Carotid sinus massage – How safe is it?

SIR—Carotid sinus massage (CSM) is a useful diagnostic tool in the investigation of unexplained falls and syncope [1]. Despite the increased use of CSM, concerns persist regarding its safety particularly in older patients. The principal concern relates to the development of neurological events secondary to CSM. The likelihood of performing CSM over atheromatous carotid arteries is higher in older patients with the increased theoretical risk of precipitating an anoxic event or profound haemodynamic changes sufficient to cause a permanent neurological deficit.

To date, four major studies [2–5] have reviewed the incidence of neurological complications following CSM. Reported neurological complication rates ranged from 0.17% [4] to 1.0% [5]. Cardiac complications including ventricular [6, 7] and atrial arrhythmias [8] have previously been described only rarely. Data on CSM complications are available from only three centres worldwide, with 79.5% of these patients being from two centres. It is unclear whether CSM complication rates observed at these centres are comparable with those found elsewhere.

Whether differences in patient risk factors account for the apparent 5–to 6-fold variation in complication rates described in these studies is also unclear. This knowledge is important if physicians are to provide meaningful information to their patients and obtain informed consent for the procedure.

Computerised data on CSM studies performed at King’s College Hospital (KCH) (London, UK) and Mid-Western Regional Hospital (MWRH) (Limerick, Ireland) were prospectively collected from August 1995 to March 2004 and January 1998 to March 2004, respectively. A specific field existed in both the databases for operators to record complications arising from CSM as they occurred. The absence of complications was thus 0.17% per patient studied. The incidence therefore was 0.17% per patient investigated. There were no cardiac complications.

At MWRH, one patient suffered a lacunar stroke with left-sided hemiparesis that resolved apart from residual loss of right hand fine motor function. A CT brain of this patient revealed small vessel disease only. Carotid Doppler scanning revealed heterogeneous plaque with 50% stenoses in both the carotid bulb and internal carotid artery on the left side. The incidence therefore was 0.17% per patient investigated. There were no cardiac complications.

At KCH, one patient sustained a stroke (partial anterior circulation infarct) with confusion, dysphasia and mild right-sided weakness, which resolved apart from residual loss of right hand fine motor function. A CT brain of this patient revealed small vessel disease only. Carotid Doppler scanning revealed heterogeneous plaque with 50% stenoses in both the carotid bulb and internal carotid artery on the left side. The incidence therefore was 0.17% per patient investigated. There were no cardiac complications.

The incidence of neurological and cardiac complications per patient studied at both centres combined was 0.21 and...
Table 1. Comparative demographic and complication rate data between the published series

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</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>1191</td>
<td>1201</td>
<td>2392</td>
<td>4000</td>
<td>1600</td>
<td>1719</td>
<td>1000</td>
</tr>
<tr>
<td>Number of females (%)</td>
<td>849 (71.6)</td>
<td>819 (68.2)</td>
<td>1668 (69.7)</td>
<td>–</td>
<td>–</td>
<td>756 (44)</td>
<td>694 (69.4)</td>
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<tr>
<td>Mean age (SD)</td>
<td>78.5 (10.1)</td>
<td>71.5 (15.8)</td>
<td>75 (13.8)</td>
<td>74 (14)</td>
<td>–</td>
<td>63 (16)</td>
<td>69.1 (10.5)</td>
</tr>
<tr>
<td>Median age</td>
<td>80</td>
<td>76</td>
<td>78</td>
<td>–</td>
<td>–</td>
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<td>–</td>
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<tr>
<td>Age range</td>
<td>15–94</td>
<td>21–101</td>
<td>15–101</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Complication ratea (%)</td>
<td>0.17</td>
<td>0.25</td>
<td>0.21</td>
<td>0.28</td>
<td>0.45</td>
<td>0.17</td>
<td>0.9</td>
</tr>
<tr>
<td>Neurological</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Persisting neurological deficits</td>
<td>0.08</td>
<td>0.17</td>
<td>0.13</td>
<td>0.1</td>
<td>0.19</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Cardiac</td>
<td>0</td>
<td>0.17</td>
<td>0.08</td>
<td>0</td>
<td>–</td>
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KCH, King’s College Hospital; MWRH, Mid-Western Regional Hospital.

Table 2. Cardiac complications: co-morbidities and co-prescribed medication

<table>
<thead>
<tr>
<th>Cardiac arrhythmias</th>
<th>Co-morbidity</th>
<th>Medications</th>
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</thead>
<tbody>
<tr>
<td>Patient 1</td>
<td>Ventricular tachycardia</td>
<td>Hypertension, Orthostatic hypotension, Ischaemic heart disease</td>
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<tr>
<td>Patient 2</td>
<td>Ventricular tachycardia</td>
<td>Orthostatic hypotension, Cardioinhibitory carotid sinus hypersensitivity, Atrial fibrillation</td>
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0.08% respectively. The combined rate of persisting neurological deficits was 0.13%.

This study, which to our knowledge is the second largest reported series, reaffirms the safety of CSM. The mean age of our patient population was greater than that of previously published studies (Table 1) for which mean patient age was included. Despite this, there was no increased neurological complication rate.

Comparative demographic and complication rate data between the two study centres and previously published series were broadly similar, with the exception of one series [5] showing an apparently higher complication rate. The differences in complication rates between published studies may be partly explained by heterogeneous recruitment patterns or variable CSM techniques employed by multiple investigators at different centres. This was likely to have been especially prior to the publication of the Newcastle Protocol in 2000 [9]. Differences in age and co-morbidity profiles as well as retrospective versus prospective analysis of data may also have contributed.

Interestingly, Puggioni et al. [4] did not exclude patients from CSM on the basis of carotid bruits. Neither were carotid Doppler studies routinely performed prior to CSM. Nonetheless, the complication rate was no higher than that shown in previously published data. It also differed from the other studies in that CSM was performed for 10 s rather than the standard 5 s currently recommended by the Newcastle protocol. This did not appear to increase the complication rate (Table 1). The retrospective nature of this study may, however, have underestimated the true complication rate. While every effort was made to ensure the accuracy of our results, we recognise the potential for methodological error in our study, particularly in the underreporting of complications. It is possible that not all complications were prospectively recorded by individual operators as they occurred. Errors may also have occurred when the data from the two centres were collated in a unified database by a single investigator.

Richardson et al. [5] found a higher neurological complication rate than the other studies. The rates of persisting neurological complications were, however, similar in their study and ours, –0.1 and 0.13% respectively. Inconsistent definition between the series of what actually constitutes a neurological complication may partly explain this. We would disagree with the adoption of their definition [5], whereby a neurological complication is defined as ‘any symptom or sign relating to the central or peripheral nervous system’, as this may fail adequately to differentiate pre-syncpe and syncpe symptoms from stroke and TIA. It is possible that the wide definition given for neurological complications by Richardson et al. [5] led to an artificially high rate compared with other studies.

Our series is the only large series in published literature to our knowledge to describe cardiac complications following CSM. The reasons for this are unclear. Underreporting of cardiac complications in previous studies is a possibility. The co-morbidities and prescribed medications of the two patients who sustained cardiac complications in this study are outlined in Table 2. It is interesting, though perhaps not unsurprising, to note that both patients had pre-existing cardiac disease. While the small complication rate from this study precludes the identification of risk factors, it may be that significant cardiovascular co-morbidity is a risk factor for cardiovascular complications from CSM.

This study provides further evidence that CSM is associated with a low risk of either cardiac or neurological complications even in an older population. The data for neurological complication rates are comparable with previously published studies. The apparent differences in reported complica-
tion rates between the centres are more likely to be due to differences in study populations and methods than due to true differences in safety.

Key points
- Accurate information on complications following CSM is vital to ensure informed patient consent.
- While there is an apparent difference in complication rates between the published series, it is possible that this is due to methodological variation rather than real differences.
- CSM remains a safe diagnostic procedure even in older population groups.

References

Hip protector use amongst older hospital inpatients: compliance and functional consequences

SIR—Hip protectors are special undergarments with protective material inserted over the hip areas that either absorb or deflect the forces transmitted to the hip when a fall on the hip occurs. The effectiveness of hip protector garments in preventing fractured neck of femur injuries is currently unclear [1–3]. Falls are particularly prevalent in the subacute hospital setting, and approximately 2% of in-hospital falls have been found to result in fracture [4]. No randomised controlled trials of hip protectors being deployed as a single intervention in hospitals have demonstrated the effectiveness of this intervention. Such a trial would require potentially prohibitively large numbers to be sufficiently powered to detect an effect. However, owing to the high morbidity, mortality and economic costs of fractures, this setting remains a viable target for hip protector use and research.

A commonly cited problem in hip protector research is reluctance by participants to wear hip protectors [1, 5–13]. Recent studies and reviews have reported a range of contributory factors to reduced compliance with hip protector use, which are intrinsic to the protector (e.g. undergarments not fashionable), extrinsic to the protector (e.g. nurse encouragement to wear the protectors) and patient related (e.g. agitation) [5, 14, 15]. Measures of compliance have varied between studies.

Beyond the primary intended effect of hip protectors, there are many potential secondary effects that require investigation. On the positive side, the use of hip protectors has previously been reported to increase the self-efficacy of community-dwelling women who wear them [16]. On the negative side, however, hip protector use has been associated with skin irritation and abrasion [3, 17], discomfort [18] and even hip fracture [19].

Methods

Research design
Multiple snapshot cross-sectional survey.

Aims
To evaluate the compliance of patients recommended for the use of hip protectors in wearing them in the subacute setting and to determine whether patients wearing this equipment have greater functional dependency with toileting activities while doing so.

Subjects and setting
Patients included in this evaluation were those participating in the intervention arm of a randomised controlled trial of a