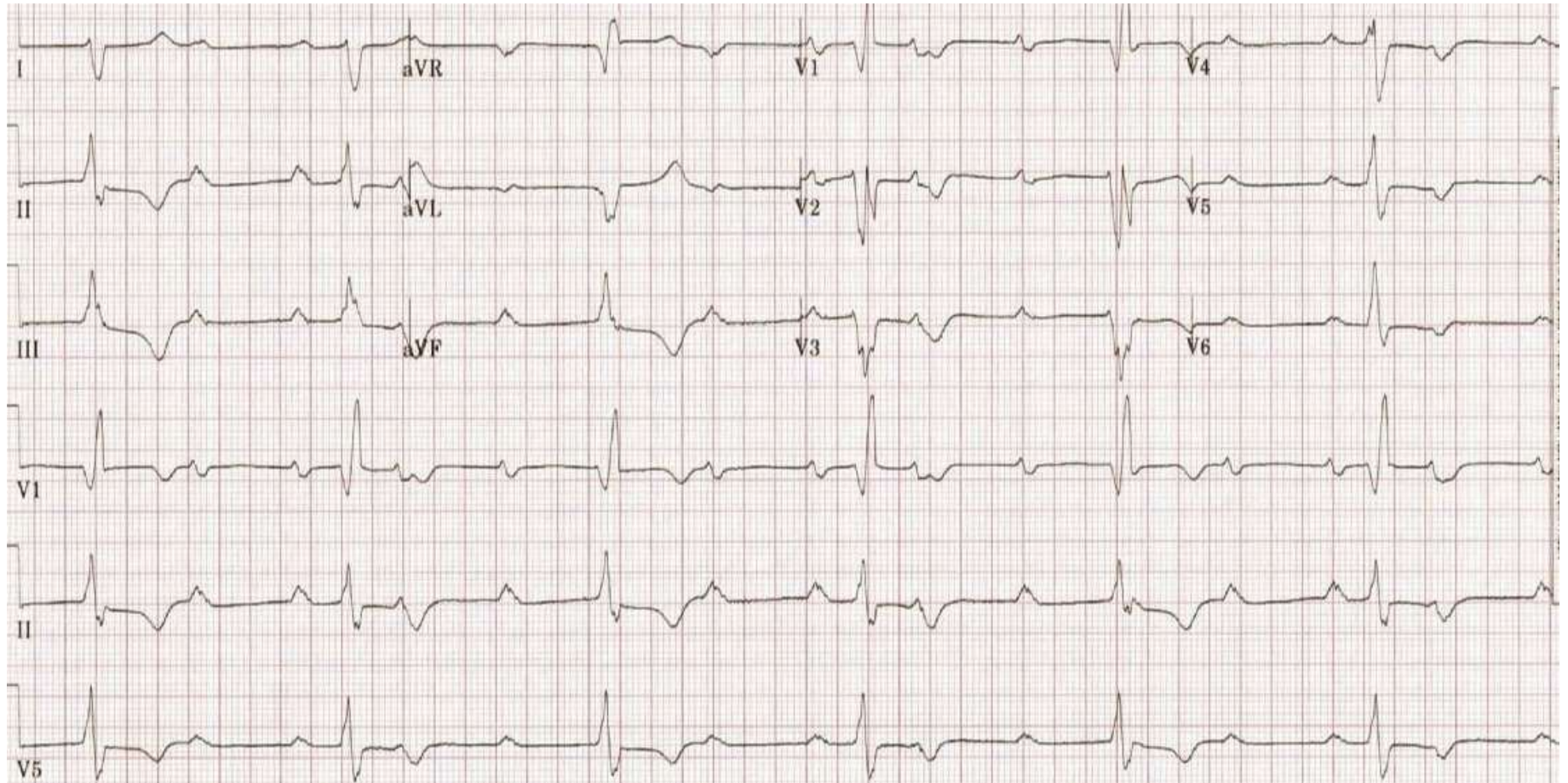


- AV Block, 3° (complete heart block or high-grade AV block)



Complete heart block (3° AV Block) with underlying sinus rhythm and ventricular escape rhythm at 36 BPM

- Atrial impulses consistently fail to reach the ventricles, resulting in atrial and ventricular rhythms that are independent of each other
- PR interval varies
- PP and RR intervals are constant
- Atrial rate is usually faster than ventricular rate
- Ventricular rhythm is maintained by a junctional or idioventricular escape rhythm or a ventricular pacemaker

The P wave may precede, be buried within (and not visualized), or follow the QRS to deform the ST segment or T wave.

Complete heart block (3° AV block) is characterized by the presence of independent atrial and ventricular activity with an atrial rate that is faster than the ventricular rate (AV dissociation is a more general term used when atrial activity does not result in 1:1 ventricular activation, even if only for a portion of the tracing, and the ventricular rate is usually faster than the atrial rate). The presence of a ventricular capture complex — a supraventricular impulse, usually sinus, that conducts through the normal AV conduction system and captures the ventricle — excludes the diagnosis of complete heart block in the setting of AV dissociation. When diagnosing complete heart block, the atrial and the ventricular rhythms (e.g., junctional, ventricular, paced) should also be described.

Ventriculophasic sinus arrhythmia — PP interval containing a QRS complex is shorter than the PP interval without a QRS complex — is present in 30%–50%.

Complete heart block is present when the atrial rate is faster than the ventricular escape rate (identified by the presence of nonconducted P waves when the AV node and ventricle are not refractory). In contrast, AV dissociation is usually present if the atrial rate is slower than the ventricular rate.

The rate and morphology of the ventricular escape QRS complexes in 3° AV block are dependent upon the location and automaticity of the cells from which the escape rhythm arises. An escape rhythm from the AV node tends to have a rate in the 50s with only a mildly prolonged QRS complex. Progressively slower rates and wider QRS complexes are seen when escape rhythms arise from the Bundle of His, Purkinje fibers, and ventricular myocardium, respectively. An escape rhythm arising from the ventricular myocardium is often referred to as a slow idioventricular escape rhythm.



Sinus rhythm and RBBB with 3° AV block and no escape rhythm

Causes of complete heart block include:

- **MI:** 5%–15% of acute MIs are complicated by complete heart block: In inferior MI, complete heart block is usually preceded by first-degree AV block or 2° AV block - Mobitz Type I, usually occurs at the level of the AV node, is typically transient (< 1 week), and is usually associated with a stable junctional escape rhythm (narrow QRS; rate ≥ 40 BPM). In anterior MI, complete heart block occurs as a result of extensive damage to the left ventricle, is typically preceded by 2° AV block – Mobitz Type II or bifascicular block.
- **AORTIC VALVE REPLACEMENT:** either surgical aortic valve replacement (SAVR) or transcatheter AVR (TAVR)
- **DEGENERATIVE DISEASES** of the conduction system (Lev's disease, Lenègre's disease)
- **INFILTRATIVE DISEASES** of the myocardium (e.g., amyloid, sarcoid)
- **DIGITALIS TOXICITY:** One of the most common causes of reversible complete AV block; usually associated with a junctional escape rhythm (narrow QRS), which is often accelerated
- **ENDOCARDITIS:** Inflammation and edema of the septum and peri-AV nodal tissues may cause conduction failure and complete heart block; PR prolongation is usually present
- **ADVANCED HYPERKALEMIA** (death is usually from ventricular tachyarrhythmias)
- **LYME DISEASE:** Caused by a tick-borne spirochete (*Borrelia burgdorferi*), this disorder begins with a characteristic skin rash (erythema chronicum migrans) and may be followed in subsequent weeks to months by joint, cardiac, and neurological involvement. Cardiac involvement includes AV block that is partial or complete, usually occurs at the level of the AV node, and may be accompanied by syncope
- **OTHERS:** Myocardial contusion, acute rheumatic fever, post-op coronary bypass or other open-heart surgeries.

First degree AV block



Second degree AV block (Mobitz I or Wenckebach)



Second degree AV block (Mobitz II)



Second degree AV block (2:1 block)



Third degree AV block with junctional escape

