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Clinical Reviews

EVALUATION AND MANAGEMENT FOR CAROTID DISSECTION IN PATIENTS PRESENTING AFTER CHOKING OR STRANGULATION

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□ **Abstract—Background: Carotid dissection (CD) is often overlooked as a concern in strangulation and choking cases. When the diagnosis is considered, the question remains what is the best means of evaluation, and which imaging study should be obtained. Objective: To evaluate the literature for evaluation of choking- and strangulation-related injuries and their association with CD. Discussion: This article will review the literature on blunt carotid injuries, with particular attention to subjects with choking and strangulation mechanisms of injury, and will include important physical findings, when and which radiographic evaluations are indicated, and treatment. Conclusion: Although rare, CD can occur after strangulation and choking. When suspected, evaluation should include imaging studies including computed tomography angiography. © 2011 Elsevier Inc.**

□ **Keywords—choking; strangulation; choke holds; carotid restraint; carotid dissection**

INTRODUCTION

A 39-year-old man came to the Emergency Department after having been found hanging suspended from a bedpost by a sheet. There was no head trauma, no loss of consciousness, and no other organ systems involved. He presented with complaints of lateral neck pain, and his mother noticed his right eye drooping a bit. The clinical concern in this case was carotid artery dissection (CD), until proven otherwise. The patient was placed into a queue with a specified evaluation plan for imaging and consultation as warranted.

The first reported case of non-penetrating trauma to the carotid artery occurred in 1872 (1). Since then, the majority of the medical literature involving carotid artery injuries consists mainly of penetrating neck trauma, as this is the predominant mechanism of injury. However, the focus of this article will be on carotid dissection caused by blunt mechanisms, with a focus on strangulations and hangings (Figure 1). The incidence of blunt carotid injury is reported to be around one to two per 1000 blunt injuries and accounts for only 1.5–10% of all reported carotid injuries (2–6). These injuries can be devastating, with mortality rates reported between 20% and 40%, and permanent neurological disabilities occurring in 40–80% of survivors (4,7,8). One of the recurrent issues with CD is that the patient often does not present or the diagnosis is not entertained until there are neurological deficits present. The objective of this article is to evaluate the literature for evaluation of choking- and strangulation-related injuries and their association with CD, specifically in asymptomatic patients.

METHODS

This article is a review of the medical literature utilizing a PubMed search for the key words "carotid artery dissection," "strangulation," "choking," and "hanging."

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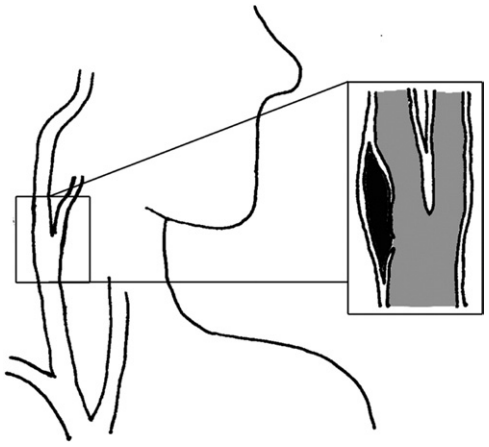

Figure 1. Schematic of a carotid artery dissection.

Variations of these key words were also utilized, for example, "choke," "choked," and "choking." Articles were predetermined to be appropriate for review if they addressed the evaluation of patients with no symptoms of CD in the face of hangings, strangulation, or chokings. Review articles, formal studies, and case reports were reviewed.

DISCUSSION

Mechanisms of Injury

As the diagnosis of CD in general is a rare event, and those caused by blunt trauma are even more rare, most of the medical literature is based on case series and case reports. Brown et al. report on 143 cases of carotid artery injury, but only two were from blunt trauma, with both of those presenting with neurological deficits (6). Up to 70% of all blunt carotid injuries occur as a result of motor vehicle collisions, 12% in sporting events, 10% in fights, and 7% in falls (9,10).

Carrillo et al. presented 30 cases of CD caused by blunt mechanisms, including 25 from motor vehicle crashes, two from falls, two from assaults, and one from strangulation. The patient with strangulation presented with cervical bruising and altered mental status (11). A history of strangulation or choking often leads the emergency physician to order an objective radiological evaluation of the carotid vessels. Case reports reflect that strangulation as a cause of CD typically will present with neurological findings (12–14). A review of the literature reflects no reports of CD in patients who were strangled or choked and had a normal neurological examination and no pain, bruising, or tenderness over the lateral neck region. The lack of finding cases of CD does not necessarily mean that they do not occur, but rather that they are likely extremely rare in these patients. A stable, asymptomatic patient without competing injuries, with a normal neurological examination, with no focal tenderness or bruising over the carotid arteries, based on current limited literature does not necessarily require imaging as the risk of CD is felt to be extremely low. In these asymptomatic patients, objective evaluation is not required; however, return precautions should be given to the patient in case neurological changes occur.

The actual mechanism of injury that initiates the dissection is felt to be a direct blow to or hyperextension of the neck, which causes a stretching of the neck in combination with compression of the carotid artery against the first and second cervical vertebrae (15). The diagnosis of CD should be considered by the clinician evaluating a patient with this type of mechanism of injury.

Clinical Presentation

Although choking and strangulation patients usually present early and without neurologic deficits, some may present later when neurologic symptoms occur as a result of CD. These patients will typically have clinical findings consistent with CD, including pain over the carotid or evidence of injury to that region. Dissection of the artery results from an intimal tear or primary hemorrhage of the vasa vasorum. Thrombus forms in the vessel and can lead to narrowing of the artery with reduced flow, or the thrombus may break free and become an embolic source for distal branch occlusion (16). The patient with carotid artery dissection from all mechanisms will suffer cerebral infarction in up to 82% of cases, and usually present within 7 days (17). Alimi et al. reported that only 56% of patients usually present with clinical findings in the first 24 h, and 66% within the first week (18). However, symptoms of stroke have been delayed up to several weeks. In patients presenting with spontaneous CD, the most common clinical findings include neck, jaw, or head pain, Horner's syndrome, and tinnitus in up to 96% of cases (19).

Kerwin et al. obtained four-vessel angiography on all patients who presented with the following liberal screening criteria: anisocoria, unexplained mono- or hemiparesis, a neurological examination unexplained by head computed tomography (CT) scan, a basilar skull fracture through or near the carotid canal, a fracture through the foramen transversarium, evidence of cerebral vascular accident (CVA) or transient ischemic attack (TIA), massive epistaxis, a severe flexion or extension cervical spine fracture, massive facial fractures, or neck hematoma (20). In that study, they report on 1941 blunt injury trauma patients seen over 18 months, of whom 48 patients met the above criteria, with 21 (44%) having at