



Tilt-table testing: down but not out

“The [tilt] test has been used with varying tilt angles and durations, and with various degrees of pharmacological and mechanical stimulation to help induce fainting during blood pressure and heart rate monitoring in susceptible individuals.”

Keywords: syncope • tilt-table test • vasovagal syncope

Syncope is very common, with the overall incidence for first syncope being 6.2 per 1000 patient years, increasing to 20 in females aged over 80 years [1]. Vasovagal syncope (VVS) is by far the most common cause, explaining over 20% of cases, with an underlying cardiac cause in 10% of cases and up to 37% of cases remaining unexplained [1].

The importance of syncope cannot be understated. It can have a negative impact upon education, physical activity and leisure, but can also result in loss of employment, driving restrictions, social isolation, falls and significant injury. Vasovagal syncope aside, cardiac and unexplained syncope are also associated with an increased mortality, necessitating accurate diagnosis [1].

The increase in morbidity and mortality is one of the driving forces behind the development of international guidelines and the creation of specialist syncope clinics. When the European Society of Cardiology Practice Guideline is applied in a specialist syncope setting the rate of undiagnosed syncope decreases from 37 to 10% [2,3]. Moreover, specialist syncope clinics reduce hospital readmission, reduce inappropriate use of investigations and reduce healthcare costs [4]. At the heart of these specialist clinics is the tilt table.

Tilt-table testing

Tilt-table testing has been used as an adjunct in the diagnosis of vasovagal syncope since 1986 [5]. The test has been used with varying tilt angles and durations, and with various degrees of pharmacological and mechanical stimulation to help induce fainting during

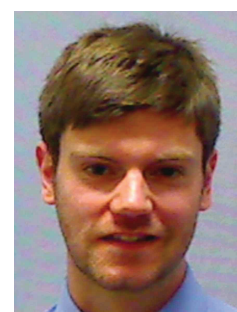
blood pressure and heart rate monitoring in susceptible individuals [6]. However, the recent NICE guidance on transient loss of consciousness minimizes the importance of tilt table testing while missing the nuances of its benefits to clinicians and patients [7]. Below, we show how tilt-table testing continues to be a safe, useful addition to the syncope diagnosis and management armamentarium.

Safety

Tilt-table testing is arguably one of the safest, simplest and least restrictive or invasive investigations in the evaluation of syncope. In 1969 consecutive tilt tests performed in individuals aged over 60 years, an episode of atrial fibrillation, with no cardiovascular or neurological complication, was the only complication identified [8]. The most commonly cited case report relating to the safety of tilt testing is that of an 80-year-old female who developed (and survived) an episode of ventricular fibrillation during an isoproterenol tilt test [9]. She was known to have a history of coronary artery disease and a conduction defect on her ECG, which today would preclude her from having isoproterenol. Indeed, even a passive tilt test would not be recommended in high-risk individuals until a cardiac cause had been excluded and the history was suggestive of VVS.

Accuracy

One of the principle arguments against tilt testing is its sensitivity and specificity. This varies widely, depending on inclusion/exclusion criteria, methodology (e.g., tilt angle, duration and provocation method), interpre-



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tation of result and expertise of the clinician. Perhaps the most widely used method is 'The Italian Protocol', which consists of a 20-min passive upright phase, followed by a 15-min provocation phase (400 µg sublingual glyceryl trinitrate) [10]. It may be a surprise to sceptics of the tilt test to note that the sensitivity (62%) and specificity (92%) of this protocol is high and fares very well when compared with other commonly used clinical investigations, for example, the chest x-ray diagnosis of the pneumothorax (sensitivity 52% and specificity 99%) or the ECG in diagnosing an ST elevation myocardial infarction (sensitivity 56% and specificity 94%) [11,12].

Diagnosis

While it is not suggested that all cases of suspected VVS should undergo tilt-table testing, it is an extremely useful tool for those in whom the diagnosis is in doubt, where there are driving or employment restrictions or for guiding the treatment strategy.

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The majority of syncopal episodes can be confidently diagnosed as VVS in the context of a structurally normal heart, normal surface ECG and an appropriate clinical history [2,6] with no further investigation. However, in the absence of these features, tilt testing can provide a valuable diagnostic and educational tool. Although there are no trials assessing the accuracy of the diagnosis based on simple clinical evaluation, there are scoring tools based on features from the history, examination and ECG findings. However, with a sensitivity of 87% and specificity of 32% these tools provide little support for their use in the diagnosis of VVS [13].

Unexplained syncope

The diagnosis of VVS is often complex; a classic example of this being the older person who presents with unheralded syncope, recurrent unexplained falls or drop attacks. Older people with VVS are less likely to report dizziness, palpitations and syncope, and less likely to associate the event with change in posture, hot environments or prolonged standing [14]. This may be partly explained by the differing patterns of hypotension and bradycardia associated with fainting in older and younger age groups. Older people with

VVS tend to have a dysautonomic pattern of progressive blood pressure drop prior to sudden collapse with loss of consciousness, compared with the younger patient with the classical prodromal symptoms of VVS who collapses with a rapid fall in blood pressure and/or heart rate [15]. To add to the complexity, older people are more likely to have a history of cardiac disease and an abnormal ECG, but where a cardiac cause has been excluded, tilt testing provides a safe and rapid diagnostic method. The combination of these factors makes the diagnosis of VVS more challenging in older people and emphasizes the value of tilt testing in complex cases.

Epilepsy

Epilepsy is a life-changing diagnosis, with implications for driving, employment, life-long medication, stigma and family planning issues. The history is characteristic for many patients with seizure disorders, with prolonged loss of consciousness and postevent confusion, muscle aching and lateral tongue biting being very suggestive of seizure rather than syncope. [16]. However, convulsions can occur in up to 80% of people with a syncopal episode [17] and history alone may not be adequate when attempting to distinguish VVS from epilepsy; clinical history has a specificity of only 50% in suspected temporal lobe epilepsy [18]. One retrospective study revealed that 27% of cases of epilepsy were misdiagnosed when in fact they had VVS [19]. Tilt testing has much to offer in terms of improving the precision of diagnosis, indeed, it has the highest diagnostic yield for cases of unexplained seizures in apparent treatment-resistant epilepsy [19].

Further benefits

Driving

The UK Driver and Vehicle Licensing Agency has strict regulations that often result in driving restrictions following syncope. For example, for a single episode of unexplained syncope, a bus or lorry driver would be prevented from driving for 3 months after the event, even if the probability of VVS were high. The restrictions may be longer in the presence of high-risk features, such as an abnormal ECG or injury sustained during the episode, but if the cause is identified and treated the restrictions are shorter. In such circumstances syncope has huge implications for an individual who may lose their income. Timely tilt testing in this situation is crucial.

Employment

Rapid diagnosis and initiation of treatment is equally important for those who are unable to work in high-risk employment (e.g., at height, with dangerous

machinery/chemicals), until diagnosis is ascertained and treatment started.

Education

For those individuals who have short-lived premonitory symptoms, or those who do not recognize the presyncopal warning a tilt test is a valuable tool to educate individuals how to recognize presyncope, when to begin abortive measures, and to demonstrate how effective and simple abortive measures are.

Treatment strategy

A definitive diagnosis of VVS is required when formulating a management plan. Not least to avoid treatment in those inaccurately diagnosed from simple clinical evaluation alone. Decision-making can be complex, for example, in those with heart or liver failure, and requires certainty of diagnosis before balancing the risks/benefits of treatment. The two most commonly used medications for VVS come at a price. Fludrocortisone requires regular monitoring of electrolytes and can cause interstitial edema; midodrine is prescribed off licence, requires close monitoring for supine hypertension and can cause liver failure. Midodrine should not be used without tilt-test confirmation of VVS.

Furthermore, recent work highlights the benefits of permanent pacing in patients with tilt-positive vasovagal syncope and prolonged asystole recorded during

spontaneous events. Without the tilt test such patients would be denied definitive management [20].

Conclusion

Tilt testing is safe, accurate and noninvasive. It increases diagnostic rates in unexplained syncope and can help reduce misdiagnosis in some patients with apparent treatment-resistant epilepsy. It should be used early when there are driving or employment restrictions but also in older people with unheralded syncope, unexplained falls and drop attacks where a cardiac or alternative cause has been excluded. The test can be of substantial benefit in syncope management, highlighting previously unnoticed premonitory symptoms to help patients recognize and hence abort an incipient faint. Used wisely it is a powerful, cheap and safe diagnostic and management tool in patients with these distressing symptoms.

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