



Clinical Review



VASCULAR CAUSES OF SYNCOPE: AN EMERGENCY MEDICINE REVIEW

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Abstract—Background: Syncope is a common emergency department (ED) complaint, accounting for 2% of visits annually. A wide variety of etiologies can result in syncope, and vascular causes may be deadly. **Objective:** This review evaluates vascular causes of syncope and their evaluation and management in the ED. **Discussion:** Syncope is defined by a brief loss of consciousness with loss of postural tone and complete, spontaneous recovery without medical intervention. Causes include cardiac, vasovagal, orthostatic, neurologic, medication-related, and idiopathic, and most cases of syncope will not receive a specific diagnosis pertaining to the cause. Emergency physicians are most concerned with life-threatening causes such as dysrhythmia and obstruction, and electrocardiogram is a primary means of evaluation. However, vascular etiologies can result in patient morbidity and mortality. These conditions include pulmonary embolism, subclavian steal, aortic dissection, cerebrovascular disease, intracerebral hemorrhage, carotid/vertebral dissection, and abdominal aortic aneurysm. A focused history and physical examination can assist emergency physicians in determining the need for further testing and management. **Conclusions:** Syncope is common and may be the result of a deadly condition. The emergency physician, through history and physical examination, can determine the need for further evaluation and resuscitation of these patients, with consideration of vascular etiologies of syncope. Published by Elsevier Inc.

Keywords—syncope; vascular; pulmonary embolism; subclavian steal; aortic dissection; cerebrovascular disease; intracerebral hemorrhage; subarachnoid hemorrhage; carotid dissection; vertebral dissection; abdominal aortic aneurysm

INTRODUCTION

Syncope is common, accounting for close to 2% of emergency department (ED) visits per year and 2–7% of admissions (1–3). Up to 40% of patients experience at least one episode of syncope by age 40 years, with 13.5% experiencing recurrent syncope, and the annual incidence of syncope approaches 7% in those over 75 years (3–5).

Syncope is defined by a brief loss of consciousness (LOC) with loss of postural tone and complete, spontaneous recovery without medical intervention. This is due to at least 10 s of complete blood disruption to the central nervous system, with 33–50% reduction in cerebral blood flow (4,6–14). One of the difficulties evaluating syncope is the wide range of etiologies that can result in this condition. Causes include vasovagal (20–30%), cardiac (10%), orthostatic (10%), medication related (7%), neurologic (37%), and unknown/idiopathic (37–40%). Despite focused but thorough history and physical examination, up to 60% of patients will not have an official diagnosis on initial evaluation (9,10,12,14–17).

One of the primary etiologies emergency physicians evaluate for includes cardiac causes. These are broken into electrical (dysrhythmia) and structural

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(9,10,14–18). Dysrhythmias include prolonged QT interval, Brugada morphology, ventricular tachycardia, Torsades, sick sinus syndrome, short QT syndrome, right ventricular dysplasia, second-degree type two and third-degree heart block, and Wolff-Parkinson-White syndrome. Structural include hypertrophic obstructive cardiomyopathy, valvular disease (aortic stenosis), and myocardial infarction (12–18). With these conditions, the electrocardiogram (ECG) is a vital component of evaluation (12–14,17,18). Ultrasound may be valuable in the evaluation of patients with suspected cardiac cause, including valvular disease and hypertrophic obstructive cardiomyopathy.

However, another deadly cause of syncope includes vascular pathology. This review seeks to evaluate these vascular causes while providing an approach to evaluation and management. Syncope due to fluid depletion or hemorrhage will not be reviewed in this article.

METHODS

Authors conducted a literature search including Medline, Google Scholar, and Google FOAM using search terms “syncope,” “vascular,” “pulmonary embolism,” “subclavian steal,” “aortic dissection,” “cerebrovascular disease,” “intracerebral hemorrhage,” “subarachnoid hemorrhage,” “carotid dissection,” “vertebral dissection,” and “abdominal aortic aneurysm.” Studies to include were reached by consensus of the two authors. Authors sought data concerning the etiology of syncope in these conditions, the incidence, presentation with history and physical examination, testing, and management.

DISCUSSION

Emergency physicians evaluate for these deadly cardiac causes. However, other dangerous etiologies of syncope include the supposed “15%” club, in which syncope is a disease manifestation in 15% of cases (though this is often not accurate). These include vascular or obstructive causes of syncope, which may result in morbidity and mortality if not diagnosed and appropriately managed.

Pulmonary Embolism

Pulmonary embolism (PE) is a potentially lethal disorder with a wide range of clinical presentations, from asymptomatic to hemodynamic instability. The most common symptoms include dyspnea, tachypnea, or chest pain. PE occurs in over 112 cases per 100,000, with over 100,000 deaths in the United States per year. Risk factors include inherited and acquired (19–23). Acquired include recent surgery, trauma, immobilization, active malignancy, and hormone therapy (22–32). Nonprovoking factors include

cigarette smoking and obesity (22–27). In over 50% of patients with PE, it is due to proximal deep venous thrombosis (22,23,31–34). Syncope can occur in approximately 10% of patients with PE, due to several mechanisms (33,34). One of these potential mechanisms includes right ventricular failure from massive PE, resulting in impaired left ventricular filling and reduced cerebral blood flow. Another mechanism includes unstable tachydysrhythmia or bradydysrhythmia from PE. Finally, PE may result in stimulation of vagal receptors, with bradycardia, vasodilatation, and hypotension. Patients in whom syncope is a presenting symptom more commonly have larger emboli, or embolus in the main pulmonary artery (33–35). ECG and computed tomography (CT) of the pulmonary vasculature with intravenous (i.v.) contrast can assist with diagnosis. Biomarkers may be elevated, which is due to right ventricular strain most commonly.

Subclavian Steal

Subclavian steal occurs with significant stenosis of the subclavian artery, which results in vascular flow reversal in the vertebral artery ipsilateral to the affected subclavian vessel (36,37). Most patients experience no symptoms. If symptoms do occur, arm fatigue, pain, and paresthesias are the most common symptoms. However, syncope can occur with ischemia in the vertebrobasilar system. Other symptoms including vertigo, ataxia, diplopia, nystagmus, and dizziness can occur as well if the vertebrobasilar system is affected (38–41). Syncope and arm symptoms are suggestive of the diagnosis. CT of the chest extending into the upper extremities with i.v. contrast can assist with diagnosis.

Aortic Dissection

Aortic dissection is a rare, life-threatening condition that occurs due to a tear in the aortic intima (42–45). Incidence rates range from 16 per 100,000 to 1 in 6250 persons, though mortality is severe at 27% (42–45). Patients are often over age 60 years with hypertension, male gender, collagen vascular disorder, or several other conditions that predispose patients to aortic pathology (Turner syndrome, inflammatory disease, trauma, pregnancy, aortic coarctation, bicuspid aortic valve). Though hypertension is common, hypotension may be present in patients with ascending dissections with cardiac tamponade, acute aortic valve regurgitation, or acute myocardial ischemia (42–44). Classically, ascending dissection is associated with mortality of 1–3% per hour in the first 48 h (45). The dissection then propagates proximally or distally from the point of the primary tear. This propagation of the dissection is the primary cause of symptoms including ischemia,

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