



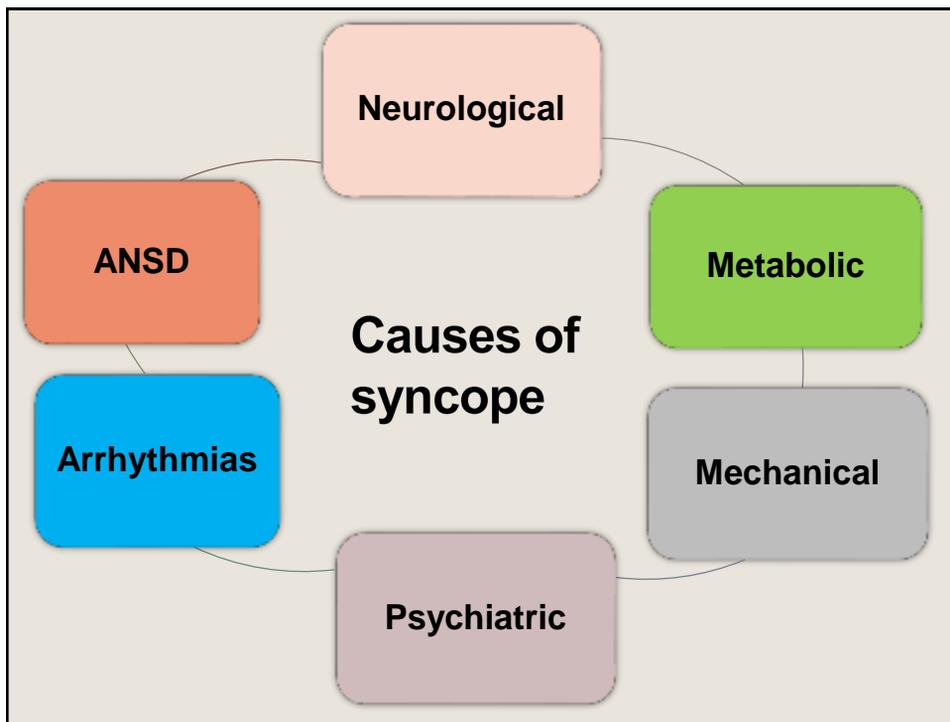
Tilt table test results (interpretations & pitfalls)

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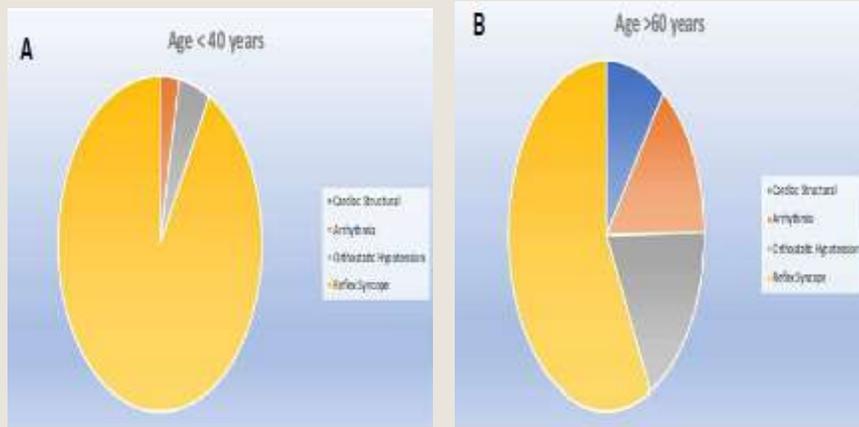
Agenda

- ***Causes of syncope***
- ***TTT in guidelines***
- ***Indications***
- ***Contraindications***
- ***Requirement and procedure***
- ***Interpretation***
- ***Pitfalls***
- ***Conclusions***

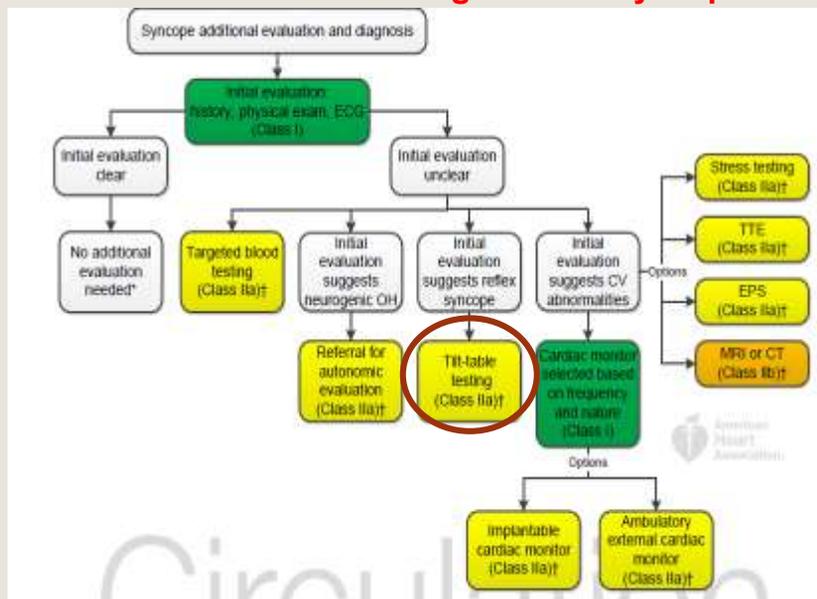
- ❖ **The tilt-table test is a simple, safe, noninvasive, and informative test first described in 1986 as a diagnostic tool for patients with syncope of unknown origin.**
- ❖ **TTT enables the reproduction of reflex syncope in a laboratory setting.**



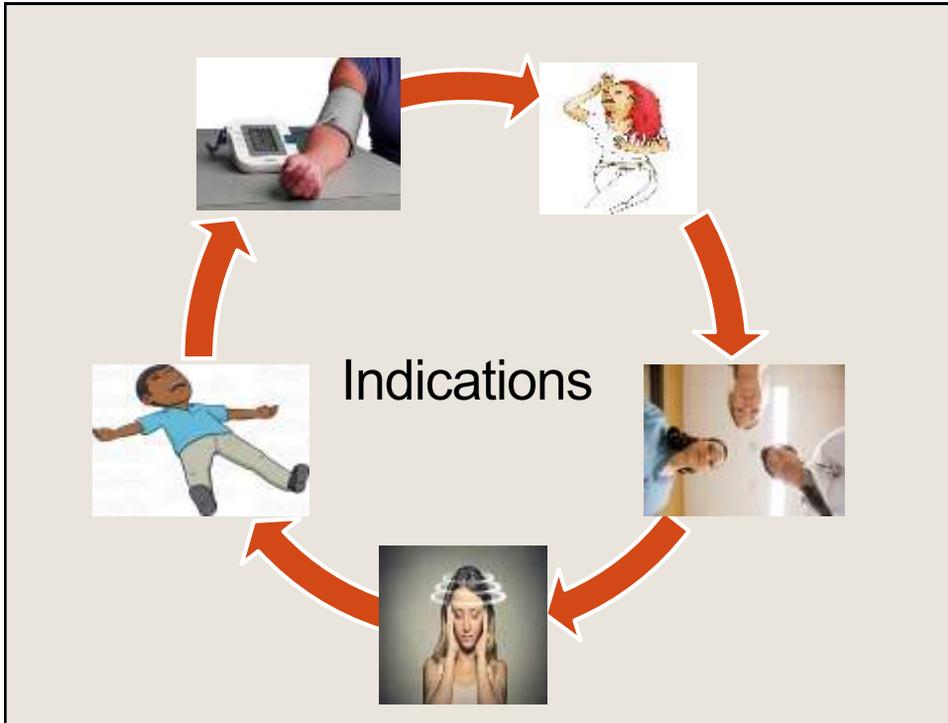
Reflex syncope in different age groups



Additional Evaluation and Diagnosis for Syncope



Shen W-K, et al. 2017 ACC/AHA/HRS Syncope Guideline



European Society of Cardiology 2009 Indications

- 1- Unexplained single syncopal episode in high-risk settings
- 2- Recurrent episodes of syncope in the absence of SHD
- 3- Susceptibility to reflex syncope



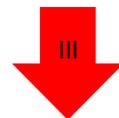
- 1- Discriminate between reflex and orthostatic hypotensive syncope



- 1- Differentiating syncope with jerking movement from epilepsy
- 2- Patients with recurrent unexplained falls
- 3- Patients with frequent syncope and psychiatric disease



- 1- Assessment of treatment
- 2- Isoproterenol CI in IHD



ACC/AHA/HRS guidelines 2017

IIa

- If the diagnosis is unclear after initial evaluation, TTT can be useful for patients with suspected VVS

IIa

- TTT can be useful for patients with syncope and suspected delayed OH when initial evaluation is not diagnostic

IIa

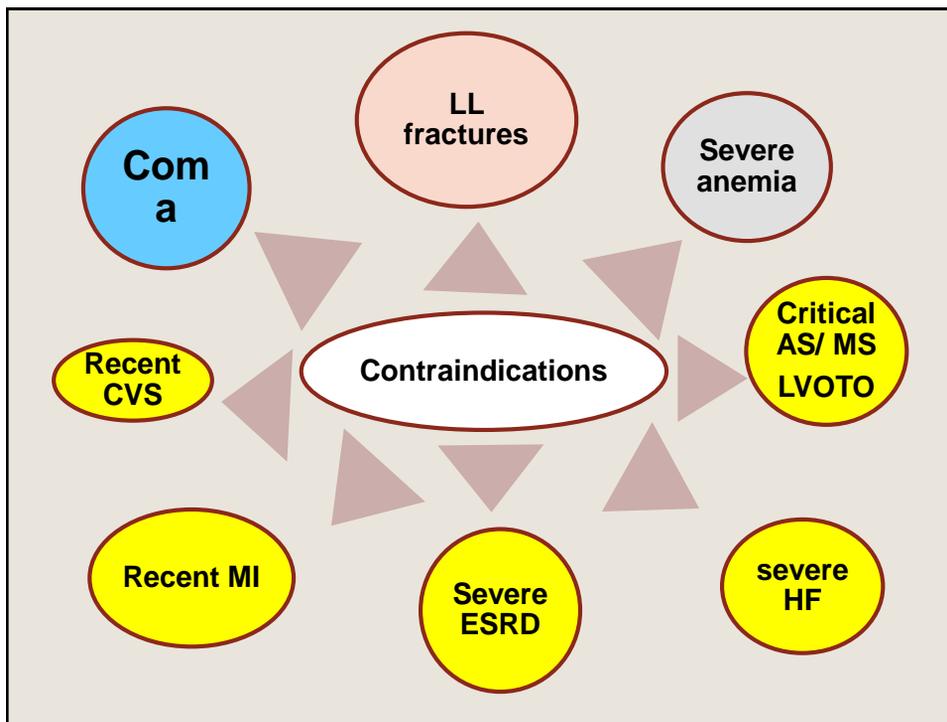
- TTT is reasonable to distinguish convulsive syncope from epilepsy in selected patients

IIa

- TTT is reasonable to establish a diagnosis of pseudosyncope

III

- TTT is not recommended to predict a response to medical treatments for VVS



TTT equipments



Prei-procedural care:

❖ Patient education

❖ Patient Instructions:

1- Avoid dehydration on the day of the study in patients-→ Administer IV saline (caution in HF or RF)

2- Hold all medications the night before the procedure and in the morning to increase the sensitivity of the study unless you suspect diuretic drug is the cause of syncope

TTT approach



Test termination

- If systolic blood pressure falls < 70 mmHg, or significant bradycardia even if symptoms are not present.
- If the patient faints, and return patient to supine position.
- Administer **250-mL bolus of 0.9% NaCl** for hypotension \pm **atropine** for persistent bradycardia
- Record blood pressure and heart rate until back to baseline.

Outcome...

Generally tilt-table testing is safe, but **complications may occur related to decreased perfusion of the heart**, including the following:

- ECG changes of transient myocardial ischemia with or without angina.
- Vasospasm with isoproterenol administration
- Occasionally, cardiac arrhythmias result in termination of the test

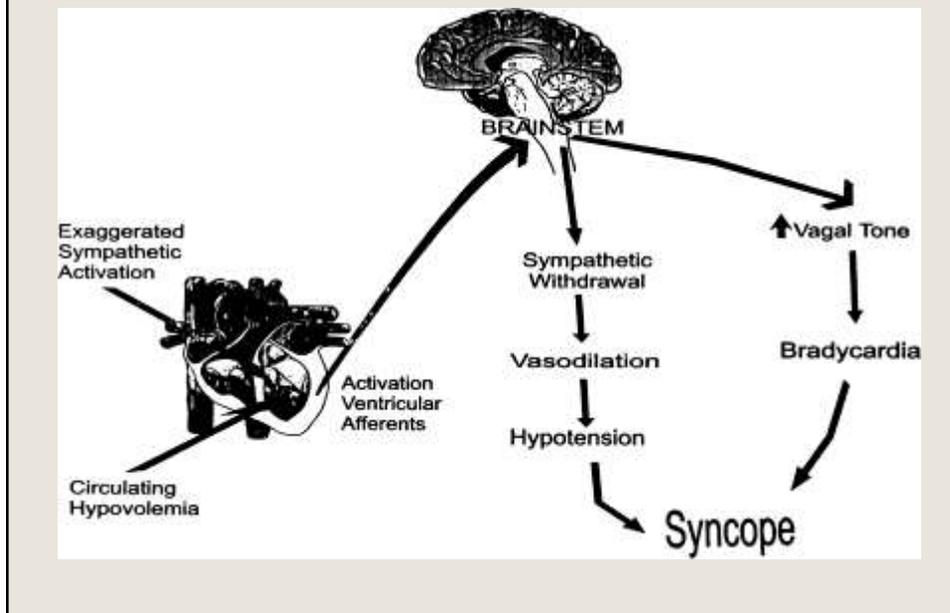
Outcome...

Complications may also occur related to decreased perfusion of the brain, including the following :

- Seizures from prolonged hypotension (this is a transient phenomenon and not indicative of a seizure disorder)
- Rarely, transient ischemic attacks or strokes occur
- Transient mental confusion can occur
- Patients may also experience nonspecific symptoms

such as nausea or anxiety

Theories for pathophysiology of reflex syncope



Results

Mixed type

- HR dropped $\neq 40$ bpm or < 40 bpm $\neq 10$ s \pm asystole < 3 s
- BP falls before HR

CI type

- (A) Without asystole : HR < 40 bpm > 10 s
- (B) With asystole: asystole > 3 s

VD type

- HR fall $\neq 10\%$ of its peak at syncope
- BP falls with or before HR falls

Initial orthostatic hypotension	<ul style="list-style-type: none">• BP fall >40 mmHg at standing that is spont. and fast normalize• Symptoms <30 s
Classic orthostatic hypotension	<ul style="list-style-type: none">• Fall in systolic BP ≥ 20 mmHg and diastolic BP ≥ 10 mmHg during the first 3 m after standing.
POTS	<ul style="list-style-type: none">• HR rise >30 bpm or HR >120 bpm after standing + symptoms and BP variability
Chonotropic incompetence	<ul style="list-style-type: none">• HR increase <10% of pretilt rate
Negative TTT	<ul style="list-style-type: none">• Syncope, orthostatic hypotension or POTS are not provoked.

Test interpretation- diagnostic criteria

In patients without SHD

Reflex hypotension/bradycardia with reproduction of syncope or progressive OH (with or without symptoms) **diagnostic of reflex syncope and OH (I)**

Reflex hypotension/bradycardia without reproduction of syncope may be diagnostic of **reflex syncope (IIa)**

In patients with SHD, apply the same diagnostic criteria

Arrhythmias and other cardiac causes of syncope should be excluded before considering a positive TTT as diagnostic of reflex syncope (IIa)

Induction of LOC in absence of hypotension and/or bradycardia should be considered diagnostic of **psychogenic pseudosyncope (IIa)**

If the patient experiences progressive OH (slow progressive decrease in SBP ± symptoms), the test is **diagnostic for OH syncope, not reflex syncope**

If TTT is being done to evaluate for POTS, the test would be considered diagnostic if there is a sustained HR increase of >30 bpm or an increase to ≥ 120 bpm within the first 10 m of the passive phase

Correlation Between Clinical Syncope And Induced Syncope

Spontaneous syncope and induced syncope in the tilt-table test are associated with **similar premonitory signs and symptoms**

The temporal sequence of changes in BP and HR during induced syncope **parallel** those seen with spontaneous syncope

Plasma catecholamine levels measured before and after spontaneous and induced syncope are **very similar**

Test sensitivity and specificity

Positive responses in reflex syncope are **61-80%**, **specificity is 84-90%** (using both isoproterenol infusion or nitroglycerin)

Comparison of isoproterenol and nitroglycerin

One study of 71 patients with unexplained syncope and 30 controls

TTT twice on separate days, with all patients receiving isopro. and nitrogly.

Rates of test positivity were similar in patients receiving nitroglycerin (49%) and isoproterenol (41%)

Sublingual nitroglycerin **was simpler** to use and **better tolerated** than isoproterenol

In a study of 96 patients with unexplained syncope who underwent three separate TTT on the same day (passive, once with isoproterenol, once with nitroglycerin),

Sublingual nitroglycerin with TTT led to **higher number of positive responses** than isoproterenol (55% versus 42 %)

Sublingual nitroglycerin with TTT led to **higher number of positive responses** among patients with a positive TTT without pharmacologic agents than isopro. (94 versus 67%)

Pitfalls

- Although TTT is frequently positive in patients with VV syncope, it is not the gold standard for the diagnosis of VV syncope, **as it has limited sensitivity, specificity, and**
- The response to TTT can be **highly variable** such that a patient may display CI response on one day and VD response on another day.

Pitfalls....

- Factors such as **prior history of syncope and pharmacological provocation** during the protocol all seem to have an effect on the test results.
- These protocols were reported with **variations in the initial stabilization phase, duration, tilt angle and type of support.**
- The reported false negative rate is as high as **14 to 30 %**. **True false negative rate** is difficult to determine since there is **no gold standard for comparison.**

The response to TTT appears to vary with the patient age

Younger subjects are more likely to have **a bradycardic response**, whereas older subjects are more likely to have **a hypotensive response.**

In one study of 145 patients with a history of presyncope or syncope, patients with a history of recurrent syncope were **significantly more likely to have a positive test** compared with those with a single episode or with recurrent presyncope

Patients with SHD or with a non-CV cause for syncope were **significantly less likely to have a positive test** (16 versus 42%)

Conclusions

- TTT is still underutilized in many centers, and syncope patients are often subjected to a large number of different diagnostic tests which significantly increase health costs and have little diagnostic yield.
- **In patients demonstrated susceptibility to reflex syncope, TTT may help to reassure them that a diagnosis has been established.**

Simply.....

ask for tilt
for patient who faint
it's a safe test

Questions....

