Electrocardiographic Monitoring in the Assessment of Unexplained Syncope

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Syncope is defined as a transient, self-limited loss of consciousness that usually leads to falling. Onset is relatively rapid, and recovery is spontaneous, complete, and often quick. The underlying mechanism is a transient global cerebral hypoperfusion. Syncope is common (1% to 3% of emergency department visits), disabling (major injury reported in about 6% of patients), and associated with sudden death in patients with cardiac syncope (1). Consequently, syncope often leads to hospital admission, multiple consultations, and the performance of several specialized diagnostic tests.

The evaluation of a patient presenting with syncope consists of several steps. First, true syncope should be differentiated from dizziness, vertigo, somatization disorders, drop attack (in which consciousness is not lost), and disorders in which consciousness is lost because of mechanisms such as metabolic disorders (hypoglycemia) or epilepsy. Second, a baseline clinical assessment should be performed, which includes a detailed medical history, physical examination, orthostatic blood pressure measurements, and 12-lead electrocardiography (ECG). This noninvasive evaluation leads to a diagnosis of syncope, which includes clinical vasovagal syncope, orthostatic hypotension, situational syncope, and, rarely, arrhythmias such as complete atrioventricular block, in approximately 50% of patients (2). In another 10% of patients, the evaluation may only suggest a diagnosis, as symptoms of pulmonary embolism, severe aortic stenosis, or acute cardiac ischemia may be present. In these patients, specific diagnostic testing is recommended to confirm or rule out the diagnosis (e.g., echocardiography for suspected aortic stenosis). Third, in patients in whom the cause of syncope remains unexplained, specialized diagnostic tests should be performed. The choice of evaluation strategy should be determined by the frequency of syncopal episodes and the presence or absence of heart disease (3). In patients with structural heart disease or an abnormal ECG, identification of arrhythmias as the cause of syncope is important. Thus, tests for detecting arrhythmia and measuring the type and severity of heart disease are recommended. Conversely, in patients without heart disease and a normal ECG, evaluation for neurally mediated syncope or psychiatric illnesses (anxiety or panic disorder, major depression) is recommended, especially in those with recurrent episodes.

Recent guidelines have reviewed the role of ECG monitoring in the evaluation of unexplained syncope (4). This procedure is considered diagnostic when a correlation between syncope and an electrocardiographic abnormality (bradyarrhythmia or tachyarrhythmia) is shown. It is also useful for excluding an arrhythmic cause of syncope when there is an association between syncope and sinus rhythm. Most ECG monitoring is undertaken with external 24-hour cassette tape recorders (Holter monitoring) connected to the patients via external ECG patches. However, the likelihood of finding a correlation between symptoms and arrhythmia is very low (4%) with 24-hour Holter monitoring (3), with broad variations (1% to 20%) also observed because of inclusion of patients with different symptoms (syncope or dizziness), or the use of different arrhythmia endpoints. In about 15% of patients, symptoms are not associated with arrhythmias, and thus a rhythm disturbance could be excluded as a cause of syncope.

Currently, 24-hour Holter monitoring is recommended in patients with structural heart disease, symptoms suggesting arrhythmic syncope, and a high pretest probability of identifying an arrhythmia responsible for syncope (4). Long-term (30 days or more) ECG monitoring can be performed using continuous loop recorders. The device is activated after symptom onset by pressing a button, which stores heart rhythm readings from the previous 2 to 5 minutes and the subsequent 60 seconds. In studies that evaluated loop monitoring in patients with high recurrence rates of syncope (5,6), true-positive tests (arrhythmias detected during syncope) occurred in 8% to 20% of patients, whereas true-negative results (normal sinus rhythm during syncope) occurred in 12% to 27% of patients. The limitations of this test are patient compliance, the potential for errors in using the device, and problems with transmission, which occurs in as many as one third of patients. For these reasons, comparisons with 24-hour Holter monitoring are not possible. Currently, loop recording is recommended when the cause of syncope remains unexplained after full evaluation, particu-

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larly in patients with frequent episodes of syncope or a high likelihood of arrhythmias.

In this issue of the *Journal*, Sivakumaran et al (7) compared the diagnostic utility of loop recorders with Holter monitors in patients with syncope or presyncope. They randomly assigned patients to receive either a Holter monitor or a loop recorder for 1 month. If the initial strategy was not diagnostic, patients were offered crossover to the alternate strategy. The authors found that loop recorders were considerably more effective than 24-hour Holter monitors, with an overall probability of obtaining a symptom-rhythm correlation of 56% for loop recorders versus 22% for Holter monitors. Arrhythmia was a cause of syncope in only 1 patient; however, both methods were useful for excluding an arrhythmic cause of syncope because there was a correlation between recurrent symptoms and sinus rhythm. The authors also demonstrated that the longer duration of monitoring offered by the loop recorder provided sufficient time to observe recurrence of symptoms. About 25% of patients who had recurring symptoms failed to activate the device.

Do these results advocate the use of ECG monitoring as the initial step in the evaluation of all patients with unexplained syncope? Certainly not. In patients with structural heart disease or an abnormal ECG, the likelihood of arrhythmia is high. In this setting, cardiac evaluation should be done in the hospital and 24-hour ECG monitoring can be recommended as a first step before proceeding to electrophysiological testing. In some cases, a positive rhythm-symptom correlation may negate the need for electrophysiological testing. However, the likelihood of such a correlation is not known. For patients without structural heart disease and a low risk of arrhythmia, such as in the study by Sivakumaran et al, hospitalization is not necessary and the choice of testing should be guided by the frequency of symptoms. For patients with infrequent symptoms, ECG monitoring or any other test is unlikely to yield a diagnosis, and follow-up without evaluation can be recommended. If symptoms are frequent, evaluation should focus on diagnosing neurally mediated syncope (using tilt testing) and carotid sinus syncope, and detecting psychiatric illnesses. If arrhythmias remain a chief concern despite a low probability, then, as Sivakumaran et al have demonstrated, loop recorders are more appropriate for obtaining a symptom-rhythm correlation than Holter monitoring because the longer duration of monitoring afforded by loop recorders provides the necessary time frame for symptoms to recur.

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