Head-up Tilt Test for Assessing Complications of Neurally Mediated Syncope and Other Causes of Unconsciousness: Case Series

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Abstract

We investigated NMS with coexisting disease. We examined 63 cases by using the head-up tilt test (HUT) to diagnose unexplained syncope between 1998 and 2001. Drug free HUT durations of 20 min at 60° was used. If there was negative study by drug free HUT, Isoproterenol protocol during HUT was used as an additional tool for eliciting. Twenty seven cases out of 63 were diagnosed as NMS. 9 cases out of 27 diagnosed as NMS complicated with other causes for syncope, which included 2 cases of epilepsy, 2 cases of tachycardic arrhythmia, and 5 cases of bradycardic arrhythmia. In conclusion, it is important to keep in mind that the symptoms of NMS may be seen as complications in various diseases that can cause unconsciousness.

Key Words
Neurally mediated syncope, head-up tilt test, unconsciousness

Introduction

The etiology of syncope is difficult to verify especially for a patient who has an indistinct episode. In those cases, there is a high possibility of multiple mechanisms causing the unconsciousness, i.e., the conditions of sick sinus syndrome (SSS), such as autonomic insufficiency, vasovagal syncope, carotid sinus hypersensitivity, and anomalous venous return may overlap. Also, idiopathic epilepsy and unconsciousness caused by a cardiovascular origin are often misdiagnosed. The head-up tilt test (HUT) is a practical technique for differentiating the syncope of an unknown origin and is an important test method for diagnosing neurally mediated syncope (NMS). In this study, we performed HUT throughout the four years from 1998 through 2001 and selected cases in which mechanisms of syncope other than NMS were suspected among the cases diagnosed as NMS.

Materials and Methods

Sixty-three cases of patients from 19 to 86 years (mean 48±2 years) in which HUT was performed in this hospital were studied. These patients had either situation syncope or NMS with a clinical history suggesting predisposition or orthostatic syncope of an indistinct nature, moreover, in all of these, there were multiple episodes of losing consciousness. HUT was warranted to evaluate unexplained syncope and its causes of syncope had not been identified by appropriate testing (including conventional electrophysiology study, etc.).

The head-up tilt test (HUT) at 60 degrees for 20 minutes was used in the beginning. If NMS was not diagnosed within 20 min of HUT, isoproterenol

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infusion of 0.01\(\mu\)g/mg/kg/min was administered and after an increasing heart rate of 20% compared to that when at rest, another 20 minutes of HUT was performed. When syncope or presyncope occurred, and NMS was diagnosed by a reduction in heart rate and blood pressure, HUT was immediately discontinued, and the patient was returned to a lying position. NMS was classified as follows: cardioinhibitory type, showing a more than 30% decrease of the heart rate baseline; vasodepressor type, decrease systolic blood pressure of more than 20 mmHg for 1 minute; and mixed, a combination of the above.

Results

Twenty-seven cases (43%) out of 63 were diagnosed as NMS. These cases of NMS included 6 cases of cardioinhibitory type, 10 cases of vasodepressor type, and 11 mixed cases. Twelve cases out of 27 were diagnosed by using isoproterenol protocol, and fourteen cases had prodromal features. Thirty six patients in whom symptoms were not elicited during drug-free phase were also negative study with regard to the use isoproterenol protocol and there were neither structural cardiovascular disease nor seizure, etc. if any other examinations except HUT were used. HUT was cancelled in 4 cases (6%) because the complication had occurred during exertion. These complications included 2 cases of angina pectoris, 1 case of prolongation of QT interval, and 1 case of paroxysmal atrial fibrillation. Among the patients diagnosed as NMS, 9 cases presented other causes for the loss of consciousness, which include 2 cases of epilepsy, 2 cases of tachycardic arrhythmia, and 5 cases of brady-cardic arrhythmia (Table 1). In this study, we identified 5 cases out of 9 were obvious episode of syncope proved as other origins of unconsciousness (Table 1).

Discussion

Five cases out of 9 were obvious episodes of syncope proved as other origins of unconsciousness. It is difficult to rule out whether each episode was NMS or of other origin. Furthermore, there was a possibility of being diagnosed accidentally by HUT. However, in 9 cases of NMS associated with other origins, the cause of unexplained syncope was certainly diagnosed as NMS. Scheepers and Clough et al.\(^2\) stated that 20 cases out of 49 diagnosed as idiopathic epilepsy were also caused by a cardiovascular mechanism.

Table 1. NMS Patients with Other Origins of Unconsciousness

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Age</th>
<th>Gender</th>
<th>Other origin</th>
<th>Classification of HUT</th>
<th>Symptom from other origin</th>
<th>Prodomal of NMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>61</td>
<td>M</td>
<td>Traumatic epilepsy</td>
<td>Mixed</td>
<td>Convulsion Syncope (+)</td>
<td>Nausea, sweating</td>
</tr>
<tr>
<td>2</td>
<td>34</td>
<td>M</td>
<td>Idiopathic epilepsy</td>
<td>Vasodepressor</td>
<td>Convulsion Syncope (+)</td>
<td>Fear</td>
</tr>
<tr>
<td>3</td>
<td>78</td>
<td>F</td>
<td>SSS (Pacing mode: VVI)</td>
<td>Vasodepressor</td>
<td>Palpitation Syncope (-)</td>
<td>Fear</td>
</tr>
<tr>
<td>4</td>
<td>59</td>
<td>M</td>
<td>Ventricular tachycardia (ICD)</td>
<td>Mixed</td>
<td>None Syncope (-)</td>
<td>Nausea, sweating, Drop attack</td>
</tr>
<tr>
<td>5</td>
<td>58</td>
<td>M</td>
<td>Ventricular tachycardia (Taking antiarrhythmic drugs)</td>
<td>Mixed</td>
<td>Tonic posture Syncope (+)</td>
<td>Fear</td>
</tr>
<tr>
<td>6</td>
<td>32</td>
<td>F</td>
<td>Paroxysmal AV-block</td>
<td>Mixed</td>
<td>None Syncope (-)</td>
<td>Ill feeling, Drop attack</td>
</tr>
<tr>
<td>7</td>
<td>74</td>
<td>F</td>
<td>Paroxysmal AV-block</td>
<td>Vasodepressor</td>
<td>None Syncope (-)</td>
<td>Ill feeling, Drop attack</td>
</tr>
<tr>
<td>8</td>
<td>77</td>
<td>F</td>
<td>SSS (Pacing mode: VVI)</td>
<td>Vasodepressor</td>
<td>Fading vision Syncope (+)</td>
<td>Epigastric discomfort</td>
</tr>
<tr>
<td>9</td>
<td>68</td>
<td>M</td>
<td>Paroxysmal advanced AV-block (Pacing mode: VDD)</td>
<td>Vasodepressor</td>
<td>Palpitation Syncope (+)</td>
<td>Dizziness</td>
</tr>
</tbody>
</table>

NMS = neurally mediated syncope; SSS = sick sinus syndrome; ICD = implantable cardioverter defibrillator; HUT = head-up tilt test
Moreover, Zaidi and Clough et al. revealed that there was a responsive autonomic dysfunction in 25% of the refractory epileptic patients they refer to as convulsive syncope. In the present study, case 1 and 2 both corresponded to the above. Therefore, if a patient has a history that is related to the prodrome of NMS or epileptic symptoms, and experiences complications from either or both, differentiation using HUT can be effective.

There are many cases of SSS which are complicated with NMS. These cases are believed to be associated with the dysfunction of either the cardiac or non-cardiac autonomic nerve route. In the present study, a pacemaker alone to bradyarrhythmia cases could not control the syncope in cases 3 and 8. Therefore, when a patient complains of SSS-type symptoms and recurring syncope even after the pacemaker insertion, HUT would be indicated because a vasodepressor-type of NMS complication is suspected.

Three patients (Case 3, 8, and 9) out of 4 paced implantation patients had episodes of syncope before implantation. In Case 9, AV-block was not accompanied with NMS during HUT, moreover, there were different symptoms between NMS during HUT and AV-block. Thus, we surmised that this case had both episodes of syncope diagnosed as NMS and AV-block. Case 4 was a patient who had hypertrophic cardiomyopathy as an underlying disease, and no cardiac symptoms immediately before the syncope, but did have marked autonomic symptoms immediately after the syncope suggesting a high possibility of NMS. However, the coherence between ventricular tachycardia (VT) and syncope was not obvious since the syncope occurred immediately after exercise and the ECG revealed a non-sustained VT. An implantable cardioverter defibrillator was used since there are no effective drugs available for this type of case.

There is a report stating that 70% of the syncope of an unknown cause can be diagnosed by combining an electrophysiological study (EPS) and HUT. For patients who have heart disease, HUT with drug administration may cause complications of severe arrhythmias. Accordingly, for those cases EPS was preferred prior to HUT.

In conclusion, it is important to keep in mind that the symptoms of NMS may be seen as complications in various diseases that can cause unconsciousness. These results indicate that HUT can be an important examination that effectively differentiates those diseases.

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References


神経調節性失神と他の意識消失機序の合併に対する
受動的起立試験の有用性

抄録

Neurally mediated syncope (NMS) と診断された中で、NMS 以外の他の意識消失の機序を
合併した症例を検討した。対象は、1998 年から 2001 年の間に当施設を受診し、原因不明の意
識消失のために Head-up tilt test (HUT) を行った 63 例である。NMS は、60 度 HUT を 20 分
間、陰性時は isoproterenol 負荷での HUT を 20 分間施行し診断した。結果は、63 例中 27 例
が NMS と診断され、27 例中 9 例に NMS 以外の他の意識消失機序の疾患を合併した。9 例の
内訳は、てんかんが 2 例、洞機能不全症候群が 2 例、高度房室ブロックが 3 例、心室頻拍が 2
例であった。以上より、他の意識消失機序を有する症例においても NMS は合併するため、その診
断に HUT が必要であることを結論とした。

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