The usefulness of carotid sinus massage in different patient groups

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Abstract

Aim: to determine the positive yield of carotid sinus massage in different patient groups: unexplained syncope, falls, dizziness and controls.

Design: observational study.

Setting: teaching hospital.

Methods: we studied consecutive patients over the age of 60 years referred to the ‘falls clinic’ with a history of unexplained syncope, unexplained falls and unexplained dizziness. We also studied asymptomatic control subjects recruited from a general practice register aged 60 years and over. All patients and control subjects underwent a full clinical assessment (comprehensive history and detailed clinical examination including supine and erect blood pressure measurements) and 12-lead electrocardiography. We performed carotid sinus massage in the supine position for 5 seconds separately on both sides followed by repeating the procedure in the upright positions using a motorised tilt table. Heart rate and blood pressure were recorded using a cardiac monitor and digital plethysmography respectively. The test was considered positive if carotid sinus massage produced asystole with more than a 3 second pause (cardioinhibitory type of carotid sinus syndrome), or a fall in systolic blood pressure of more than 50 mmHg in the absence of significant cardioinhibition (vasodepressor type of carotid sinus syndrome) or where there was evidence of both vasodepressor and cardio-inhibition as above (mixed type).

Results: we studied 44 asymptomatic control subjects and 221 symptomatic patients (130 with unexplained syncope, 41 with unexplained falls and 50 with unexplained dizziness). In the overall symptomatic patient group, the positive yield (any type of carotid sinus syndrome) was 17.6% (95% CI = 12.7–22.5). The positive yield in men (26.3% (95% CI = 16.4–36.2)) was twice that in women (13.1% (95% CI = 7.6–18.6)) (P = 0.014). Overall any type of carotid sinus syndrome was present in 22.3% (n = 29) of the syncope group, 17.1% (n = 7) in the unexplained fallsers group and 6% (n = 3) in the dizziness group. We also found that no women with unexplained dizziness had a positive carotid sinus massage test. None of the controls demonstrated a positive response. None of the subjects suffered any complications during or after the test.

Conclusion: the positive yield of carotid sinus massage in symptomatic patients was 17.6% with the yield in men being twice that in women. None of the asymptomatic control subjects demonstrated a positive response. The yields in unexplained syncope and unexplained falls patients were around 4-fold and 3-fold higher respectively than in unexplained dizziness patients. The positive yield in women with unexplained dizziness (without a definite history of syncope and falls) is zero. Hence, carotid sinus massage in older adults should particularly be targeted at patients with unexplained syncope and unexplained falls.

Keywords: carotid sinus massage, syncope, falls, dizziness, carotid sinus syndrome

Introduction

Falls in older adults are a major public health concern. They may result in considerable morbidity, mortality, reduced functional level and institutionalisation. Each year approximately 30% of people over the age of 65 years living at home fall at least once [1, 2]. The National Service Framework for Older People has highlighted the importance of falls prevention and improving the diagnosis, care and treatment of those who have fallen [3].

Unexplained syncope, falls and dizziness may present diagnostic challenges to the physician dealing with older adults. The mainstay of diagnosis is a thorough history. There are, however, difficulties even in cognitively normal older adults where recall for falling is poor and several studies have demonstrated amnesia for loss of consciousness.
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in falls [4, 5]. An important yet frequently overlooked cause of unexplained syncope falls and dizziness in the older adult is carotid sinus syndrome (CSS) [6]. CSS is rare below 50 years of age and an association with hypertension, and coronary heart disease has been demonstrated. The common underlying factor in such patients is atherosclerosis [7].

The different types of CSS (cardio-inhibitory, vasodepressor and mixed) can be diagnosed by performing a standardised carotid sinus massage (CSM) both in the supine and upright positions under controlled conditions. The latter position appears to increase the diagnostic yield by more than 15% [8]. Syncope due to CSS is a modifiable risk factor for falls as the cardio-inhibitory type of CSS can be abolished by insertion of a dual chamber permanent cardiac pacing system [9–11]. Patients with predominantly vasodepressor type of CSS may benefit from general advice (avoiding tight neck collars, sudden neck movements) and drugs such as fludrocortisone or midodrine [12].

It is unclear however, which patient groups in terms of symptoms would benefit most by performing CSM. The aim of the present study was therefore to assess the yield of carotid sinus massage in various patient groups: unexplained syncope, unexplained falls (without a definite history of syncope), and unexplained dizziness (without a definite history of falls and syncope). We also studied a group of asymptomatic individuals.

Methods

We retrospectively studied a consecutive group of patients over 60 years of age with syncope, falls or dizziness, the causes of which were unexplained (after a full history, examination, postural blood pressure measurements, routine blood tests, 12 lead electrocardiography and 24-hour Holter monitoring, where indicated). The patients were referred by hospital consultants and/or general practitioners. We recruited a group of asymptomatic controls from an age-sex general practice register. We excluded subjects who had significant aortic stenosis, recent myocardial infarction, cerebrovascular events and significant carotid artery disease. For the control subjects, we obtained approval from the local research ethics committee.

The patient group was divided based on their symptoms: 1. Syncope group: falls associated with a definite history of loss of consciousness. 2. Falls group: falls without a definite history of loss of consciousness. 3. Dizziness group: No definite history of falls and syncope.

All patients and subjects were allowed to have a light breakfast and their usual medication and the test was performed in the morning. They were laid supine on a mechanical tilt table. Beat to beat blood pressure and heart rate were recorded using a digital plethysmography (Finapres, Ohmeda, Hatfield, UK) and cardiac monitor (Hewlett-Packard, Oregon, USA) respectively. Resuscitation equipment was available throughout the procedure. After ensuring that the heart rate and blood pressure remained stable for 5 minutes, carotid sinus massage was applied for 5 seconds separately on both sides in the supine position. We then tilted the subjects to 70 degrees and applied carotid sinus massage on either side.

Definitions and diagnostic criteria for CSS

We diagnosed three subtypes of CSS, according to the definitions used by Kenny which are commonly used in the UK [13]:

1. Cardioinhibitory – when CSM results in 3 seconds of asystole (or longer).
2. Vasodepressor – when CSM results in a drop of systolic blood pressure of 50 mmHg or more with symptoms.
3. Mixed – where there is a combination of both of the above.

Results

We performed CSM in 265 subjects (221 patients and 44 symptomatic controls).

In the combined patient group (falls or syncope or dizziness) the positive yield (any type of CSS) was 17.6% (95% CI = 12.7–22.5). Analysing by sex, however, the positive yield in men (26.3% (95% CI = 16.4–36.2)) was approximately twice that in women (13.1% (95% CI = 7.6–18.6)) \( (\chi^2 = 5.99, df 1, P = 0.014) \).

None of the asymptomatic control subjects demonstrated a positive response to CSM.

None of the patient groups or the asymptomatic controls demonstrated any complications related to CSM.

The patient and control subjects characteristics are shown in Table 1.

The responses to CSM in different patient groups are shown in Table 2.

The responses to CSM by sex are shown in Table 3.

Table 1. Characteristics of patient and control groups

<table>
<thead>
<tr>
<th></th>
<th>Syncope</th>
<th>Falls</th>
<th>Dizziness</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number</td>
<td>130</td>
<td>41</td>
<td>50</td>
<td>44</td>
</tr>
<tr>
<td>Mean age (in years (range))</td>
<td>78.8 (60–96)</td>
<td>79.5 (60–92)</td>
<td>79.5 (62–96)</td>
<td>71.3 (63–86)</td>
</tr>
<tr>
<td>No. of females (%)</td>
<td>83 (63.8%)</td>
<td>31 (75.6%)</td>
<td>31 (62%)</td>
<td>16 (36.4%)</td>
</tr>
</tbody>
</table>
Table 2. Responses to carotid sinus massage by patient groups (percentages with 95% confidence intervals for proportions)

<table>
<thead>
<tr>
<th></th>
<th>VD-CSS</th>
<th>CI-CSS</th>
<th>Any type of CSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syncope (n = 130)</td>
<td>13.1% (7.3–18.9)</td>
<td>11.5% (6.0–17.0)</td>
<td>22.3% (15.1–29.5)</td>
</tr>
<tr>
<td>Fallers (n = 41)</td>
<td>7.3% (0–15.3)</td>
<td>9.7% (0.7–18.8)</td>
<td>17.1% (5.6–28.6)</td>
</tr>
<tr>
<td>Dizziness (n = 50)</td>
<td>4.0% (0–9.4)</td>
<td>2.0% (0–5.9)</td>
<td>6.0% (0–12.6)</td>
</tr>
<tr>
<td>χ² (df 2); P</td>
<td>3.71; 0.156</td>
<td>4.02; 0.134</td>
<td>6.62; 0.037</td>
</tr>
</tbody>
</table>

VD-CSS = vasodepressor type of CSS; CI-CSS = cardioinhibitory type of CSS.

Table 3. Responses to CSM in different patient groups by sex (percentages with 95% confidence intervals for proportions)

<table>
<thead>
<tr>
<th></th>
<th>VD-CSS</th>
<th>CI-CSS</th>
<th>Any type of CSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syncope (83 women, 47 men)</td>
<td>17.0% (6.3–27.7)</td>
<td>17.0% (6.3–27.7)</td>
<td>31.9% (18.6–45.2)</td>
</tr>
<tr>
<td>Falls (31 women, 10 men)</td>
<td>10.5% (0–24.3)</td>
<td>9.7% (0–20.1)</td>
<td>20.0% (0–44.8)</td>
</tr>
<tr>
<td>Dizziness (31 women, 19 men)</td>
<td>10.5% (0–24.3)</td>
<td>0%</td>
<td>15.8% (0–32.2)</td>
</tr>
<tr>
<td>χ² (df 2); P</td>
<td>0.6; 0.72</td>
<td>3.9; 0.15</td>
<td>2.1; 0.36</td>
</tr>
</tbody>
</table>

VD-CSS = vasodepressor type of CSS; CI-CSS = cardioinhibitory type of CSS.

Discussion

Falls in older adults are common and constitute an important public health problem in terms of morbidity and mortality and the cost to health and social services. Hip fracture is one of the most devastating consequences of falls and syncope as the mortality from hip fracture is approximately 30% at one year [14]. Syncope accounts for 3% of visits to the accident and emergency department [15]. Carotid sinus syndrome in older adults is being increasingly recognised as an important condition presenting with unexplained falls or syncope [4, 6]. Centres which routinely perform CSM report symptoms related to carotid sinus hypersensitivity in up to 45% of patients with unexplained falls or syncope (16, 17) and in 36% of patients who sustained a fractured neck of femur following an unexplained fall, highlighting the importance of diagnosing this condition [18]. There is, however, a wide variation in the diagnostic yield of CSM between various centres ranging from 20 to 40% [19, 20]. Complications as a result of CSM are rare. In a study by Richardson et al. [21], CSM performed in 1000 consecutive patients over the age of 50 years reported no cardiac complications and 0.1% a persistent neurological complication. In the present study no patient developed either cardiac or neurological complications.

The positive yield of CSM in the unexplained syncope group and in the unexplained falls group (22.3% (n = 29) and 17.1% (n = 7) respectively) were higher than in the unexplained dizziness group (6.0% (n = 3)) (χ² 6.62, df 2; P = 0.037).

In the syncope group, 11.5% of patients required pacemaker implantation following a diagnosis of cardio-inhibitory type of CSS. It is also apparent from our study that the positive yield of CSM in women with unexplained dizziness was zero, suggesting that women with dizziness without falls and syncope do not benefit from CSM, and no woman in the dizziness group required a pacemaker. Also any type of CSS occurred twice as often in men than in women consistent with what is described in the literature [13]. In our control asymptomatic group none of the subjects demonstrated a positive response to CSM.

It is possible that some of our fallers category could be in the syncope group, as there is emerging evidence of an overlap between syncope and falls due to amnesia for loss of consciousness during and after a fall [5]. This may explain some of the positive responses in the fallers group. We aimed to get as much collateral history or direct witness account of the events. But, clearly this was not always readily available in some of the older adults living on their own, or even if they lived with carers or in a residential setting if the fall occurred while they were on their own.

Limitations of the study include the retrospective data collection and the fact that the age and the sex of the patient and the control group do not match closely. However, bias was reduced by studying consecutively referred patients. The age and sex difference is unlikely to have influenced the findings as none of the controls showed a positive response. Another limitation is the small number of subjects in the various patient groups when analysed by sex. The 95% CIs for positive results between the patient groups generally overlapped with one another, possibly due to the numbers in each group not being enough for the differences to be statistically significant. Our data, in men and women, therefore suggest a trend towards differences between the falls and syncope groups compared to the dizziness group.
In conclusion, our study has shown that the positive yield of CSM overall was around 18% in patients with unexplained falls, syncope or dizziness, and was doubled in men compared to women. Furthermore, the positive yield in unexplained syncope and unexplained falls tended to be higher that in patients with dizziness. Women with dizziness without falls and syncope do not benefit from CSM. Hence, patients with unexplained syncope and unexplained falls in particular should be targeted for CSM. None of the asymptomatic group showed a positive response to CSM.

Key points
- Carotid sinus massage (CSM) is a useful investigation in the evaluation of unexplained falls and syncope.
- The positive yield of CSM in patients with unexplained falls, syncope and dizziness is twice in men compared to women.
- The diagnostic yield of CSM in women with dizziness without falls is zero, suggesting that this group should not be considered for CSM.

Acknowledgements
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References

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