Syncope:
diagnostic tools

Syncope, or fainting, is a symptom rather than a disease. It can be caused by several underlying conditions and can often be mistaken for epilepsy. This can lead to inappropriate prescribing and significant health costs. In the second part of this article, **Drs Sanjiv Petkar, Adam Fitzpatrick and Paul Cooper** discuss the diagnostic tools available for identifying syncope and how it can be differentiated from epilepsy.

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Syncope is a symptom with many underlying causes. It accounts for one to three per cent of all hospital admissions worldwide[1-3] and syncope and collapse were the sixth commonest reason for admission of adults aged over 65 years to acute hospital beds in a study carried out in the north of England[4].

Diagnosis

Syncope is a clinical diagnosis and it is therefore not surprising that a meta-analysis of six population-based studies[5] came to the conclusion that history, physical examination and electrocardiography (ECG) are the core of syncope workup and when the results from these three evaluations are combined, permit a diagnosis in 50 per cent of patients. The same authors as well as another study[6,7] showed that laboratory tests yield results of diagnostic importance only in two to three per cent of all cases. They found that ECG is diagnostically useful in five to 10 per cent of all patients, CT in four per cent of patients, electroencephalogram (EEG) in two per cent of all cases and prolonged ECG monitoring in four per cent.

The importance of the history in patients presenting with transient loss of consciousness (T-LOC) has been emphasised in two other studies. The Syncope Symptom Study administered a uniform 118-item historical questionnaire to 671 patients who were referred to three academic centres in Canada and Wales for assessment of T-LOC. A point score was developed. The cause of loss of consciousness was shown satisfactorily in 539 patients and included seizures (n=102; complex partial epilepsy and generalised epilepsy) and syncope (n=437); tilt positive vasovagal syncope (n=267), ventricular tachycardia (n=90) and other diagnoses such as complete heart block and supraventricular tachycardia (n=80). The point score based on symptoms alone correctly classified 94 per cent of patients, diagnosing seizures with 94 per cent sensitivity and 94 per cent specificity[7]. The conclusion of the authors was that a simple point score of historical features distinguishes syncope from seizures with very high sensitivity and specificity.

A further study from the same group administered this questionnaire to 418 patients with syncope and no apparent structural heart disease[8]. The point score correctly classified 90 per cent of patients, diagnosing vasovagal syncope with 89 per cent sensitivity and 91 per cent specificity.

Defining the syndrome

Reflex syncope

T-LOC precipitated by fear, severe pain, emotional distress, instrumentation or prolonged standing suggests reflex syncope. A prodrome of nausea, vomiting, sweating, or feeling of cold and tiredness may also suggest reflex syncope. Of particular

importance is facial pallor during T-LOC. Blood drains away from the skin with diversion to skeletal muscle when the arterioles open with loss of sympathetic tone. Often patients are so pale that a witness might say 'I thought he/she was dead' and they are described as being 'as white as a sheet'. Nausea and vomiting after the event is suggestive of reflex syncope[9] but this can also represent reflex vagal hypertonia.

Convulsive syncope
Brief myoclonic jerking of limbs starting after the loss of consciousness, which itself is of short duration, can be seen in convulsive syncope.

Situational syncope
Syncope occurring during or immediately after urination, defecation, coughing or swallowing is called situational syncope. These situations are associated either with stimulation of autonomic reflexes, such as the gag reflex, or manoeuvres that raise intra-thoracic pressure and reduce venous return during standing (in men, often when getting up to go to the bathroom in the middle of the night) or both.

Arrhythmic syncope
Patients suffering T-LOC in the setting of definite structural heart disease, or T-LOC during (not after) exercise may indicate that syncope is due to a malignant tachyarrhythmia. Arrhythmias might also cause T-LOC when supine, sometimes when preceded by palpitation. If there is a family history of sudden cardiac death, an inherited cardiomyopathy such as hypertrophic cardiomyopathy, or a primary electrical heart disease, such as the Long QT or Brugada syndromes, arrhythmic syncope must be considered very likely, and every effort made to prove the diagnosis, because the risk of death is high[10].

Epilepsy
Similar to syncope, epilepsy is also a clinical diagnosis; and laboratory tests such as the EEG are used by neurologists to define the epilepsy syndrome affecting a patient rather than to cement a diagnosis in unselected patients with blackouts[11]. A diagnosis of epilepsy is more likely when there is a history of aura, such as unusual or distinctive smell before the event. Genuine tonic–clonic movements that are prolonged and coincident with the onset of T-LOC, rather than limb twitching (myoclonic jerks), are more suggestive of generalised epilepsy. A turn of the head at lateralised clonic movements, or clear automatisms

(eg, chewing or lip smacking suggest focal epilepsy). Lateral tongue biting, a suffused or cyanosed face, prolonged post-T-LOC confusion, or headache and aching muscles suggest generalised epilepsy, as does a family history of epilepsy. Epilepsy is far more likely if there is a previous history of brain injury, and epilepsy is very common in conjunction with cerebral birth trauma or hypoxia, severe learning disabilities, and autism.

ECG
Reflex syncope is the most common cause of syncope and usually there is no underlying structural heart disease. In these cases, a 12 lead ECG is commonly normal. However, an abnormal 12-lead ECG is an independent predictor of arrhythmic syncope or increased mortality[10]. The finding of a cardiac arrhythmia at the time of the patient's symptoms can cement the diagnosis. A 12-lead ECG must be done for every patient presenting with blackouts and it is extremely useful for diagnosing the inherited electrical disorders of cardiac rhythm presenting with syncope (eg, Long QT syndrome, Brugada syndrome and arrhythmogenic right ventricular dysplasia).

It should also be appreciated that a normal 12-lead ECG in a patient presenting with syncope is an important negative finding. An abnormal 12-lead ECG is an independent predictor of cardiac syncope or increased mortality[1]. The most common diagnoses encountered in the A&E department in this group of patients are ventricular tachycardia, and bradyarrhythmias.

Tilt table testing
In 1986, Kenny *et al*[12] first described the role of tilt table testing in the investigation of patients in whom the cause of syncope remained unexplained despite clinical and electrophysiological assessment. 67 per cent of patients had a positive test, manifested by hypotension and bradycardia when compared with only one control. Since this first study, tilt table testing has been used extensively in the management of patients with reflex syncope[10]. While this test is simple, non-invasive and with a low risk of complications, the overall yield from tilt testing varies from 26–87 per cent and is dependent on the population being studied, the angle and duration of tilt and the provocative drugs used[13]. The highest yield is seen in patients who have a high likelihood of a positive response. Other limitations of this test are its poor

reproducibility[10] and its failure to predict response to treatment, either with drug therapy or devices (eg, pacemakers[10, 14]). The benefit of tilt table testing lies in its ability to diagnose patients with suspected psychogenic blackouts, especially when accompanied by simultaneous recording of ECG, phasic blood pressure and EEG. Patients with psychogenic blackouts have been shown to be suggestible to blacking out during tilt, even at a pre-suggested time during tilt. However, the ECG, blood pressure and EEG can be shown to remain quite normal throughout[15].

Implantable loop recorder

Implantable loop recorders (ILR) are small devices implanted underneath the skin, on the left side of the chest, under local anaesthesia. The loop recorder has 42 minutes of continuous solid-state memory capable of producing high fidelity electrocardiographic recordings. It has a battery life of 18–24 months and has a loop memory that allows activation after consciousness is restored.

Results suggest that a high ECG symptom correlation is achieved by means of this device, approximately 90 per cent at six months[10]. However, downsides of this investigational tool are that its up-front costs are high, that it is invasive, requiring minor surgery to implant the device and the lack of any other physiological parameter (eg, blood pressure) that can be measured[10].

The role of the loop recorder in assessing the efficacy of specific therapy in patients with recurrent reflex syncope was evaluated in a prospective multicentre observational study, the ISSUE 2 study[16]. Patients with three or more clinically severe syncopal episodes without significant electrocardiographic and cardiac abnormalities were included. Patients with orthostatic hypotension and carotid sinus syncope were excluded. All patients underwent a loop recorder implantation in phase I of the study. Though patients underwent other tests, including tilt table testing, therapy was delayed until ILR documentation of the first episode of syncope was

Key points

> Syncope and collapse is the sixth most common reason for admission to hospital in those over 65 years of age.
> A detailed history is the first and single most important step in arriving at a diagnosis. This can be challenging in some elderly patients.
> Recording of physiological parameters during a spontaneous episode (versus a provoked one) is likely to be more rewarding.
> Cardioinhibitory response during carotid sinus massage predicts a favourable response to pacing.

obtained, which then determined further therapy (Phase II).

Among 103 patients who entered Phase II, 53 patients received specific therapy (47 a pacemaker because of asystole four catheter ablation, one implantable cardioverter defibrillator and one antiarrhythmic therapy) while the remainder did not receive specific therapy. There was a significant decrease in the syncope burden in patients assigned to the specific therapy group (based on ILR findings) when compared to the group that received empirical therapy. Importantly, this study also showed that it was safe to delay therapy until an ILR documented episode of spontaneous syncope.

Carotid sinus massage

Carotid sinus massage is recommended in patients over the age of 40 years with syncope of unknown aetiology after the initial evaluation[17]. Carotid massage should be performed with the patient both supine and erect. The procedure is considered positive if syncope is reproduced during or immediately after massage in presence of asystole longer than three seconds and/or a fall in systolic blood pressure of 50mmHg or more. In an unselected population of 272 individuals over 65 years of age[16], 39 per cent had a positive response but only in 16 per cent was it accompanied by symptoms. Among a smaller group of 80 previously asymptomatic elderly individuals, 35 per cent had carotid sinus hypersensitivity. This suggests that carotid sinus hypersensitivity is common in older persons and that a positive response is diagnostic of the cause of syncope only in the absence of any other competing diagnosis[10]. Recent evidence suggests that a cardioinhibitory response during carotid sinus massage predicts an asystolic mechanism of spontaneous reflex syncope that is likely to benefit from cardiac pacing therapy[18].

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Conclusion

Syncope is a problem that affects a significant proportion of the normal population. The prevalence of syncope increases with age. Taking a detailed history and the judicious use of a few investigations can help arrive at a correct diagnosis, in the majority of patients. However, retrograde amnesia of the event and cognitive impairment may make the task of diagnosing syncope in the elderly challenging. Appreciation of the presenting clinical features of syncope can help in preventing a misdiagnosis and its attendant consequences.