Sick Sinus Syndrome

Synonyms: sinoatrial disease, tachy-brady syndrome

Definition
Sick sinus syndrome is a collection of conditions in which the ECG indicates sinus node dysfunction. It is characterised by sinus node dysfunction with an atrial rate inappropriate for normal requirements. Sick sinus syndrome is usually caused by idiopathic fibrosis of the sinus node.

Aetiology
Causes include:

- An intrinsic disease of the sinus node:
  - Idiopathic degeneration of the sinus node is the most common cause of sick sinus syndrome.
  - Collagen vascular disease: amyloidosis, haemochromatosis, fatty replacement, sarcoidosis.
  - Familial sinoatrial node disorders: autosomal and recessive forms.
  - Friedreich's ataxia, muscular dystrophy.
  - Cardiomyopathies: ischaemia, myocardial infarction, myocarditis, pericarditis, rheumatic heart disease, surgical injury, arteritis.
  - Surgical injury.

- Extrinsic causes:
  - Hyperkalaemia, hypoxia, hypothermia, hypothyroidism, hyperthyroidism.
  - Drugs - eg, digoxin, calcium-channel blockers, beta-blockers, sympatholytic agents, anti-arrhythmic drugs.
  - Toxins - eg, result of sepsis.

Sleep apnoea may be a contributing factor by causing reduced cardiac oxygenation. Paediatric causes include congenital abnormalities and sinoatrial nodal artery deficiency.

Epidemiology
Sick sinus syndrome is most common in the elderly, but can occur in all ages.

Presentation
Abnormalities in sick sinus syndrome include episodes of sinus bradycardia, sinus arrest or exit block, combinations of sinoatrial and atrioventricular nodal conduction disturbances, and atrial tachyarrhythmias.

- At least 50% of people with sick sinus syndrome develop alternating bradycardia and tachycardia, also known as tachy-brady syndrome.
- Patients are often asymptomatic, or have subtle or nonspecific symptoms, such as fatigue.
- Presentation may be with fatigue, dizziness, palpitations, and syncope or presyncope.
- Central nervous system: dementia, irritability, lethargy, light-headedness, confusion, memory loss, nocturnal wakefulness, syncope.
- Cardiovascular system: angina, arterial thromboemboli, cerebrovascular accident, congestive heart failure (dyspnoea), palpitations.
- Other: digestive disturbances, dizziness, errors in judgment, facial flushing, fatigue, oliguria.

Symptoms associated with sick sinus syndrome may be aggravated by digoxin, verapamil, beta-blockers, sympatholytic agents such as clonidine and methyldopa, and anti-arrhythmic agents.

Investigations
- Blood tests include renal function, electrolytes, TFTs and drug levels (eg, digoxin).
- ECG: arrhythmias associated with sick sinus syndrome include:
  - Atrial bradyarrhythmias: sinus bradycardia, sinus arrest (with or without junctional escape), sinoatrial exit block (Mobitz type I or Mobitz type II block), ectopic atrial bradyarrhythmia, atrial fibrillation with slow ventricular response greater than three-second pause following carotid massage, long pause following cardioversion of atrial tachyarrhythmias.
  - Atrial tachyarrhythmias: atrial fibrillation, atrial flutter, atrial tachycardia, paroxysmal supraventricular tachycardia.
  - Ventricular (escape) tachyarrhythmia.
  - Alternating bradycardias and tachycardias: tachy-brady syndrome.
Ambulatory ECG to associate arrhythmias with symptoms.
Echocardiogram: associated structural and functional heart abnormalities.

Management

- The treatment of choice for symptomatic bradyarrhythmias in patients with sick sinus syndrome is the placement of a pacemaker. [5, 6]
- Atrial or dual-chamber pacemakers usually provide effective relief of symptoms and lower the incidence of atrial fibrillation, thromboembolic events, heart failure and mortality, when compared with ventricular pacemakers. [7]
- Beta-blockers, quinidine and digoxin may be used in conjunction with a pacemaker for tachyarrhythmias.
- Anticoagulation will be needed for patients with atrial fibrillation. [8]

Complications

- Patients with sick sinus syndrome who have tachy-brady syndrome or chronic atrial fibrillation are at risk for embolic cerebrovascular event.
- Myocardial infarction or sudden cardiac death.
- Congestive heart failure.

Further reading & references

- ECG Library
- Guidelines on Diagnosis and Management of Syncope; European Society of Cardiology (2009)
- Guidelines on cardiac pacing and cardiac resynchronization therapy; European Society of Cardiology (2013)
- Dual-chamber pacemakers for symptomatic bradycardia due to sick sinus syndrome without atrioventricular block (part review of technology appraisal guidance 88); NICE Technology Appraisal, Nov 2014

1. Adan V, Crown LA; Diagnosis and Treatment of Sick Sinus Syndrome. American Family Physician; Volume 67, Number 8; April 15 2003.
2. Sick Sinus Syndrome 1, Autosomal Recessive, SSS1; Online Mendelian Inheritance in Man (OMIM)
6. Dual-chamber pacemakers for the treatment of symptomatic bradycardia due to sick sinus syndrome and/or atrioventricular block; NICE Technology Appraisal Guidance, February 2005
8. Anticoagulation - oral; NICE CKS (May 2013)

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