

**Carotid sinus
hypersensitivity :
evaluation and treatment**

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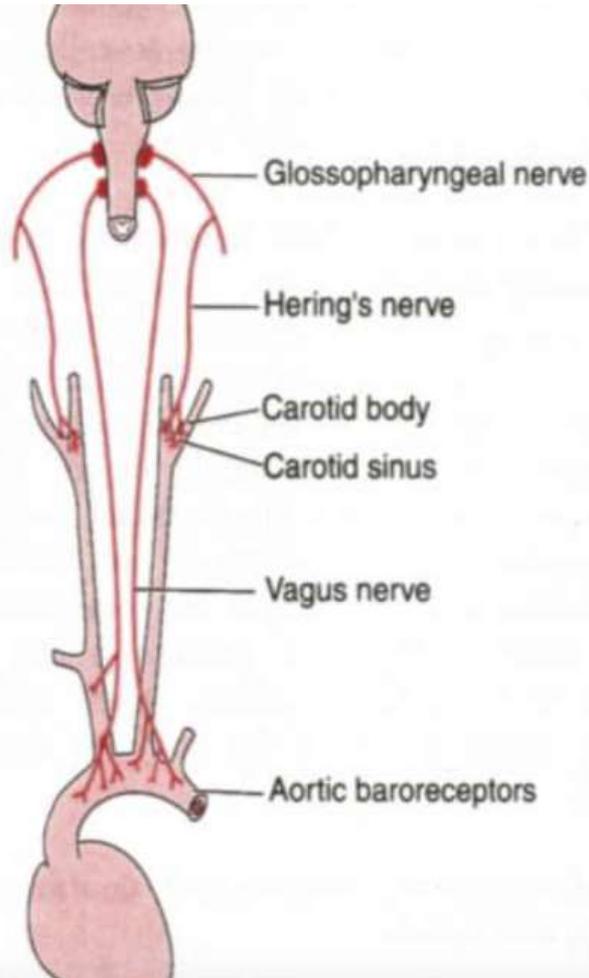
- The diagnosis and management of syncope are still a challenging task in our daily medical practice.
- In elderly patients ,identifying the underlying diagnosis may be more complex due to multiple comorbidities, atypical presentations, amnesia from loss of consciousness and difficulties in remembering and characterizing the episode.
- **Carotid sinus hypersensitivity** has been shown to be a cause of syncope ,particularly in elderly.

Prevalence

- Prevalence of CSH in patients with syncope is 23 % to 41%.
- Described in 17% of normal subjects.
- 20% of patients with cardiovascular disease.
- 38% of patients with severe carotid artery disease.
- More common in male .

- **Carotid sinus hypersensitivity** is an exaggerated response to carotid sinus baroreceptor stimulation.
- The **carotid sinus syndrome (CSS)** and **carotid sinus hypersensitivity (CSH)** are closely related disorders.
- **Carotid sinus syndrome** is characterized by syncope triggered by manipulation of the carotid sinus in daily life; classically this is the result of manoeuvres such as shaving or fitting a tie. Bradycardia and/or hypotension can be triggered by carotid sinus massage (CSM) in these patients.
- **Carotid sinus hypersensitivity** is a condition where CSM is positive in an **asymptomatic** patients.

Carotid sinus



Carotid sinus is a thin walled dilatation located at the proximal end of the internal carotid artery just above the bifurcation of common Carotid artery.

Classification of CSS

Dominant Cardioinhibitory CSS

Initial CSM: Ventricular asystole $>3s$ + reproduction of spontaneous symptoms. CSM + Atropine: Absence of ventricular asystole and symptoms (Vasodepressor component either insufficient to cause symptoms or absent).

Mixed CSS

Initial CSM: Ventricular asystole $>3s$ + reproduction of spontaneous symptoms. CSM + Atropine: BP fall $>50\text{mmHg}$ with reproduction of spontaneous symptoms.

Dominant Vasodepressor CSS

Initial CSM: Ventricular asystole absent or $<3s$ + BP fall $>50\text{mmHg}$ with reproduction of spontaneous symptoms. CSM + Atropine: Ventricular asystole absent, BP fall as with Initial CSM + reproduction of spontaneous symptoms.

CSS = Carotid sinus syndrome, CSM = Carotid sinus massage, BP = Blood pressure. Atropine administered IV 0.02 mg/kg body weight.

**Table 5** Prevalence of trauma among patients with syncope, based on the specific cause of syncope

Type of syncope	No trauma, n (%)	Trauma, n (%)	P-value	Severe trauma, n (%)	P-value
Cardiac (90)	64 (71.1)	26 (28.9)		7 (7.8)	
Arrhythmic (52)	35 (67.3)	17 (32.7)		4 (7.7)	
Structural (38)	29 (76.3)	9 (23.7)		3 (7.9)	
Orthostatic hypotension (69)	49 (71)	20 (29)		3 (4.3)	
Neurally-mediated (633)	462 (73)	171 (27)	0.07 ^a 0.008 ^b	27 (4.3)	0.34 ^a <0.0001 ^b
Vasovagal (494)	376 (76.1)	118 (23.9)		11 (2.2)	
Situational (102)	67 (65.7)	35 (34.3)		7 (6.9)	
Carotid sinus syndrome (37)	21 (56.8)	16 (43.2)		9 (24.3)	
Other (33)	25 (75.8)	8 (24.2)		0 (0)	
Unknown origin (289)	185 (64)	104 (36)		17 (5.9)	

^aAmong the main categories of syncope.^bAmong the different subgroups.

severe trauma carotid sinus massage should be the first diagnostic manoeuvre to be undertaken after a non-diagnostic initial evaluation.

Carotid sinus hypersensitivity

- CICSH is defined as greater than or equal to 3 seconds asystole during carotid massage.
- Vasodepressor CSH is defined as greater than or equal to 50 mm Hg decrease in blood pressure in response to carotid sinus massage.
- Mixed CSH is diagnosed by the presence of a greater than or equal to 3-second pause, along with a decrease in systolic blood pressure of at least 50 mm Hg upon rhythm resumption.

Recommendations: carotid sinus massage

Recommendations	Class ^a	Level ^b
Indications		
• CSM is indicated in patients >40 years with syncope of unknown aetiology after initial evaluation	I	B
• CSM should be avoided in patients with previous TIA or stroke within the past 3 months and in patients with carotid bruits (except if carotid Doppler studies excluded significant stenosis)	III	C
Diagnostic criteria		
• CSM is diagnostic if syncope is reproduced in the presence of asystole longer than 3 s and/or a fall in systolic BP >50 mmHg	I	B

^aClass of recommendation.

^bLevel of evidence.

BP = blood pressure; CSM = carotid sinus massage; TIA = transient ischaemic attack.

Carotid sinus syndrome (CSS)

Cardioinhibitory carotid sinus hypersensitivity (CICSH)

Cardiac sinus massage

Recommendations	Class ^a	Level ^b
Indications		
CSM is indicated in patients >40 years of age with syncope of unknown origin compatible with a reflex mechanism. ⁹²⁻⁹⁴	I	B
Diagnostic criteria		
CSS is confirmed if CSM causes bradycardia (asystole) and/or hypotension that reproduce spontaneous symptoms, and patients have clinical features compatible with a reflex mechanism of syncope. ^{89,90,92,93,98-102}	I	B
<p>Additional advice and clinical perspectives</p> <ul style="list-style-type: none"> ● History of syncope and its reproduction by CSM defines CSS; positive CSM without a history of syncope defines carotid sinus hypersensitivity.^{89,90,92,93} Carotid sinus hypersensitivity in patients with unexplained syncope may be a non-specific finding because it is present in ≤40% of older populations and should be used with caution for diagnosis of the mechanism of syncope. ● CSM should be performed with the patient in the supine and upright positions, and with continuous beat-to-beat BP monitoring. This may be more readily performed in the tilt laboratory.⁹⁰ ● Although neurological complications are very rare,^{90,95-97} the risk of provocation of TIA with the massage suggests that CSM should be undertaken with caution in patients with previous TIA, stroke, or known carotid stenosis >70%. 		

Carotid Sinus Massage (CSM)

- Method¹
 - Massage, 5-10 seconds
 - Don't occlude
 - Supine and upright posture (on tilt table)
- Outcome
 - 3 second asystole and/or 50 mmHg fall in systolic BP with reproduction of symptoms = Carotid Sinus Syndrome
- Absolute contraindications²
 - Carotid bruit, known significant carotid arterial disease, previous CVA, MI last 3 months
- Complications
 - Primarily neurological
 - Less than 0.2%³
 - Usually transient

¹Kenny RA. *Heart*. 2000;83:564.

²Linzer M. *Ann Intern Med*. 1997;126:989.

³Munro N, et al. *J Am Geriatr Soc*. 1994;42:1248-1251.

Arguments for adapting cut-off value for asystolic period triggered by carotid sinus massage to ≥ 6 s

Current 3 s criterion based on arbitrary clinical observations and has low specificity. Thirty-nine per cent of the general population >65 years fulfils this criterion	This review, Kerr et al. ³⁷
Pathophysiological reasoning: no loss of consciousness before ~ 6 s asystole	Wieling et al. ⁶
In the general population >65 years, the 95th percentile for carotid sinus massage response was 7.3 s asystole	Kerr et al. ³⁷
In clinical follow-up of syncope, only 0.7% of asystolic episodes of 3–6 s but 43% of episodes of >6 s resulted in pre-syncopal or syncopal symptoms	Menozzi et al. ⁵⁶
In ISSUE-2, the average pause at time of syncope recurrence was of 9 s (range 8–18)	Brignole et al. ⁷²

Symptoms

The most common symptoms attributed to CSH are dizziness (presyncope) and syncope.

Typical provocation maneuvers such as head turning, shaving, or the wearing of tight neck collars

The onset of symptoms tends to be sudden, of short duration, and with quick recovery.

Symptoms may be of longer duration when significant hypotension occurs. Significant injuries, including fractures, are not uncommon due to minimal premonitory symptoms

Sequence of symptoms and signs in prodromal phase of syncope

Abrupt syncope with acute standstill of perfusion of the brain and retina

- After approximately 6 s: darkened vision (black out), staring, 'freeze'
- 7–13 s: fixation in the midline or upwards turning of the eyes, loss of muscle tone, loss of consciousness
- After approximately 14 s muscle jerks

Gradual onset syncope with autonomic activation and symptoms of hypoperfusion

Autonomic activation

- Sweating
- Facial pallor
- Nausea
- Pupillary dilatation
- Palpitations
- Yawning^a
- Hyperventilation

Symptoms of hypoperfusion

- Brain: light-headedness, unclear thinking
- Retina: blurred vision, loss of peripheral and colour vision (grey out), darkened vision (black out)
- Shoulders: coat hanger pain
- Angina pectoris
- Hypotensive TIA^b

a Precise mechanism unclear. b Extremely rare, usually resulting from the combination of occlusive carotid artery disease and orthostatic hypotension.

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

S W Parry, D A Richardson, D O'Shea, B Sen, R A Kenny

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.

(Heart 2000;83:22–23)

Carotid sinus hypersensitivity- Diagnosis

Carotid sinus hypersensitivity is diagnosed when CSM elicits ≥ 3 s asystole (cardio-inhibitory type)

A fall in systolic blood pressure of ≥ 50 mmHg (vasodepressor type), or both (mixed type)

The 2009 ESC guideline states that ‘the diagnosis of CSS requires the reproduction of spontaneous symptoms during 10 s sequential right and left CSM performed supine and erect, under continuous monitoring of heart rate and periodic measurement of blood pressure.

Diagnosis

Carotid sinus syndrome (CSS) is diagnosed when a hypersensitive response to carotid massage is produced in patients presenting with syncope or other symptoms (as previously described).

A cardioinhibitory response is referred to as cardioinhibitory CSS (CICSS), and a vasodepressor response is vasodepressor CSS (VDCSS).

CSS is widely accepted as a condition related to aging, as it is rarely identified in patients under the age of 50 years.

There is differing opinion whether reproduction of spontaneous symptoms in association with a hypersensitive response is required for the diagnosis

Treatment

The treatment of CSH depends on a number of factors, including the hemodynamic response to carotid massage and the patient's clinical history

If there are obvious causative factors such as vigorous head turning or tight shirt collars, these maneuvers/clothing should be minimized and/or avoided.

The role of pacemaker in hypersensitive carotid sinus syndrome

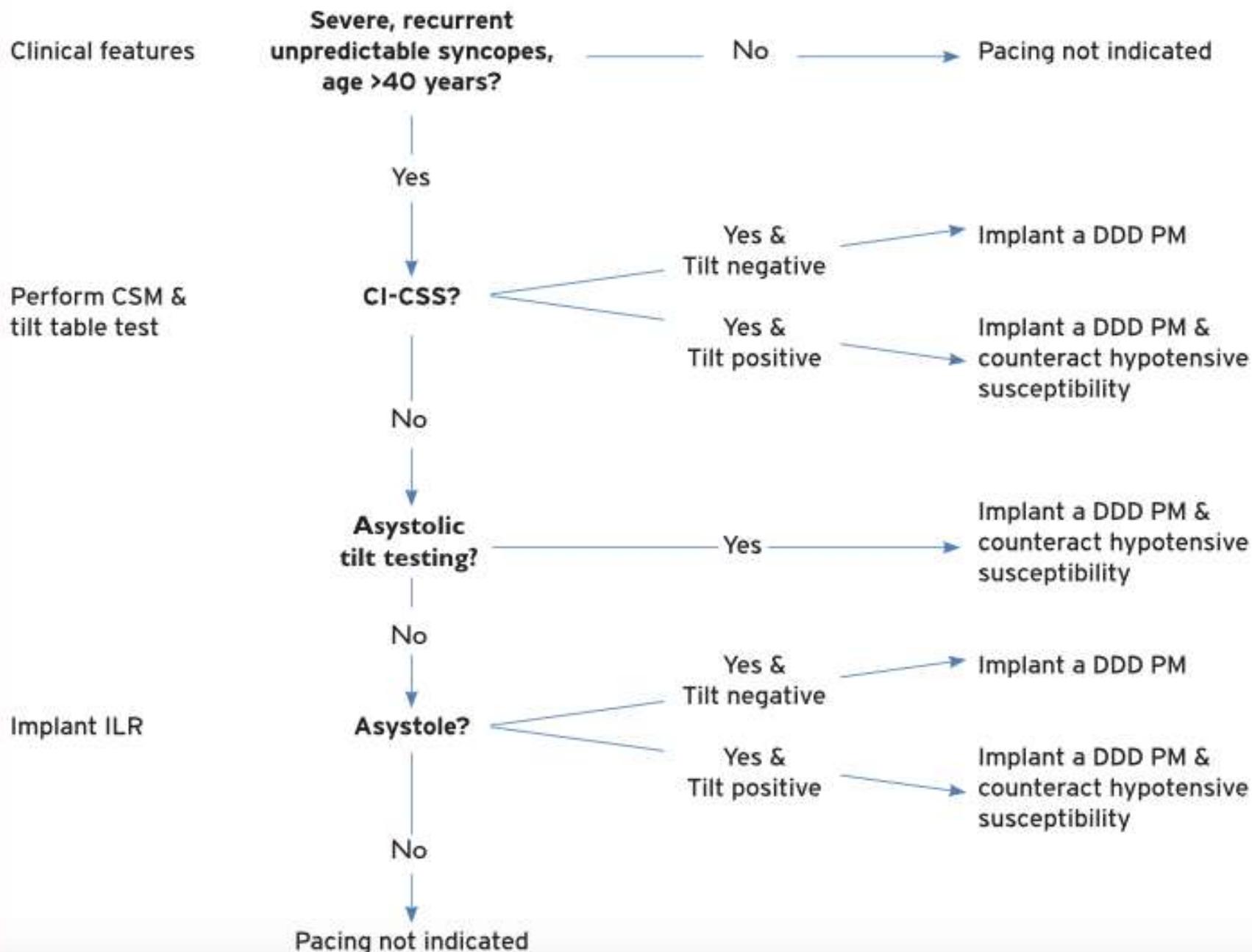
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Permanent pacemaker is **an effective treatment for CSS**. However, the recurrence of symptoms was two- to threefold more frequent in patients with mixed CSS, probably due to the persistence of vasodepressor component.

Pacing for reflex syncope: decision pathway



Cardiac pacing should be considered to reduce syncope recurrence in patients with cardioinhibitory carotid sinus syndrome who are >40 years with recurrent frequent unpredictable syncope.^{90,292,293}

IIa

B

- **Dual-chamber pacing (DDD)** is the treatment of choice for cardioinhibitory and mixed forms. It is believed to improve quality of life by reducing the number of episodes of recurrent syncope, but it does not completely eliminate the risk of syncope recurrence , especially in patients with vasodepressive effects.
- Syncope recurrence is **20%** in 5 yrs in paced patients.

Vasodepressive type

- Increase intake of fluids
- Increase salt consumption
- Antihypertensive drug therapy modification
- Midodrine
- Fludrocortisone
- Droxidopa

Conclusion

- Although carotid sinus hypersensitivity was first reported more than 200 years ago, a complete understanding of this relatively common clinical finding in older patients has proven elusive.
- Evidence exists to support an association between symptoms, particularly syncope, and a hypersensitive response to carotid sinus massage; however, the clinical implication of a high prevalence in asymptomatic healthy older persons is not known.
- A central degenerative process likely underlies the pathophysiology, but this is currently remains unproven.
- Although selected patients have had symptom improvement with treatment, particularly permanent pacing, there is a dearth of randomized controlled trial data to guide management.

Thank You

- It is known that patients with CSH showing a reduction in blood pressure after an SCM have a worse prognosis than those with a pure cardioinhibitory response or a lack of vasodepressor response

What is Carotid Sinus Hypersensitivity?

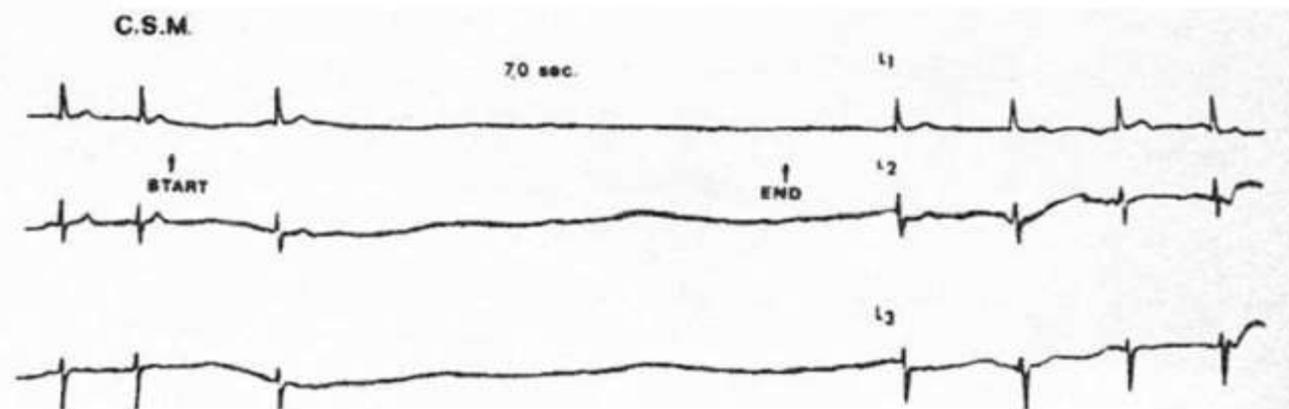
- The carotid sinus syndrome (CSS) and carotid sinus hypersensitivity (CSH) are closely related disorders.
- Carotid sinus hypersensitivity consists of bradycardia and/or hypotension triggered by CSM in patients without a typical history.
- In the 2009 European Society of Cardiology (ESC) guidelines on the diagnosis and treatment of syncope, CSS and inducible carotid sinus syncope are used as synonyms encompassing the presence of CSH with the reproduction of spontaneous complaints on CSM in a syncope patient

CSS

Carotid sinus syndrome (CSS) is a disease of the autonomic nervous system presenting with syncope, especially in older males who often have cardiovascular disease.

Carotid sinus syndrome is defined, by the new Guidelines of the European Society of Cardiology (ESC) as syncope with reproduction of symptoms during carotid sinus massage (CSM) of 10s duration.

It is always vasodepressor but the degree of vasodepression varies and when it exists alone, the vasodepressor (VD) form, the systolic blood pressure falls .50 mmHg.



Case of CSS showing result of CSM.

Relation between age and the prevalence of carotid sinus hypersensitivity

