Case Report

Radiographically occult perforation and dissection of the common carotid artery following stab injury to the neck

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A R T I C L E   I N F O

A B S T R A C T

In recent years, many diagnostic algorithms have been devised to reduce the rate of negative explorations associated with indiscriminate surgical management of penetrating neck injuries. In hemodynamically stable patients, the need for surgical intervention is usually determined by integrating both clinical signs and radiological findings; if such investigations remain unremarkable, recommended treatment consists in close observation and sequential physical examinations. We report on a 29-year-old male who was admitted to a Swiss tertiary care hospital after sustaining a penetrating injury to his left neck following a knife attack. Disregarding a pre-hospital account of hemorrhage from the wound and slight dysphagia, no manifest symptoms or signs of internal organ damage were present on primary survey. Moreover, there was no evidence of vascular or aerodigestive tract injury on initial CT angiography. We nonetheless proceeded with immediate surgical exploration, exposing a significant perforation of the left common carotid artery with concomitant dissection of the said vessel. Surgical repair was successfully performed and the patient suffered no long-term sequelae. We thus recommend that a high level of suspicion be upheld in both asymptomatic and oligosymptomatic patients with PNI and that clinical practitioners remain cautious in the face of deceptively reassuring radiologic findings.

Background

The management of penetrating neck injuries (PNI), e.g. traumatic lesions violating the platysma, has long been a matter of discussion among emergency clinicians, with the most avid debate pertaining to the category of stable and oligosymptomatic patients [1]. Aside from injuries to the aerodigestive tract, PNI frequently involve damage to vascular structures such as the carotid arteries [2]. Aiming to provide improved criteria correlating with injury severity and to reduce the rate of unwarranted surgical explorations, recent studies have advocated a so-called "no-zone" approach to PNI; instead of basing decisions primarily on the location of the external injury (as in a "zone-based approach"), this strategy involves a stepwise diagnostic work-up dependent on patient symptoms, physical findings and adjunct studies [3,4]. CT angiography has been shown to constitute a valuable and readily available tool to guide decision-making in cases where a lack of "hard" symptoms obviates immediate surgical exploration

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[5,6]. Despite such advances in diagnostic acuity, one may still encounter cases such as the following where the entirety of clinical and radiological evidence remains inconsistent, prompting a course of action off the customary track.

Case report

We report on a 29-year-old male who suffered a knife stab injury to the left side of his neck following a scuffle with an unknown assailant. While the patient himself supposedly remained oblivious to his injury due to alcohol intoxication, bystanders reportedly observed some bleeding from the wound, which they proceeded to dress with a compression bandage. Upon arrival of paramedical support, the patient was found alert and hemodynamically stable. Beneath the dressing, a wound measuring around 10 mm in diameter was noted at the left superior carotid triangle (Fig. 1). Aside from superficial lacerations on the left hand and the chest, no further traumatic lesions were found. A cervical collar was applied to hold a soft compression bandage in place and the patient was taken to the resuscitation room of a tertiary care hospital. Upon arrival, he complained of slight dysphagia but was otherwise asymptomatic with a GCS of 15, a systolic blood pressure of 140 mm Hg, a heart rate of 90 bpm and a blood oxygen saturation of 99%. Initial hemoglobin levels were at 15.9 g/dL. The patient declared to be otherwise healthy. Except for the aforementioned lesions, physical examination was unremarkable; in particular, there was no active bleeding from the cervical wound, no visible hematoma and no evidence of any neurological or peripheral vascular deficit. A CT trauma scan including a cranio-cervical CT angiography study was performed, revealing circumscribed subcutaneous emphysema in the left neck without evidence of vascular, pharyngo-esophageal or laryngo-tracheal involvement (Fig. 2). Despite these findings, prophylactic antibiotic treatment was started and the patient was taken to the OR for exploration of the cervical wound under general anesthesia. Shortly after superficial dissection, we encountered substantial arterial bleeding which was traced back to an injury of the left common carotid artery close to its bifurcation; circumferential preparation of the said vessel using a "no-touch" technique exposed a perforation of both the lateral and medial arterial wall; moreover, an endoluminal dissection membrane was identified at the site of the lateral perforation (Fig. 3). Therapeutic anticoagulation was initiated intraoperatively (5000 units of heparin bolus dose) and continued henceforth (20,000 units of heparin per 24 h). The adventitial and medial layers of the aforesaid perforations were successively closed using a running 6/0 polypropylene suture and covered with gelatin-resorcinol formaldehyde-glutaraldehyde glue and absorbable gentamicin sponges. Regular flow within the common carotid artery and its branches was confirmed intraoperatively using Doppler sonography. Also the postoperative CT angiogram was free of pathological findings of the cervical arteries. The patient was subsequently transferred to the intensive care unit, showing no signs of neurological impairment after extubation. He was discharged home five days after admission following an uneventful postoperative recovery. It was recommended that therapeutic anticoagulation be continued with rivaroxaban for a total of 12 months. The patient was seen again six weeks postoperatively following a planned outpatient MR angiogram of the neck. He was free of complaints and back at work; MR imaging did not reveal any pathologic finding (Fig. 4).
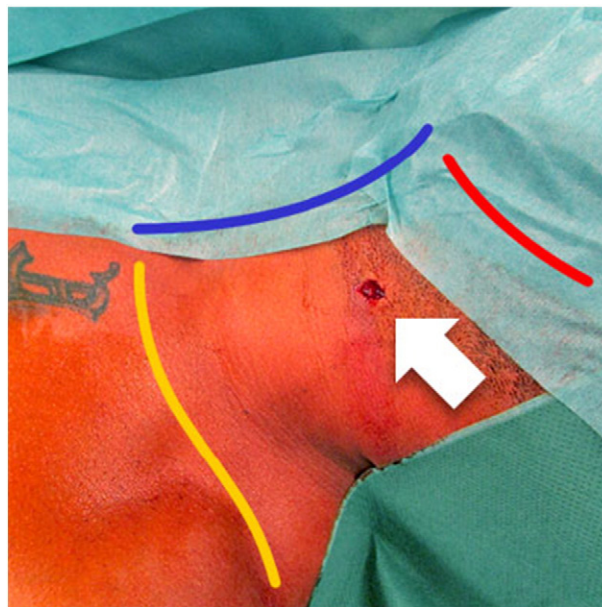

Fig. 1. External wound located at the left superior carotid triangle (red line: left lower mandibular border; blue line: anterior cervical midline; yellow line: left clavicle).

Fig. 2. Sagittal maximum intensity projection image of preoperative CT angiography showing normal common, internal and external carotid arteries.

Discussion

Over the last decades, the heterogeneous group of PNI has been subdivided according to different criteria. Earlier guidelines stipulated that the site of the external wound be considered to estimate internal organ involvement and the need for surgical exploration; in this context, lesions located between the lower mandibular border and the thoracic inlet were traditionally subjected
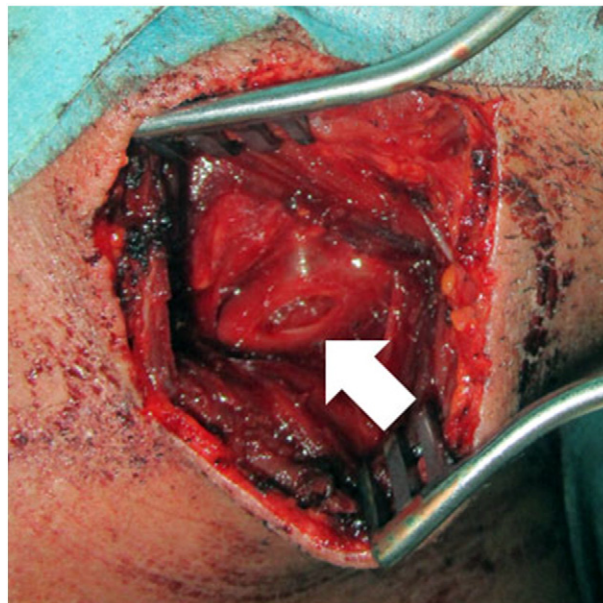
Fig. 3. Perforation of the lateral wall of the left common carotid artery close to its bifurcation.

Fig. 4. 3D volume rendered MR angiography image 6 weeks after surgery showing no abnormality of the cervical arteries.

to indiscriminate wound exploration due to the accessibility of underlying structures in this area [7]. However, high rates of non-therapeutic surgical interventions have led to the proposition of a selective non-operative management of PNI: While there is still unanimous agreement that the minority of unstable patients with "hard" signs such as active hemorrhage, expanding/pulsating hematoma, bruit/thrill, shock, pulse deficit or central neurologic impairment (Table 1) should undergo surgery without delay, modern concepts direct that hemodynamically stable patients who are asymptomatic or demonstrate but "soft" signs like venous

Table 1
"Hard" and "soft" symptoms/signs in PNI [1,11].

Hard signs	Soft signs
Vascular	
Shock	
Pulsatile bleeding	Venous oozing
Expanding hematoma	Stable hematoma
Audible bruit or palpable thrill	
Unilateral extremity pulse deficit	
Signs of cerebral ischemia	
Aerodigestive	
Airway compromise	
Massive hemoptysis	Minor hemoptysis
Massive hematemesis	Minor hematemesis
Extensive subcutaneous air	Minor subcutaneous emphysema
Wound bubbling	
Stridor/hoarseness	Dysphonia
	Dysphagia

oozing, minor hematoma, dysphagia, dysphonia or subcutaneous emphysema (Table 1) be managed according to clinical and instrumental findings and irrespective of wound location [3,4]. CT angiography has emerged as the preferred modality of investigation due to its availability, speed and capacity to simultaneously depict vascular, laryngotracheal and pharyngoesophageal damage with high rates of sensitivity and specificity; besides, it has been reported to correlate strongly with conventional arteriography results, especially when it comes to large-caliber vessels such as the common carotid artery [5,6,8]. Large prospective and retrospective studies have shown that a workup including CTA and clinical findings can effectively reduce the rate of negative surgical explorations to around 1% while implicating a negligible number of missed injuries [9–11]. In the presented case the patient was virtually asymptomatic at admission, complaining only of slight dysphagia. Since CTA did not expose any internal organ injury, it would have seemed reasonable to follow him expectantly. However, the proximity of the wound trajectory to major vessels in conjunction with unverified reports of bystanders who had witnessed the attack and subsequent bleeding from the wound prompted us to proceed in an anticipatory manner, revealing the intraoperative findings described above. Even though selective non-operative management appears to be a practical and safe strategy for PNI, this case shows that clinical decision-making remains challenging despite sensitive imaging technology. We suggest that clinical evidence and heteroanamnestic information be judiciously weighed and not be disregarded in light of negative radiological findings; this may be particularly important in patients with an altered state of consciousness, e.g. due to alcohol intoxication.

Consent

Written informed consent was obtained from the patient for publication of this case report and the accompanying tables and figures.

Competing interests

The authors declare that they have no competing interests.

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