Diagnosis of carotid sinus hypersensitivity in older adults: carotid sinus massage in the upright position is essential

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Objective—To assess the diagnostic value of supine and upright carotid sinus massage in elderly patients.

Design—Prospective controlled cohort study.

Setting—Three inner city accident and emergency departments and a dedicated syncope facility.

Patients—1375 consecutive patients aged > 55 years presenting with unexplained syncope and drop attacks; 25 healthy controls.

Interventions—Bilateral supine carotid sinus massage, repeated in the 70° head up tilt position if the initial supine test was not diagnostic of cardioinhibitory and mixed carotid sinus hypersensitivity.

Main outcome measures—Diagnosis of cardioinhibitory or mixed carotid sinus hypersensitivity; clinical characteristics of supine v upright positive groups.

Results—226 patients were excluded for contraindications to carotid sinus massage. Of 1149 patients undergoing massage, 223 (19%) had cardioinhibitory or mixed carotid sinus hypersensitivity; 70 (31%) of these had a positive response to massage with head up tilt following negative supine massage (95% confidence interval, 25.3% to 37.5%). None of the healthy controls showed carotid sinus hypersensitivity on erect or supine massage. The initially positive supine test had 74% specificity and 100% sensitivity; these were both 100% for the upright positive test. The clinical characteristics of the supine v upright positive subgroups were similar.

Conclusions—The diagnosis of carotid sinus hypersensitivity amenable to treatment by pacing may be missed in one third of cases if only supine massage is performed. Massage should be done routinely in the head up tilt position if the initial supine test is negative.

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Carotid sinus hypersensitivity may be a cause of the symptoms in 30% of elderly patients with unexplained syncope,^{1 2} while up to 30% of older patients with carotid sinus hypersensitivity present with drop attacks.^{1 3} Cardioinhibitory and mixed carotid sinus hypersensitivity subtypes are amenable to permanent pacing. The cardioinhibitory subtype is defined by the finding of at least three seconds of asystole during carotid sinus massage; if a fall in systolic blood pressure of more than 50 mm Hg is also present, this defines the mixed subtype.¹⁻⁴ Carotid sinus massage is commonly performed at the bedside in the supine position. Treatment of both cardioinhibitory and mixed subtypes of carotid sinus hypersensitivity by permanent cardiac pacing results in an 80% reduction in syncopal episodes.^{2 3} In centres where carotid sinus massage is routinely performed, carotid sinus hypersensitivity accounts for up to 20% of pacemaker implants.⁵

Carotid sinus hypersensitivity is commonly excluded as a diagnosis on the basis of negative carotid sinus massage in the supine position without recourse to testing in the upright position. Our experience from a dedicated syncope facility for older adults (with 2000 patients assessed annually) has shown that carotid sinus hypersensitivity is revealed in the upright position only in a significant proportion of

patients.^{1 6} Our objective was thus to determine the value of carotid sinus massage in the diagnosis of carotid sinus hypersensitivity in the upright position following an initial negative supine test. We studied a prospective consecutive series of patients with unexplained syncope and drop attacks and compared them with a group of healthy age matched controls.

Methods

We recruited 1375 consecutive patients more than 55 years of age from three city centre accident and emergency departments and the syncope facility. They presented with unexplained syncope (loss of consciousness with loss of postural tone and collapse) and drop attacks (sudden collapses to a lower level without loss of consciousness in the absence of an overt medical or environmental reason for collapsing). They had no cognitive impairment (mini-mental state examination score > 24/30). We excluded 226 patients because of contraindications to carotid sinus massage (carotid bruits; cerebrovascular accident or myocardial infarction within the previous three months; history of ventricular arrhythmia). Twenty five healthy age matched controls taking no drug treatment, with no history of falls, dizziness, or syncope, and no cardiovascular comorbidity were recruited from among the patients'

Table 1 Clinical characteristics in subjects with carotid sinus hypersensitivity who tested positive to carotid sinus massage in supine and head up tilt positions

Characteristic	Supine (n = 153)	Head up (n = 70)	p Value
Age (median) (years)	75	76	0.9
Sex			0.89
Female	80 (54%)	39 (56%)	
Male	70 (46%)	31 (44%)	
Syncope incidence	90 (58.8%)	37 (52.8%)	0.07
Previous fractures	25 (16.3%)	14 (20.0%)	0.57
Ischaemic heart disease	35 (22.9%)	21 (30.0%)	0.32
Hypertension	37 (24.2%)	16 (22.9%)	0.87
Cerebrovascular disease	21 (13.7%)	7 (10.0%)	0.52
Current smoker	68%	60%	0.29

relatives. The study had local ethics committee approval and informed consent was obtained.

The subjects underwent carotid sinus massage on a footplate-type tilt table with continuous ECG and non-invasive blood pressure monitoring (Finapres, Ohmeda, Madison, Wisconsin, USA). While supine, a five second longitudinal massage was performed on the right carotid sinus; this was repeated on the left following haemodynamic re-equilibration. Massage was repeated within one minute of assuming the 70° head up tilt position in all patients who had a negative response. The clinical characteristics of the supine positive versus the upright positive groups were also examined.

Results

Of the 1149 patients examined, 223 (19%) had a cardioinhibitory or mixed response to carotid sinus massage. Seventy (31%) of these had a positive response to carotid sinus massage in the 70° head up tilt position following negative supine massage (95% confidence interval, 25.3% to 37.5%). None of the healthy controls had asystolic responses in either supine or upright positions. The specificity and sensitivity of the initially supine positive test were thus 74% and 100%, respectively, while the upright positive test had 100% specificity and sensitivity. The clinical characteristics of the subjects were similar in the supine and upright groups, with no significant differences in age, syncope incidence, number of previous fractures, prevalence of ischaemic heart disease, hypertension, or cerebrovascular disease, or smoking habit (table 1).

Discussion

In this large prospective series, the diagnosis of carotid sinus hypersensitivity would have been missed in over one third of the cases if carotid sinus massage had been performed with the patient in the supine position only, which is current clinical practice. Achievement of an accurate diagnosis in this context may forestall further wasteful and increasingly invasive and expensive investigations. The reasons for the differential response are not yet understood. One explanation may be that assumption of the upright posture alters baroreflex gain and consequently heightens the response to carotid sinus massage. Alternatively, better exposure of the carotid sinus while upright may facilitate more accurate targeting of massage.

Initial carotid sinus massage in the upright posture is not recommended, as this might increase the risk of watershed cerebrovascular complications.⁷ Rather, in patients with unexplained syncope or drop attacks, upright carotid sinus massage should be performed if initial supine carotid sinus massage is not diagnostic.

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