Section one: Definition, pathophysiology, epidemiology

CHAPTER 1
Syncope: definition, classification, and multiple potential causes

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Introduction

The term 'syncope' is derived from an old Greek word meaning 'to cut short' or 'interrupt'. In modern usage, syncope refers to a transient and spontaneously reversible interruption of global cerebral activity resulting in loss of consciousness (and by inference, loss of postural tone). However, in the clinic, most English-speaking patients do not use the word 'syncope'. More commonly they will use terms that are more common in everyday language such as 'fainting', 'blacking out', 'collapse', or 'passing out'. In former days, the term 'swoon' was used, but this is rare today. Additionally, syncope must be considered as part of the differential diagnosis for patients who present with an apparent self-limited 'fall' or 'collapse' (Figure 1.1), even if it is unclear whether they suffered loss of consciousness.

The '*sine qua non*' of syncope (faint) is transient global diminution of blood flow to the brain, such that a disturbance of cerebral function occurs

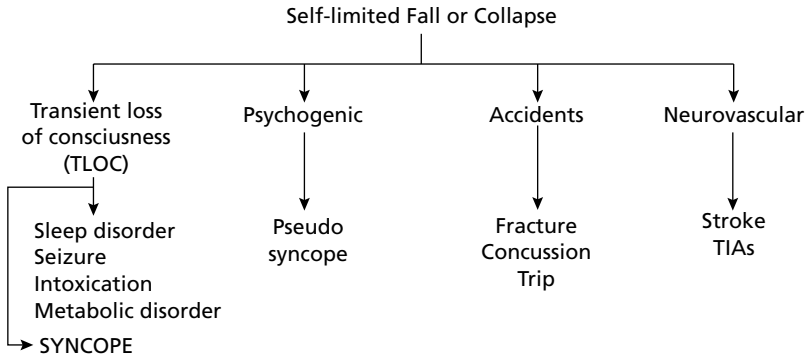

Figure 1.1 Scheme depicting differential diagnostic considerations for patients who present with a self-limited fall or collapse. Syncope is only one element of the differential, but is the primary focus of this book.

Table 1.1 Conditions often mistakenly considered to be syncope.

Dizziness
Vertigo
Drop attacks
Falls
Psychogenic syncope
Transient ischemic attack (TIA)

(see Chapters 3 and 4). As discussed below and elsewhere in this book, this definition eliminates many other conditions that are often mistakenly (even in the literature) considered to be syncope (Table 1.1).

In terms of a practical approach to the clinical problem, physicians are most often first confronted with a patient who has apparently experienced an episode of transient loss of consciousness, or (as in the case of an unexplained 'fall' – suspicion of transient loss of consciousness). In this scenario, one should not immediately assume that the event was 'syncope', since it is not the only explanation for such symptoms. The broader term 'Transient Loss of Consciousness (TLOC)' is a better starting point, since it has a much more diverse set of etiologies and thereby requires the physician to consider a wider range of possibilities. Only if TLOC is due to transient inadequacy of global cerebral blood flow should the differential diagnosis begin to focus on those conditions typically responsible for 'syncope'.

Goals

This chapter provides an introduction to the concept of syncope as a symptom with many potential causes. Indeed, multiple possibilities frequently coexist in the same patient, thereby complicating the diagnostic dilemma. Specifically, the objectives of this section are to:

- define syncope;
- provide a classification of the principal causes of syncope in a manner consistent with the most recent ESC Syncope Task Force guidelines; and
- highlight the possibility that multiple potential contributing factors need to be considered when evaluating syncope patients.

Definition

Syncope is a symptom defined as a transient, self-limited loss of consciousness, and as a consequence the concomitant loss of voluntary muscle tone. The underlying mechanism is transient global cerebral hypoperfusion. The onset of syncope is relatively rapid and the subsequent recovery is by definition

spontaneous, complete, and usually prompt. Residual symptoms (e.g. fatigue) may, however, persist for hours or longer in certain types of faints.

Elements of the definition of syncope

The definition of syncope incorporates five main components.

1 *Loss of consciousness.* This is a critical feature that has to be derived from the history taken from the patient or from those who witnessed the episode(s). If the history convincingly points to there not having been loss of consciousness associated with the patient's 'spell', the diagnosis of syncope is excluded – it is something else (for examples see Table 1.1). Beware, however, that the victim may deny (possibly due to memory deficit or embarrassment) having experienced loss of consciousness, and only careful interrogation of witnesses may determine the real state-of-affairs.

2 *Loss of voluntary muscle tone.* Loss of voluntary muscle control is inherent with loss of consciousness. Therefore, if standing, the fainter falls down; if seated he or she slumps over.

3 *Onset is relatively rapid.* As a rule, the onset of syncope is rapid, being no more than 10 to 20 s after onset of premonitory symptoms (if there are any such symptoms). Faints may be associated with any of a variety of warning symptoms (or none at all), and the nature of these (see Chapters 7 and 8 discussing the initial evaluation and medical history taking) may provide important clues as to the cause of the symptoms. On the other hand, many fainters either do not experience or are unaware of any premonitory symptoms. This lack of warning seems to be particularly prevalent in older individuals.

4 *Recovery is spontaneous, complete, and usually prompt.* This aspect of the definition excludes a number of conditions that may result in loss of consciousness, but which in fact do not reverse themselves to normal in the absence of medical intervention. Examples of such conditions are coma (e.g. hypoglycemia), intoxicated states (alcohol, narcotics, other drugs), stroke, or resuscitated 'sudden death' syndrome. Although states of intoxication usually reverse spontaneously, the relatively long time frame of the recovery distinguishes them from true syncope.

5 *Underlying mechanism is transient global cerebral hypoperfusion.* This element of pathophysiology differentiates 'true syncope' from loss of consciousness due to trauma (e.g. concussion) or seizures (epilepsy). Both trauma and epilepsy may lead to loss of consciousness with complete and spontaneous recovery, but their origins are not inadequacy of cerebral perfusion. With regard to epilepsy (see also Chapters 2, 17, and 23), perhaps the aspect that causes the most confusion is abnormal motor activity. In syncope, it is not uncommon for patients to exhibit jerky movements of the arms and legs for a brief period of time; nonexpert bystanders may incorrectly interpret these movements as a 'seizure' or a 'fit'. However, the jerky movements during a faint differ from those accompanying a grand mal epileptic seizure in several ways. They are

of shorter duration, they tend to occur after the loss of consciousness has set in rather than before, and they are jerkier and do not have the 'tonic–clonic' features of a true grand mal epileptic seizure.

Causes of syncope: classification and single versus multiple etiologies

Later chapters in this book provide a comprehensive discussion of the most important causes of syncope and their appropriate investigation. Only a brief

Table 1.2 Syncope classification.

Neurally mediated reflex syncopal syndromes
Vasovagal (common) faint
Carotid sinus syndrome
Situational faint
Acute hemorrhage
Cough, sneeze
Gastrointestinal stimulation (swallow, defecation, visceral pain)
Micturition (postmicturition)
Postexercise
Other (e.g. brass instrument playing, weightlifting, postprandial)
Glossopharyngeal and trigeminal neuralgia
Orthostatic
Primary autonomic failure syndromes (e.g. pure autonomic failure, multiple system atrophy, Parkinson's disease with autonomic failure)
Secondary autonomic failure syndromes (e.g. diabetic neuropathy, amyloid neuropathy)
Volume depletion
Hemorrhage, diarrhea, Addison's disease
Cardiac arrhythmias as primary cause
Sinus node dysfunction (including bradycardia/tachycardia syndrome)
AV conduction system disease
Paroxysmal supraventricular and ventricular tachycardias
Inherited syndromes (e.g. long QT syndrome, Brugada syndrome, short QT, arrhythmogenic dysplasia)
Implanted device (pacemaker, ICD) malfunction, drug-induced proarrhythmias
Structural cardiac or cardiopulmonary disease
Cardiac valvular disease
Acute myocardial infarction/ischemia
Obstructive cardiomyopathy
Atrial myxoma
Acute aortic dissection
Pericardial disease/tamponade
Pulmonary embolus/pulmonary hypertension
Cerebrovascular
Vascular steal syndromes

overview is provided here. Specifically, we provide a classification (Table 1.2) of the causes of syncope beginning with the most frequently encountered conditions, the neurally mediated reflex faints. However, it should be borne in mind that even after a thorough assessment, it may not be possible to assign a single cause for fainting. Often, patients have multiple comorbidities and as a consequence they may have several equally probable causes of fainting. Thus, individuals with severe heart disease may faint due to transient tachyarrhythmias, high-grade atrioventricular (AV) block, or even as a consequence of being excessively medicated. Thus, the physician must not be lured into the trap of accepting an observed abnormality as either the certain cause or the sole cause of fainting in a given individual.

Neurally mediated reflex faints are of several different types, but the best known is the common or vasovagal faint. This is the so-called swoon often seen in films (usually triggered in the movies by a painful or emotionally upsetting event). The vasovagal faint can occur in both healthy persons as well as those with health problems; it is not indicative of nervous system disease and should not typically initiate neurologic studies. The patient experiencing a vasovagal type of reflex faint is very likely to feel nauseated and sweaty before fainting, and often appears pale and feels clammy. After the faint, they often feel tired; this sensation may last for hours or days. Other reflex faints include carotid sinus syndrome, or faints triggered by micturition or defecation. Coughing, swallowing, laughing, or even forcibly blowing into a wind instrument may also trigger a faint, presumably on a reflex basis.

Orthostatic (postural) faints are also common, and most often are associated with movement from lying or sitting to a standing position. Many healthy individuals experience a minor form of this faint when they need to support themselves momentarily as they stand up. However, the most dramatic postural faints occur in older frail individuals, those who have underlying medical problems (e.g. diabetes, certain nervous system diseases), or persons who are dehydrated from hot environments or inadequate fluid intake. Certain commonly prescribed medications such as diuretics, beta-adrenergic blockers, antihypertensives, or vasodilators (e.g. nitroglycerin) predispose to postural faints.

Cardiac arrhythmias may cause faints if the heart rate is too slow or too fast. Occasionally, such faints occur in otherwise healthy people such as at the onset of a paroxysmal supraventricular tachycardia (SVT) episode. However, individuals with underlying heart disease (e.g. previous myocardial infarction, valvular heart disease) are at greater risk. In either case the faint tends to occur at the onset of the rhythm problem, before compensatory vasoconstriction has a chance to respond and support the central systemic pressure. Faints may also occur when a rapid abnormal rhythm stops suddenly, and a pause ensues before the normal heart rhythm takes over again. If this is for more than 5 s,

Table 1.3 Causes of 'spells' commonly misdiagnosed as syncope.

Disorders with impairment or loss of consciousness
Metabolic disorders, including hypoglycemia, hypoxia, hyperventilation with hypocapnia
Epilepsy
Intoxication (drugs, alcohol)
Vertebrobasilar transient ischemic attack
Disorders resembling syncope without loss of consciousness
Cataplexy
Drop attacks
Psychogenic syncope (somatization disorders)
Transient ischemic attacks of carotid artery origin

the patient can experience lightheadedness or a faint (especially if they are in an upright position at the time).

Structural cardiopulmonary diseases are relatively infrequent causes of faints. The most common cause in this category is fainting associated with an acute myocardial infarction or ischemic event. The faint in this case is primarily caused by an abnormal nervous system reaction similar to the reflex faints. In general, faints caused by structural disease of the heart or blood vessels are particularly important to recognize as they are warning of potentially life-threatening conditions.

Cerebrovascular disease is rarely the cause of a faint. Perhaps subclavian steal is the best example in this class, but it is extremely uncommon. In the absence of clear-cut fixed or transient localizing neurologic signs during physical examination, cerebrovascular disease as a cause of syncope is unlikely. As a rule, this category should be considered only after all other 'causes' have been eliminated.

As noted earlier, certain clinical presentations are unfortunately often mislabeled as 'syncope' (Table 1.1). In other situations, however, the medical history mimics that of a faint (see also Chapter 23), and the most important of these are worth noting here primarily because they are commonly confused with 'true' faints (Table 1.3). As a consequence of this confusion (often aggravated by the manner in which even well-known investigators present their findings in the literature), the process needed to arrive at the correct etiologic diagnosis is impeded. The most common conditions in this category include: seizures, sleep disturbances, accidental falls, and some psychiatric conditions (e.g. anxiety attacks, severe hyperventilation and hysterical reactions). Inner ear problems causing dizziness (vertigo) are also frequently mislabeled as faints. Neurologic and metabolic disturbances (such as diabetes) are rarely the cause of true fainting.

Summary

The methods recommended to determine the most probable cause of syncope and ascertain which treatment direction is most appropriate are reviewed in subsequent chapters of this book. Here, we have attempted to provide an introductory overview, so that the reader will better appreciate the value of understanding the pathophysiology, the differential diagnosis, and the need for a thoughtful evaluation strategy. In the end, however, it is important to bear in mind that neurally mediated reflex syncope, orthostatic syncope, and cardiac arrhythmias account for approximately 60 to 70% of the recognized causes of syncope. Further, in 20% of patients the cause of syncope may remain unknown in spite of an extensive and well-planned evaluation. In some of this latter 20% there may be multiple possible causes and distinguishing among them in an effort to find a 'sole' cause may be both impossible and incorrect.

Additional reading

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