

# Prevalence and correlates of syncope-related traumatic injuries in tilt-induced vasovagal syncope

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## Key words:

Traumatic injuries;  
Vasovagal syncope.

**Background.** Vasovagal syncope represents the most common form of syncope in the general population and is usually considered as a benign affection. However, syncope-related traumatic injuries may represent a major complication of such a condition in a relevant percentage of cases. The aim of this study was to assess the prevalence and clinical correlates of syncope-related trauma in a cohort of consecutive patients with recurrent vasovagal syncope.

**Methods.** Three hundred and forty-six consecutive patients were studied in whom a diagnosis of vasovagal syncope was established. All subjects were interviewed with a standard questionnaire in order to collect all possible information about their clinical history and the occurrence of trauma during syncopal spells.

**Results.** Ninety-four of the 346 patients (27.2%) reported at least one syncope-related traumatic injury. In 31/346 cases (8.9%) the severity of trauma had determined hospital admission and surgical treatment. When compared to the rest of the study population, patients with syncope-related trauma showed a higher prevalence of male gender ( $p < 0.01$ ), a higher absolute number ( $p < 0.01$ ) and frequency ( $p < 0.01$ ) of syncopal episodes in their history. Patients with trauma also reported a shorter duration of warning symptoms preceding syncope ( $p < 0.01$ ), while showing a higher prevalence of positive cardioinhibitory response to tilt table testing ( $p < 0.01$ ). Moreover, the number of syncope-related injuries was found to correlate significantly with the number of syncopal spells ( $r = 0.64$ ,  $p < 0.01$ ).

**Conclusions.** Most practicing physicians consider vasovagal syncope as simply a benign affection in young people. However, such a clinical view should be partially revised, as recurrent vasovagal syncope is associated with significant trauma-related morbidity.

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## Introduction

Syncope is a frequent finding in clinical practice, accounting for 1-3% of all emergency room visits and 1-6% of all hospital admissions<sup>1-3</sup>. In the general population the most common form of syncope is represented by vasovagal syncope, which is responsible for 30-50% of all episodes of transient loss of consciousness requiring medical attention<sup>4,5</sup>. Such a clinical condition is usually considered as a benign affection, despite the frequent association with physical injuries and the potential hazards deriving from its possible recurrence<sup>6,7</sup>.

The present clinical investigation was designed and undertaken in order to assess the prevalence and clinical correlates of syncope-related traumatic injuries in a cohort of consecutive patients with recurrent vasovagal syncope.

## Methods

**Patient population.** The study population consisted of 346 consecutive patients (204 women and 142 men, mean age  $42.6 \pm 17.4$  years) who were referred to the Syncope Clinic of our Institution (April 1994-November 1999) for the evaluation of recurrent unexplained syncope and in whom a diagnosis of vasovagal syncope was established. Syncope was defined as a sudden transient loss of consciousness with the inability to maintain postural tone and with spontaneous recovery<sup>1-6</sup>. Each patient had experienced at least two syncopal spells in the 6 months preceding the first visit to the Syncope Clinic.

**Diagnostic criteria.** In each patient the cause of syncope was established according to the results of standardized diagnostic

work-up and by strictly adhering to previously reported diagnostic criteria<sup>8-11</sup>. In fact, all patients were considered as affected by vasovagal syncope when presenting the following features<sup>8-11</sup>: 1) no clinical or laboratory evidence of any cardiac, neurological or metabolic cause for the recurrent syncopal spells; 2) positive response to head-up tilt testing.

In particular, the preliminary diagnostic evaluation included history, physical examination, full routine laboratory tests, 12-lead standard electrocardiography, exercise electrocardiography, Doppler echocardiography, 24-hour electrocardiographic monitoring, bilateral carotid sinus massage, electroencephalography, and duplex ultrasound scanning of the carotid arteries. Besides, when clinically indicated, computed tomographic scans and magnetic resonance imaging of the central nervous system and cardiac electrophysiologic study were also performed. When such a diagnostic work-up could not establish the cause of syncope, the patient underwent tilt table testing according to a previously described protocol<sup>12</sup>.

**Tilt testing.** The test was performed in the morning, in a fasting state. An electronically controlled tilt table with a foot-board for weight-bearing and restraining belts was used for the procedure. Continuous electrocardiographic monitoring for heart rate and rhythm was performed, while blood pressure was non-invasively beat to beat measured by means of an Ohmeda Finapres 2300 photoplethysmographic device (Louisville, CO, USA). Subjects were initially tilted at 60° for 30 min (control phase). Subsequently, if there were no symptoms, participants received 1.25 mg of isosorbide dinitrate sublingually and continued to be tilted for an additional 15 min (pharmacological phase). The test was considered positive if syncope occurred in association with hypotension, bradycardia or both. In the case of syncope, the procedure was terminated by rapidly lowering the tilt table to the horizontal position. In accordance with previous reports<sup>12-14</sup> and for the purpose of the study, two main forms of positive response to the tilt table test were identified: 1) a vasodepressor form (syncope associated with a systolic blood pressure decrease to  $\leq 60$  mmHg, but without significant heart rate reduction); 2) a cardioinhibitory form (syncope associated with a systolic blood pressure decrease to  $\leq 60$  mmHg and heart rate reduction to  $< 40$  b/min). Furthermore, as in previous studies, the following tilt test variables were also considered<sup>12,15</sup>: 1) test phase in which syncope occurred; 2) time to tilt-induced syncope; 3) peak systolic blood pressure and peak heart rate preceding tilt-induced syncope, as synthetic indexes of the hemodynamic behavior during the test.

**Syncope questionnaire.** At the time of the initial evaluation, each patient was interviewed using a standard questionnaire. A detailed account of syncopal spells

was obtained in all cases. Moreover, all available witnesses were interviewed, in order to collect all possible information about the specific circumstances and the patient's appearance and behavior during the episodes. Information about the overall absolute number and frequency of syncopal episodes was also obtained. All patients were questioned about the occurrence of trauma during syncopal spells. Syncope-related traumatic injuries were classified as previously described<sup>9,11</sup>: 1) major trauma (any fracture, head injury, internal organ damage requiring hospital admission and surgical treatment); 2) minor trauma (any bruise, cut and soft tissue injury).

**Statistical analysis.** Mean values ( $\pm$  SD) were calculated for continuous variables and frequencies were measured for categorical variables. Collected data were analyzed by unpaired Student's t-test for continuous variables and  $\chi^2$  for categorical variables. Correlations between variables were assessed using linear regression analysis and Pearson's correlation coefficient.

## Results

During the first visit to the Syncope Clinic 94 of the 346 patients (27.2%, 43 women and 51 men, mean age  $44.8 \pm 16.8$  years) reported at least one syncope-related traumatic injury. In 31/346 cases (8.9%) the severity of physical injuries had determined at least one hospital admission and surgical treatment, while 52/346 (15.0%) patients had suffered from more than one syncope-related trauma. When compared to the rest of the study population, patients with syncope-related injuries showed a higher prevalence of male gender (54.2 vs 36.1%,  $p < 0.01$ ), a higher absolute number ( $7.3 \pm 3.3$  vs  $3.4 \pm 1.9$ ,  $p < 0.01$ ) and a higher frequency ( $0.17 \pm 0.11$  vs  $0.05 \pm 0.04$  spells/month,  $p < 0.01$ ) of syncopal spells in their clinical history. These patients also reported a shorter duration of prodromal warning symptoms preceding spontaneous syncope ( $21.9 \pm 13.6$  vs  $117.4 \pm 87.1$  s,  $p < 0.01$ ) and showed a higher prevalence of positive cardioinhibitory response to tilt table testing (43.6 vs 22.6%,  $p < 0.01$ ). However, no significant difference was found between the two groups as to all other tilt test variables. In fact, the prevalence of a positive response during the control unmedicated phase of the test (39.3 vs 37.7%), the mean time to tilt-induced syncope ( $14.7 \pm 8.1$  vs  $15.2 \pm 8.7$  min in the control phase and  $8.6 \pm 3.9$  vs  $8.3 \pm 4.2$  min in the pharmacological phase), as well as the peak systolic blood pressure and the peak heart rate preceding tilt-induced syncope ( $131.6 \pm 22.8$  vs  $134.7 \pm 27.4$  mmHg and  $123.4 \pm 19.5$  vs  $126.7 \pm 24.9$  b/min), were found to be similar in patients with and without syncope-related trauma.

When the severity of trauma was considered, patients with major syncope-related injuries were found to have both a higher absolute number of traumatic episodes (2.7

$\pm 1.6$  vs  $1.7 \pm 0.9$ ,  $p < 0.001$ ) and of syncopal spells ( $9.6 \pm 3.7$  vs  $6.0 \pm 2.7$ ,  $p < 0.001$ ), than subjects with minor syncope-related trauma.

In the whole study population the number of syncope-related injuries was found to correlate significantly with the number of syncopal spells ( $r = 0.64$ ,  $p < 0.01$ ) (Fig. 1).

### Discussion

Vasovagal syncope rarely represents a life-threatening affection<sup>1,4,6</sup>. In fact, prospective investigations have shown that patients with vasovagal syncope carry a risk of subsequent sudden death, which is similar to that carried by the general population<sup>1,4,6</sup>. However, the available evidence as to the overall long-term morbidity and mortality of vasovagal fainters is quite limited and substantial concern persists about the unpredictable results of single specific episodes in particular circumstances<sup>16,17</sup>. As a matter of fact, physicians are aware that the clinical consequences of a single vasovagal spell critically depend upon two main factors: 1) the specific circumstances in which syncope occurs (place, activity); 2) the preexisting clinical status of the vasovagal fainter (age, concomitant diseases). In fact, vasovagal syncope while driving has been associated with catastrophic and fatal accidents<sup>16</sup>, whereas a significant percentage of major traumatic injuries in elderly subjects (hip fractures) is known to be related to vasovagal episodes<sup>17</sup>. Consequently, the clinical assessment of patients with recurrent vasovagal syncope should always consider all factors which may result in a significant risk of major syncope-related trauma (i.e. age, estimated frequency of syncopal recurrences, comorbidities, specific employment, sports activity)<sup>18</sup>.

In this study 27.2% of patients with recurrent vasovagal syncope had at least one syncope-related traumatic injury in their clinical history. This finding is in accordance with previous studies which have reported simi-

lar data about the prevalence of syncope-related trauma in vasovagal fainters (15-35% of cases)<sup>4-7</sup>. In our series traumatic events were likely to recur, as 55.3% of patients with syncope-related injuries showed more than one traumatic episode. Besides, in a non-negligible percentage of cases (8.9%) syncope-related lesions were found to be clinically relevant, requiring hospital admission and surgical treatment. Furthermore, in this population, the probability of suffering from a syncope-related traumatic lesion increased with the growing number of syncopal episodes, as shown by the correlation between the number of syncope-related injuries and the number of vasovagal spells.

Another major finding of this study is represented by the opportunity of defining a general clinical profile of the trauma-prone vasovagal fainter. In fact, in this series, male subjects, with a higher rate of syncope recurrence, brief warning symptoms before spontaneous syncopal spells and a cardioinhibitory response to head-up tilt testing, showed a relatively higher incidence of syncope-related injuries. In previous reports patients with similar clinical features have already been identified as affected by the so-called "malignant" form of vasovagal syncope, which has been associated with a significant short-term morbidity<sup>10,19,20</sup>. Accordingly, this specific subset of patients with recurrent vasovagal syncope should be considered for a closer clinical follow-up<sup>10,18-20</sup>.

Most practicing physicians tend to consider vasovagal syncope as simply a benign affection in young people. However, recurrent vasovagal syncope is associated with significant traumatic lesions in a relevant percentage of cases. Careful risk stratification is therefore mandatory in the individual patient with vasovagal syncope and should consider all clinical factors possibly associated with increased morbidity<sup>21,22</sup>. In particular, patients with a high rate of syncope recurrence and previous trauma may require therapeutic intervention, in order to prevent further spells and reduce possible trauma-related morbidity.

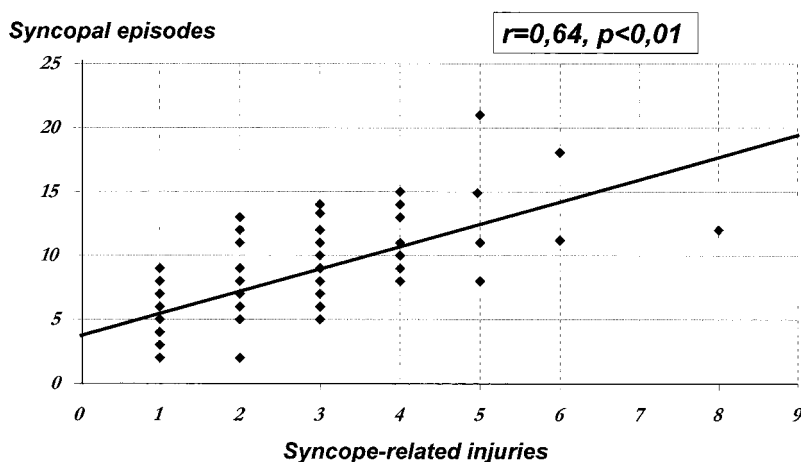


Figure 1. Correlation between the number of syncope-related injuries and the absolute number of syncopal spells in the clinical history.

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