

When is sinus tachycardia “inappropriate”?



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Inappropriate sinus tachycardia (IST)



- ✎ IST first described in 1979
- ✎ IST is a fast heart rhythm arising from the sinus node, the normal primary pacemaker of the heart.
- ✎ due to increased automaticity.

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2015 Heart Rhythm Society Expert Consensus Statement on the Diagnosis and Treatment of Postural Tachycardia Syndrome, Inappropriate Sinus Tachycardia, and Vasovagal Syncope



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Definition of IST



- ✎ The **syndrome** of IST is defined as a **sinus heart rate >100 bpm at rest** (with a **mean 24-hour heart rate >90 bpm** not due to primary causes) and
- ✎ is associated with distressing symptoms of palpitations.

Prevalence and natural history



- In a survey of middle-aged subjects, the IST prevalence was 1.2% (7 of 604 patients)
- Mean age: 38 ± 12 years
- More in people working in health care!
- Little has been reported on long-term outcomes, although there is no known mortality.

Physiology



several underlying mechanisms

- ❧ increased sinus node automaticity,
- ❧ beta-adrenergic hypersensitivity,
- ❧ decreased parasympathetic activity, and
- ❧ impaired neurohumoral modulation.

Potential causes of sinus tachycardia



- Fever
- Infection
- Anemia
- Hyperthyroidism
- Anxiety
- During Exercise
- DM related autonomic dysfunction
- Hypoglycemia
- Dehydration/hypovolemia
- Pain

Drugs causing sinus tachycardia



- ☞ Tobacco
- ☞ Caffeine
- ☞ Alcohol
- ☞ Anticholinergic drugs
- ☞ BB withdrawal
- ☞ Drug abuse (cocaine)

Cardiac causes



- ❧ Heart failure
- ❧ Pericarditis
- ❧ MI
- ❧ Pulmonary embolism
- ❧ AR/MR.

Clinical presentation



- ❧ Palpitations, fatigue and exercise intolerance
- ❧ Other symptoms: chest pain, dyspnea, presyncope.
- ❧ Overlaps with chronic fatigue syndrome or neurocardiogenic syncope

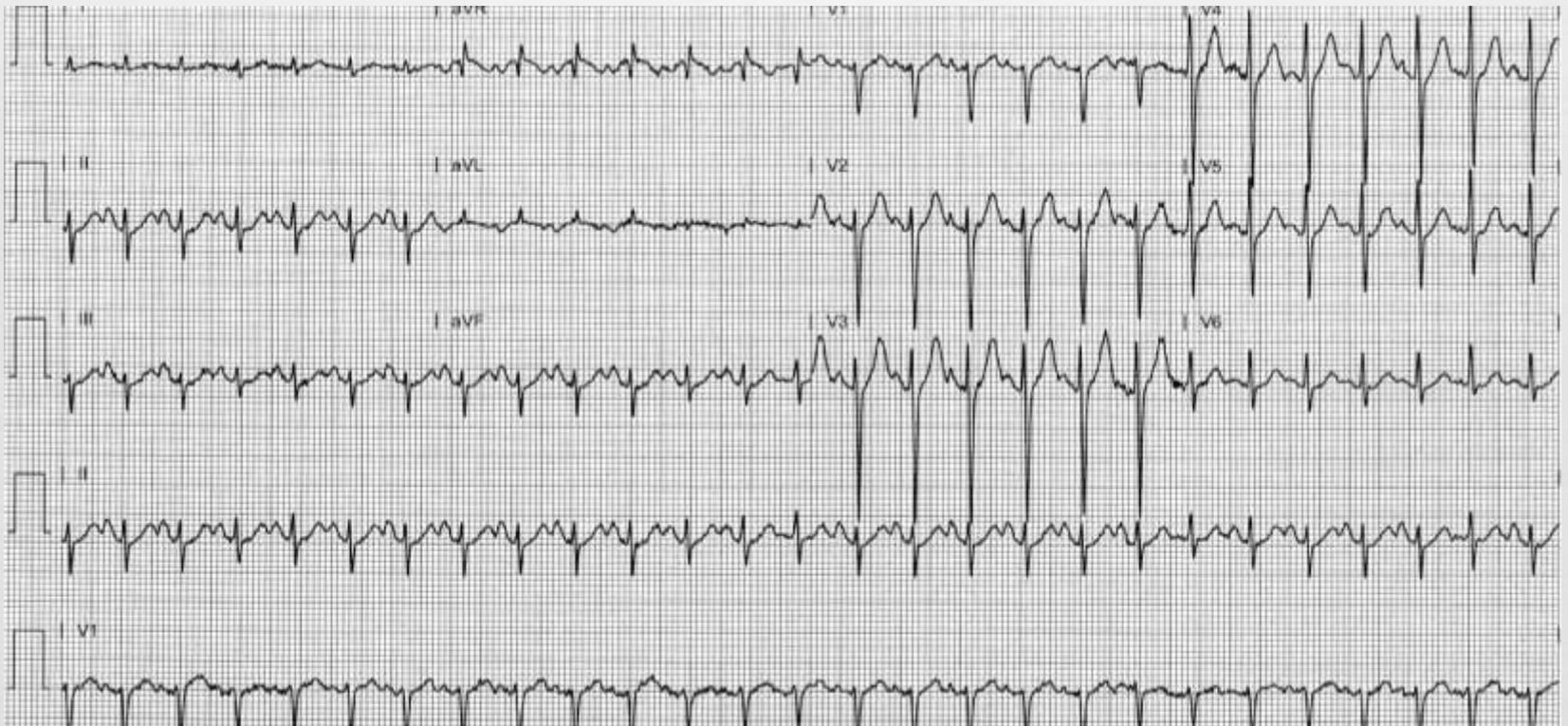
Diagnosis



- Ill-defined syndrome
- Diagnosis of exclusion (thorough history and examination)

1. a relative or absolute increase in sinus rate out of proportion to the physiological demand.
2. P wave axis and morphology during tachycardia similar to those noted during SR
3. Distressing symptoms relieved when SR is normal.

ECG (SR >100 bpm)



No abrupt termination and initiation



Holter & Stress test



- ❧ **Holter:** (Avg HR>90 bpm)
- ❧ **Stress test:** Early increase in HR with minimal exercise
- ❧ HR>130 bpm within 90 seconds of exercise in Bruce protocol.
- ❧ **DD:** physical deconditioning by chronicity and the presence of associated symptoms.

Isoproterenol provocation



- ☞ Demonstrates SN hypersensitivity to beta-adrenergic stimulation.
- ☞ IV boluses as 1 min intervals (starting at 0.25 ug, double dose every minute) until MHR of 150 bpm achieved.
- ☞ MHR achieved with iso dose of 0.29 ± 0.1 ug (versus 1.27 ± 0.4 ug in normal controls)

HRS recommendations



Recommendations—Investigation of IST

Class

A complete history, physical exam, and 12-lead ECG are recommended.

I

Complete blood counts and thyroid function studies might be useful.

IIa

A 24-hour Holter monitoring might be useful.

IIb

Urine/serum drug screening might be useful.

IIb

It might be worth considering autonomic testing.

IIb

It might be worth considering treadmill exercise testing.

IIb

DD: POTS



Postural Orthostatic Tachycardia Syndrome

- Provocation of symptoms on standing & relieved by recumbence.
- Persistent HR increase of >30 bpm or absolute pulse of 120 bpm that occurs within the first 10 minutes of standing from supine.
- Tilt table: diagnostic

DD: SNRT

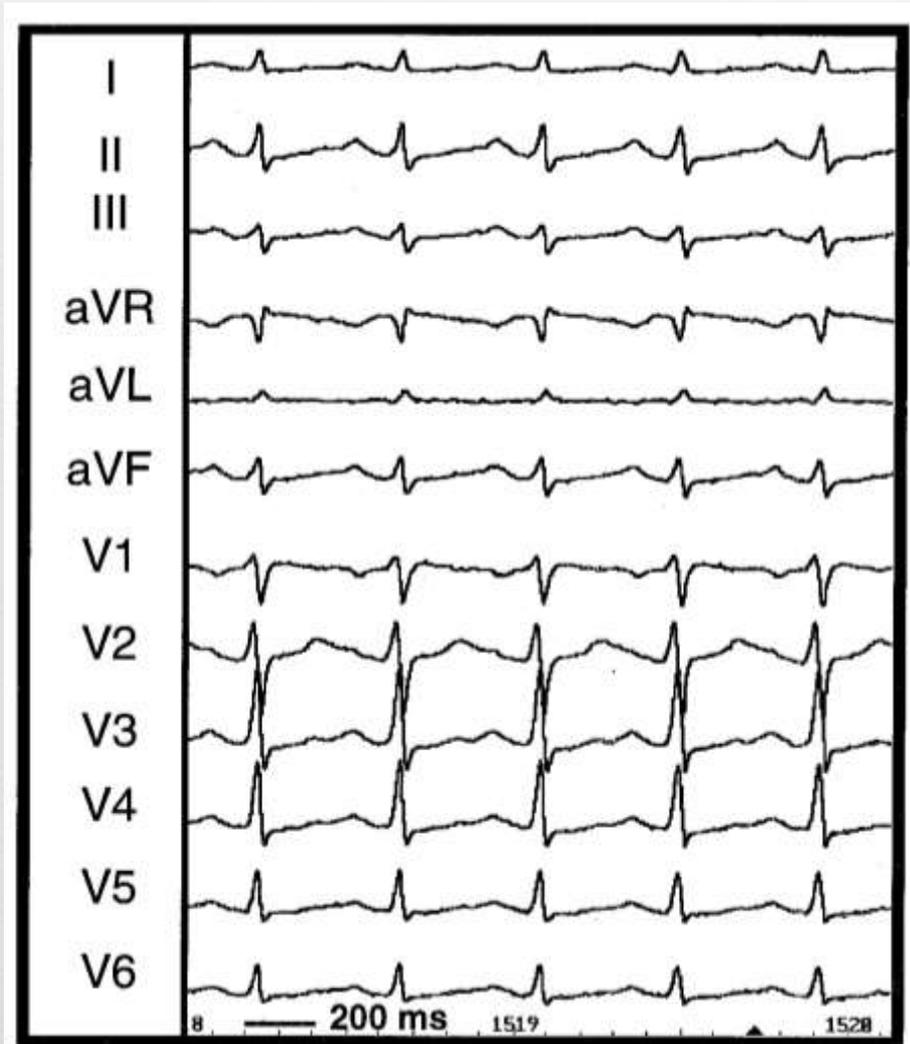


- ∞ Sudden or paroxysmal
- ∞ Middle aged
- ∞ P wave morphology identical to Sinus p wave
- ∞ **Mechanism:** reentrant

SNRT



Atrial tachycardia



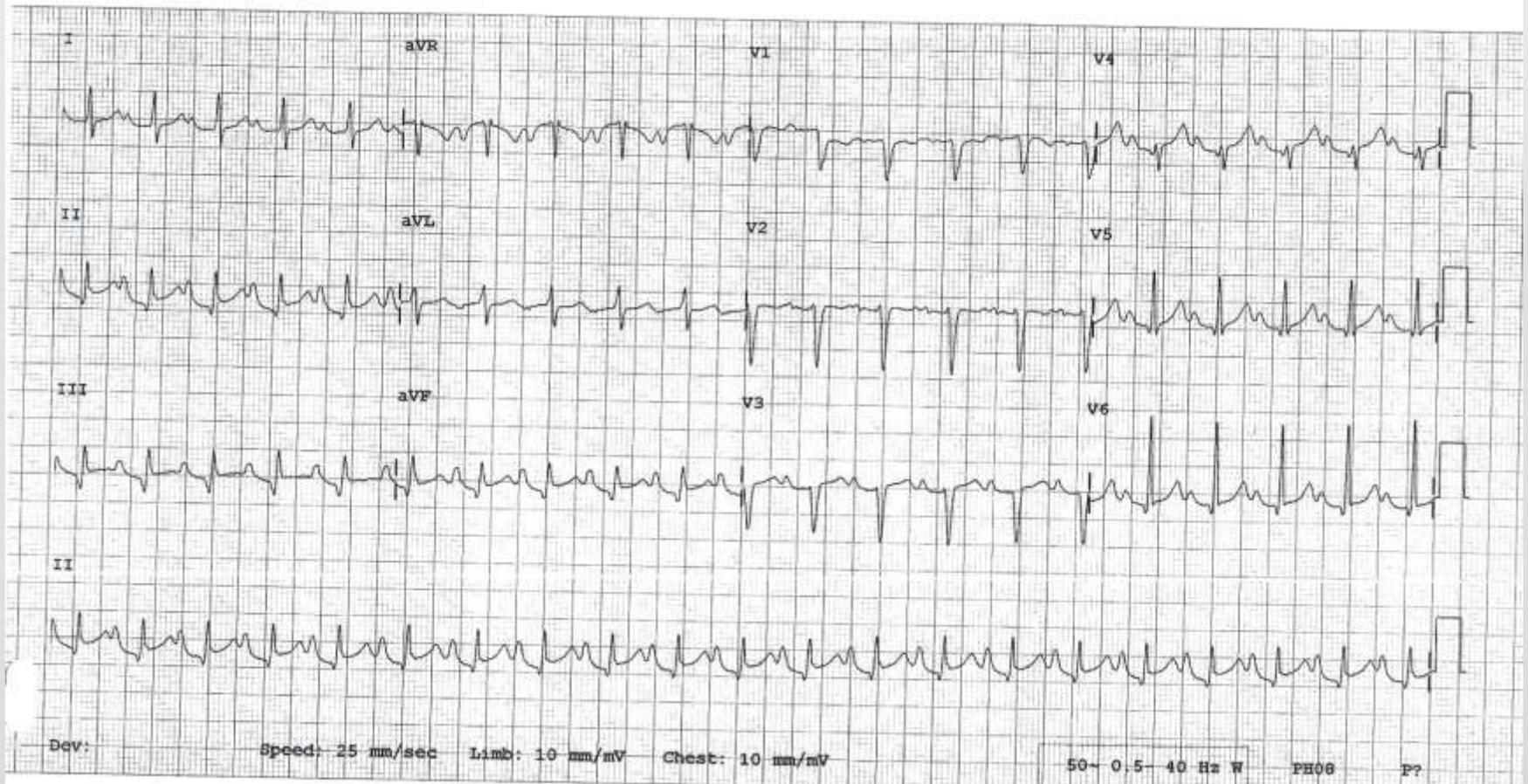
Paroxysmal/incessant
Tachy-cardiomyopathy
EP & ablation

Sites:

High crista

RSPV

F/22 yrs old, DOE, LVEF 45%



measures of cardiovascular autonomic reflexes



- ❧ heart rate responses to deep breathing, standing, Valsalva, cold face test (diving test),
- ❧ heart rate variability,
- ❧ baroreflex sensitivity.
- ❧ These tests should not be used routinely given their unproven clinical usefulness.

Treatment



- No long-term, prospective, placebo-controlled clinical trials of any therapeutic intervention that has demonstrated a substantial improvement in outcomes.
- Symptoms can continue despite heart rate control.

BB & other therapies



- Significant psychosocial distress. Close attention and effective communication can improve outcomes.
- β - Adrenergic blockers are not usually effective and can cause adverse effects, though widely used.
- Other treatments have been suggested, including fludrocortisone, volume expansion, pressure stockings, phenobarbital, clonidine, psychiatric evaluation, exercise training, and erythropoietin.

Ivabradine

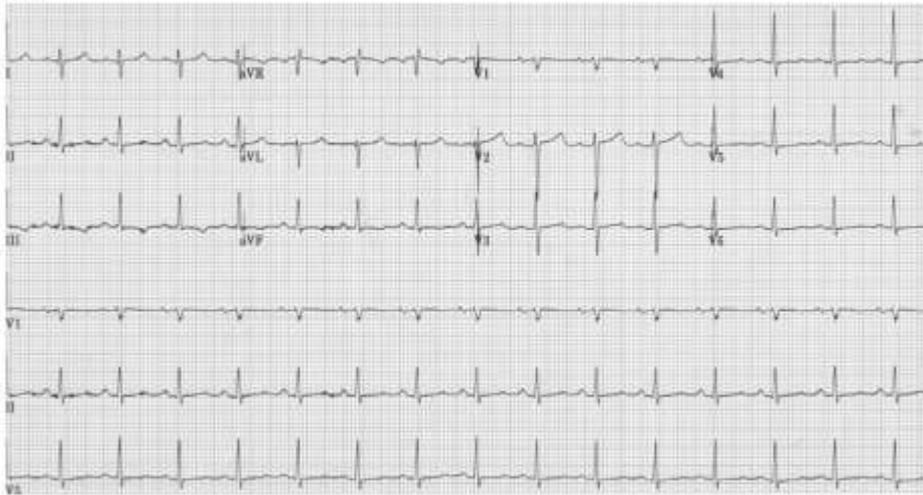
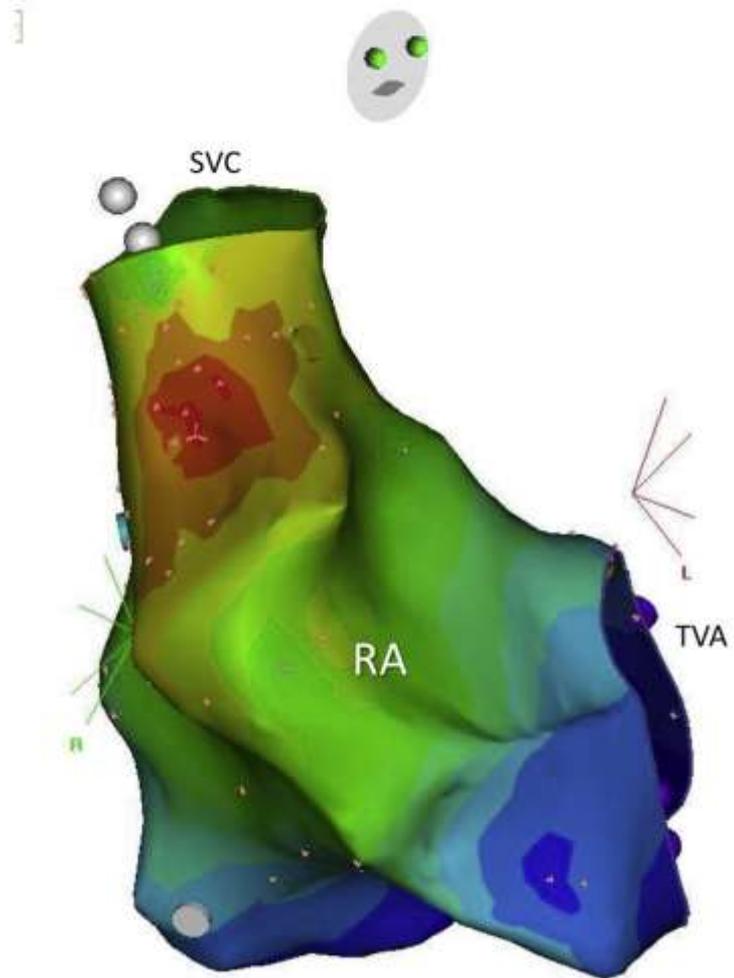


- Ivabradine holds **considerable promise for the treatment of IST**. The drug blocks the If current and has a dramatic and generally well-tolerated effect on heart rate.
- At doses of 5– 7.5 mg twice daily, the drug slows the heart rate by 25–40 bpm.
- Several small studies have reported that ivabradine reduced heart rate and improved quality of life. **Ivabradine eliminated symptoms in 70% of patients** and increased exercise performance.
- Data suggests that combinations of metoprolol and ivabradine might be safe and effective.

Invasive EP



- ❧ To rule out associated SVTs.
- ❧ Differentiate from SNRT and high cristal ATs.

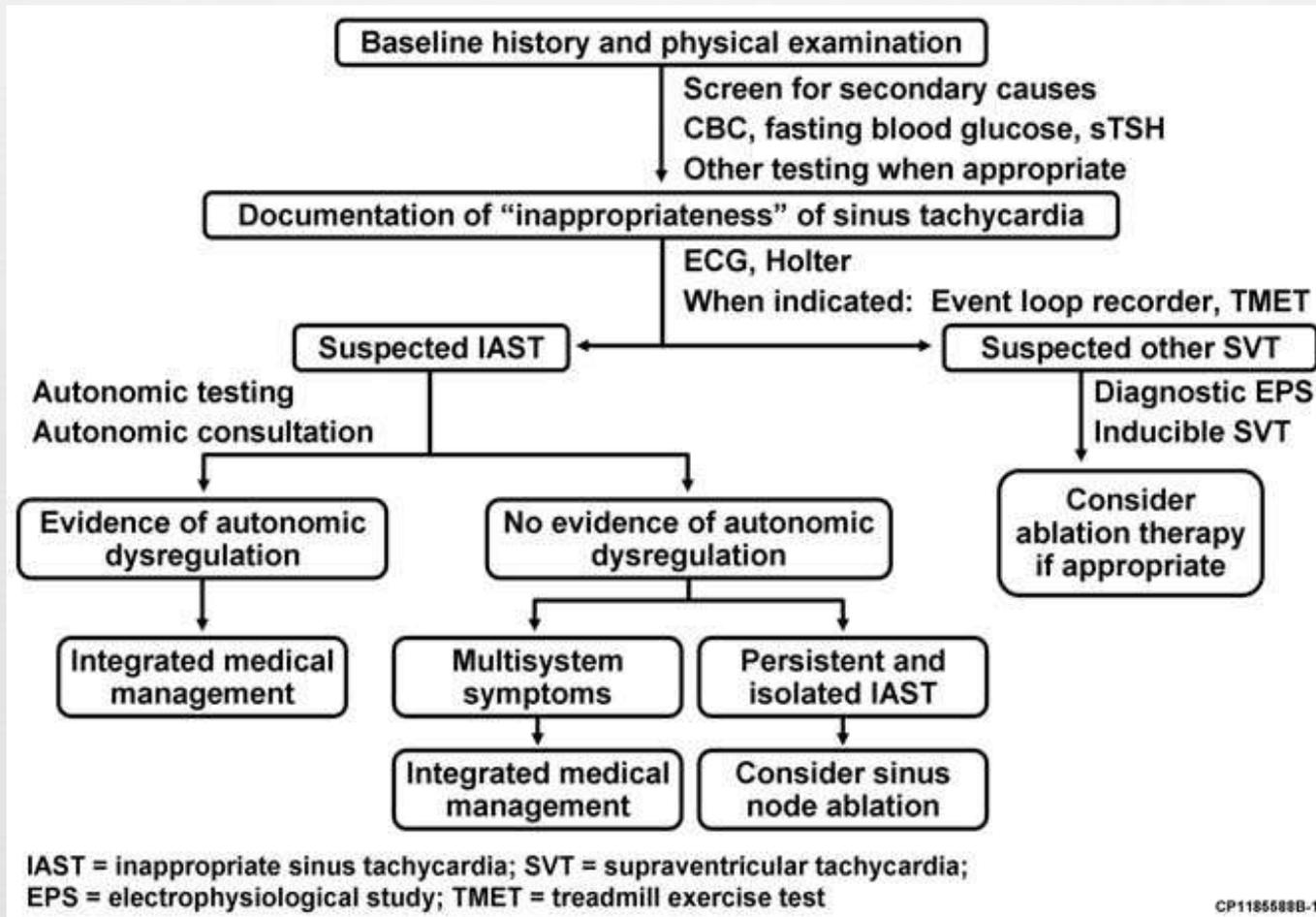
A**B****C****Isochronal Activation Map**

Modification/Ablation of SN



- Several groups have described modification or ablation of the sinus node in IST.
- Primary success rates are reasonably good, but there is a high rate of symptom recurrence, and the complication rates are significant.
- These complications include requirements for permanent pacing, transient or permanent phrenic nerve paralysis, and transient SVC syndrome

Suggested management algorithm in patients with suspected IST



Therapy recommendations



Recommendations—Treatment for IST

	Class
Reversible causes of sinus tachycardia should be sought and treated.	I
Ivabradine can be useful for treating patients with IST.	IIa
Sinus node modification, surgical ablation, and sympathetic denervation are not recommended as a part of routine care for patients with IST.	III

Thank you!

