

DEFINITION

1. **Heart block** is the term given to a disorder of conduction of the impulse which stimulates heart muscle contraction.
2. The normal cardiac impulse arises in the **sino-atrial node** situated in the right atrium and spreads to the **atrio-ventricular node**, whence it is conducted by specialised tissue known as the **bundle of His** which divides into branches supplying the right and left ventricles. **Sinus rhythm** – the normal heart rhythm – is dependent upon an orderly series of impulses arising and spreading through the heart musculature without delay.
3. The impulse may be stopped or delayed at any point in its passage and the site of the interruption or the degree of delay can be determined by electrocardiography.

CLASSIFICATION

4. The usual classification, based upon the clinical and electrocardiographic (ECG) findings, is:-
 - 4.1. **Sino-atrial (S-A) block** (sinus exit block). This comparatively rare condition is usually classified as part of the sick sinus syndrome. There is a failure of impulse transmission from the sino-atrial node so that the heart misses one or two beats at regular or irregular intervals. Where it occurs only during sleep, it is not regarded as pathological.
 - 4.2. **Atrio-ventricular (A-V) block**. When the term heart block is used without qualification, it is usually taken to mean A-V block. In this condition the sinus rate is normal, but there is a conduction defect between the atria and the ventricles. The lesion may be in the A-V node (intranodal) or in the bundle of His (infranodal), or both. The block may be described as:
 - 4.2.1. **First degree heart block** in which there is a persistent delay in conduction of the impulse from atrium to ventricle beyond the upper limit of normal (0.2 second). This condition is only diagnosed by electrocardiography.
 - 4.2.2. **Second degree heart block** (partial heart block) in which there is intermittent failure of atrio-ventricular conduction so that dropped beats occur. The dropped beats may be occasional and irregular or frequent and regular. There are two main types, which are often referred to as classified by Mobitz:

- **Mobitz type I** (Wenckebach phenomenon). There is a progressive lengthening of the interval between atrial and ventricular contraction, culminating in a failure of impulse conduction and a "dropped" beat. The interval then shortens and the sequence recurs. The characteristic ECG pattern of ventricular contraction is usually normal.
 - **Mobitz type II**. In this instance, the failure of A-V conduction occurs without any preceding lengthening of the interval between atrial and ventricular contraction. Where dropped beats occur regularly, indicating a high degree of block, it is described by the ratio of atrial to ventricular contractions, eg. 2:1 or 3:1 block. This condition is often associated with bundle branch block.
- 4.2.3. **Bundle branch block (BBB)**. In the normal heart, activation of both ventricles takes place simultaneously. Bundle branch block occurs when conduction is interrupted through either branch of the bundle of His, causing partial loss of synchronism which is evident on the electrocardiogram. **Hemiblock** (fascicular block) is a variation of BBB in which one or other of the two main branches (fascicles) of the left bundle is affected.
- 4.2.4. **Complete heart block (third degree block)**. In this condition, none of the atrial impulses reaches the ventricles, so that there is complete dissociation between atrial and ventricular contractions. Cardiac action is maintained by an *escape rhythm* arising in the bundle of His or in the ventricles, the inherently rhythmic nature of all heart muscle making it capable of initiating impulses. In third degree block, the ventricular rate is always slower than that of the atria.

CLINICAL MANIFESTATIONS

5. First degree block is asymptomatic and not necessarily pathological. It is often found by chance in well-trained athletes, other fit young people and those with high vagal tone.
6. Minor degrees of second degree heart block may also be asymptomatic and only discovered during investigations conducted for other reasons. However, dropped beats occurring in Mobitz type I may cause unpleasant sensations in the chest and feelings of faintness. There is a low risk of progression to complete heart block. This risk is much higher in type II.
7. Complete heart block usually gives rise to symptoms. The heart rate is low, often very low, with irregular and unreliable rhythmicity. There may be lethargy and exertional dyspnoea. Sudden attacks of syncope known as **Stokes-Adams** attacks may occur due to episodes of asystole. In these attacks there is loss of consciousness which may be momentary – in which there is merely clouding of consciousness – or prolonged, in which case there may be convulsions and the outcome can be fatal. When associated with anterior infarction, complete heart block indicates poor immediate and late prognoses.

8. The **treatment** of heart block, in addition to that of any underlying cause, depends on the degree of block and the setting in which it occurs. First degree block rarely requires therapy. Mobitz type I block is treated when symptomatic, usually responding to atropine. Most cases of type II require at least temporary electrical pacing. Permanent pacemaker implantation is the standard treatment for established, acquired complete block. Congenital complete heart block has a generally good prognosis and rarely needs pacing.

AETIOLOGY

9. Transient sinoatrial or partial heart block are sometimes seen at rest or during sleep in athletic young adults with a high vagal tone and population studies have suggested that benign left bundle branch block may occur. Other forms of heart block are due to impairment of the conducting system by pathological process, toxicity, trauma or congenital defect.
 - 9.1. **Idiopathic fibrosis** of the conducting system is the commonest cause of A-V heart block. It occurs with increasing frequency in the over 60's, is progressive and is often associated with sinoatrial disease. There is no specific association with coronary artery disease, although the two may coexist.
 - 9.2. **Myocardial infarction** is the most frequent cause of heart block which develops suddenly. With inferior infarction, the heart block is usually temporary. On the other hand, conduction defects associated with anterior infarction are usually markers of extensive muscle damage involving the interventricular septum and bundle of His, and tend to be permanent.
 - 9.3. **Infiltration.** The bundle of His runs close to the aortic and mitral valves and may be affected by calcification extending from a valve (particularly in calcific aortic stenosis). The conducting system may also be infiltrated by sarcoid, scleroderma, syphilis, amyloidosis, haemochromatosis or tumour. It may be damaged in any form of cardiomyopathy including the alcoholic type and, more rarely, cardiomyopathy due to trypanosomiasis (Chagas disease).
 - 9.4. **Infection.** Heart block may occur in myocarditis due to rheumatic fever or in infections such as diphtheria, tuberculosis and Lyme disease. Bacterial endocarditis may be complicated by abscess formation which can extend to involve the conducting tissues. Viral myocarditis may complicate infections including measles, mumps and varicella. In these infective cases, the heart block is usually partial and temporary.
 - 9.5. **Drug toxicity.** Heart block may occur as a complication of some medical treatments. The substances most often involved are digoxin, calcium channel blockers, beta-blockers and class I antiarrhythmics (drugs which reduce the excitability of heart muscle and retard impulse conduction). Lithium and cimetidine may also be implicated.
 - 9.6. **Traumatic damage** to the conducting system may occur through direct injury or during cardiac surgery, particularly surgery involving the aortic valve, or cardiac catheterisation.

- 9.7. There is some evidence that high dose **ionising radiation**, eg. 20000-60000 mSV as might occur in therapeutic irradiation may damage the conducting tissues. The effect is dose-related, with onset within months (not years) of irradiation.
- 9.8. **Neuromuscular diseases** including myotonic muscular dystrophy, peroneal muscular atrophy and Erb's dystrophy may affect the conducting tissues, which are composed of modified muscle fibres.
- 9.9. **Congenital mal-development** of the bundle of His can result in complete heart block. Permanent conduction defects can also be caused by maternal lupus erythematosus.

CONCLUSION

10. Heart block is, in the majority of cases, a manifestation of some underlying disease or process affecting the electrical conductive system of the heart, the cause of the heart block in these cases being that of the underlying disease. There exists a proportion of cases which do not exhibit anything other than an idiopathic degeneration of the conductive system and others where no pathological condition can be found.

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