbidity are very high. Mortality is, in most series, between 5% and 40%, and persistent neurological consequences are reported in up to 80% of patients. This is related not only to massive bleeding and cerebral ischemia due to embolization or thrombotic occlusion associated with the vascular injury but also to secondary damage to the aerodigestive tract (e.g., airway compression from a large expanding hematoma).

The anatomical location and the often complex associated injuries make traumatic cervical vascular injuries extremely challenging.

1.2.1 Causes and Mechanism

1.2.1.1 Penetrating Trauma

The most common mechanism for cervical vascular injuries is penetrating trauma. Penetrating neck injuries have a 20% incidence of major vascular injury. As shown in Table 1.1, the common carotid is the most commonly injured major artery. The majority of stab wounds affect the left side (right-handed assailants). The type of penetrating trauma is most often stab wounds by knives, but high- or low-velocity projectiles, gunshot wounds, and bone fragments from adjacent fractures are other mechanisms. High-velocity penetrating trauma is often fatal but can also cause secondary "blunt" vascular injuries because of the shock wave. The internal and external jugular veins are the most common vascular structures injured by penetrating objects.

Table 1.1 Frequency of vessel and associated organ injuries in penetrating injuries to the neck

Site of injury		
Major vessels		
Arteries (10–15%)	Common carotid artery	73%
	Internal carotid artery	22%
	External carotid artery	5%
Veins (15–25%)	External jugular	50%
	Internal jugular	50%
Other organs		
Digestive tract	5–15%	
Airway	4–12%	
Major nerves	3–8%	
No involvement of important structures	40%	

1.2.1.2 Blunt Trauma

Blunt trauma to the cervical vessels is thought to occur in less than 0.5% of all blunt traumas to the body and account for 3–10% of all carotid injuries. Blunt carotid injuries are bilateral in 20% of cases, but recent reports indicate that many of these vascular injuries go undetected.

The internal carotid artery is involved in more than 90% of these blunt injuries, most commonly its distal parts. The true incidence is unknown, but a few reports cite figures in the range of 0.1–1.1% of all blunt head and neck injuries. The variation is related to the type of study and methodology; some studies are retrospective, and others are based on liberal screening with angiography or computed tomography (CT). Blunt carotid injuries occur in motor vehicle or industrial accidents, after assaults, or from intraoral trauma. Blunt injuries to the vertebral artery are less common than carotid injuries because the vertebrals are well protected in osseous structures from direct blows. Injuries are most commonly caused by dislocated fractures or penetrating injuries. The mechanisms of blunt injuries are, as in injuries of the internal carotid artery, hyperextension and rotation or hyperflexion.

The mechanism of injury can be either a direct blow or hyperextension and rotation of the neck. In the latter type, the internal carotid artery is stretched over the body of the C2 vertebra and the transverse process of C3, which causes an intimal disruption and flap formation with subsequent risk for embolism or dissection and thrombotic occlusion. Other consequences are the development of pseudoaneurysms or, in rare cases, even complete disruption of the internal carotid at the base of the skull. In some reports, up to 50% of patients are reported to have bilateral vascular injuries after blunt trauma to the neck. Carotid dissection has been reported to also occur after minor head and neck trauma or to be associated with activities such as unaccustomed physical exercise, "heading" a soccer ball, and childbirth. Chiropractic manipulation is another well-recognized although a rare cause of vertebral artery dissection.