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Second-degree atrioventricular block: Mobitz type II

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INTRODUCTION

Atrioventricular (AV) block is defined as a delay or interruption in the transmission of an impulse from the atria to the ventricles due to an anatomic or functional impairment in the conduction system. The conduction disturbance can be transient or permanent, with conduction that is delayed, intermittent, or absent. Commonly used terminology includes:

- First-degree AV block – Delayed conduction from the atrium to the ventricle (defined as a prolonged PR interval of >200 milliseconds) without interruption in atrial to ventricular conduction.
- Second-degree AV block – Intermittent atrial conduction to the ventricle, often in a regular pattern (eg, 2:1, 3:2), or higher degrees of block, which are further classified into Mobitz type I (Wenckebach) and Mobitz type II second-degree AV block.
- Third-degree (complete) AV block – No atrial impulses conduct to the ventricle.
- High-grade AV block – Two or more consecutive blocked P waves.

The clinical presentation, evaluation, and management of Mobitz type II second-degree AV block will be reviewed here. The etiology of AV block in general, and the management of other specific types of AV block, are discussed separately. (See "Etiology of atrioventricular block" and "First-degree atrioventricular block" and "Second-degree atrioventricular block: Mobitz type I

(Wenckebach block)" and "Third-degree (complete) atrioventricular block" and "Congenital third-degree (complete) atrioventricular block".)

DEFINITION

In second-degree AV block, some atrial impulses fail to reach the ventricles. Wenckebach described progressive delay between atrial and ventricular contraction and the eventual failure of a P wave to conduct to the ventricles [1]. Mobitz subsequently divided second-degree AV block into two subtypes, as determined by the findings on the electrocardiogram (ECG) [2]:

- Mobitz type I second-degree AV block (waveform 1), in which progressive PR interval prolongation precedes a nonconducted P wave. The first P wave after block conducts to the ventricle with a shorter PR interval compared with the last P wave before block.
- Mobitz type II second-degree AV block (waveform 2), in which the PR interval remains unchanged prior to a P wave that fails to conduct to the ventricles.
- High-grade AV block, in which two or more consecutive P waves are nonconducted. In contrast to third degree (complete) AV block (waveform 3), however, some P waves continue to be conducted to the ventricle.

Mobitz type I and Mobitz type II second-degree AV block cannot be differentiated from the ECG when 2:1 AV block is present. In this situation, every other P wave is nonconducted and there is no opportunity to observe for the constant PR interval that is characteristic of Mobitz type II second-degree AV block. (See 'ECG findings' below.)

ETIOLOGY

The potential etiologies of Mobitz type II second-degree AV block include reversible and irreversible conditions (pathologic, iatrogenic, and idiopathic) that are similar to other degrees of AV block (table 1). Common causes include:

- Pathologic – Myocardial ischemia (acute or chronic) involving the conduction system, cardiomyopathy (eg, amyloidosis, sarcoidosis), myocarditis (eg, Lyme disease), endocarditis with abscess formation, hyperkalemia, and hypervagotonia.
- Iatrogenic – Medication-related (AV nodal blocking medications), post-cardiac surgery, post-catheter ablation, post-transcatheter aortic valve implantation.

Mobitz type II second-degree AV block is rarely seen in patients without underlying heart disease. When identifiable, the reversible causes most commonly associated with Mobitz type II second-degree AV block are myocardial infarction with ischemia of the AV node and medications that alter conduction through the AV node (eg, digoxin, beta blockers, calcium channel blockers). When no specific reversible cause is identified, the block is often felt to be related to idiopathic progressive cardiac conduction disease with myocardial fibrosis and/or sclerosis that affects the conduction system. (See "Cardiac arrhythmias due to digoxin toxicity" and "Etiology of atrioventricular block".)

PATHOPHYSIOLOGY

Mobitz type II second-degree AV block almost always results from conduction system disease below the level of the AV node (figure 1), occurring in the bundle of His in approximately 20 percent of cases and in the bundle branches in the remainder [3]. Patients with bundle branch involvement also have axis shifts and QRS widening depending upon the location of the block. In addition, at least two-thirds of patients with this disorder also have bifascicular or even trifascicular disease [4,5]. (See "Basic approach to delayed intraventricular conduction", section on 'Bifascicular and trifascicular block' and "Chronic bifascicular blocks".)

CLINICAL PRESENTATION AND EVALUATION

The clinical presentation of Mobitz type II second-degree AV block is variable depending upon the underlying sinus rhythm heart rate, the frequency of nonconducted P waves, and the presence of comorbid conditions. The evaluation of all patients with suspected Mobitz type II second-degree AV block includes a thorough history, including medications and recent changes in medications, along with a 12-lead ECG and bloodwork (which includes serum electrolytes and thyroid-stimulating hormone [TSH]).

Etiology and reversible causes — All patients with suspected Mobitz type II second-degree AV block should be questioned about any history of heart disease, both congenital and acquired, as well as any recent cardiac procedures or medications that could predispose to AV conduction abnormalities. Patients without known cardiac disease should be questioned about other systemic diseases associated with heart block (eg, amyloidosis, sarcoidosis). Patients who live in an area with endemic Lyme disease should be questioned about any recent outdoor exposure to ticks or known tick bites. (See 'Etiology' above.)

Patients with suspected Mobitz type II second-degree AV block that occurs in the setting of acute myocardial ischemia or infarction should undergo concurrent diagnosis and treatment for both conditions. (See "Conduction abnormalities after myocardial infarction", section on 'Management of conduction abnormalities'.)

Patients should provide a full list of medications and be questioned about any recent changes in dosing, with particular attention paid to drugs that alter AV nodal conduction (ie, beta blockers, nondihydropyridine calcium channel blockers, digoxin, select antiarrhythmic drugs).

In patients under 60 years of age who present with otherwise unexplained heart block, previously undetected cardiac sarcoidosis has been identified in up to 25 to 35 percent of patients [6,7]. Such patients with otherwise unexplained complete heart block should be evaluated for cardiac sarcoidosis [8]. (See "Clinical manifestations and diagnosis of cardiac sarcoidosis".)

Signs and symptoms — Most patients with Mobitz type II second-degree AV block will present with some degree of symptoms, though the severity of the symptoms can be quite variable. Symptoms may include:

- Fatigue
- Dyspnea
- Chest pain
- Presyncope or syncope
- Sudden cardiac arrest

Mobitz type II second-degree AV block with only infrequent nonconducted P waves in a patient with a normal sinus heart rate (ie, 60 to 100 beats per minute) may produce few or no symptoms. However, if the patient has sinus bradycardia at baseline, or there are more frequent nonconducted beats, there may be a significant reduction in cardiac output resulting in symptoms of hypoperfusion or heart failure.

The failure of one or more P waves to conduct to the ventricles can lead to fatigue, lightheadedness, presyncope, or syncope (called Stokes-Adams attacks) since the lower intrinsic cardiac pacemakers are slower than junctional pacemakers (waveform 4) [9-12].

Patients with Mobitz type II second-degree AV block often present with bradycardia but may have a normal sinus rhythm rate. Additionally, other than the presence of an irregular pulse, there are few specific physical examination findings. Patients may appear pale or diaphoretic if they have bradycardia with a resultant reduction in cardiac output. Patients with underlying

heart failure that is exacerbated by the development of heart block may have crackles on lung examination, elevated jugular venous pulsations, and/or peripheral edema.

ECG findings — Mobitz type II second-degree AV block is identified by consistent unchanging PR intervals (which are usually normal in duration but may be prolonged) followed by the block of one or more P waves that fail to conduct to the ventricles (waveform 5).

Mobitz type II second-degree AV block is distinguished from other types of AV block as follows:

- Patients with first degree AV block have a PR interval that is prolonged (>200 milliseconds) but constant, and each P wave is followed by a QRS interval (waveform 6).
- Patients with Mobitz type I second-degree AV block have progressive prolongation of the PR interval for several heart beats, followed by a nonconducted P wave (waveform 1). For patients with second-degree AV block with a ratio of atrial to ventricular conduction that is not 2:1, Mobitz type I and Mobitz type II second-degree AV block are easily distinguished. However, for patients with 2:1 atrial to ventricular conduction, the distinction between Mobitz type I and Mobitz type II second-degree AV block cannot be made from the surface ECG. (See "Second-degree atrioventricular block: Mobitz type I (Wenckebach block)", section on 'ECG findings and diagnostic maneuvers'.)
- Patients with third degree (complete) AV block will have evidence of atrial (P waves) and ventricular (QRS complexes) activity that are independent of each other on the surface ECG (waveform 3). In rare instances, the atrial rate may be exactly twice the ventricular rate, resulting in 2:1 AV block which can mimic second-degree AV block.

An increase in heart rate due to exercise, atropine, or atrial pacing can worsen Mobitz type II second-degree AV block. Conversely, vagal maneuvers may slow the sinus rate, allow more time for excitability to recover in or below the bundle of His, thereby facilitating conduction across the AV node and improving Mobitz type II second-degree AV block. (See "Second-degree atrioventricular block: Mobitz type I (Wenckebach block)", section on 'ECG findings and diagnostic maneuvers'.)

Electrophysiology study — Electrophysiology studies (EPS) performed for an evaluation of a suspected arrhythmia or when there is a question about the level of block leading to bradycardia can reveal intracardiac evidence of infra-Hisian block. In addition, an EPS may identify patients with Mobitz type II second-degree AV block who are at increased risk of progression to third degree (complete) heart block. However, since nearly all patients without a readily identifiable reversible cause are candidates for a permanent pacemaker, EPS is of limited value and not usually performed [13]. There is a 2017 case report that describes the successful

treatment of second-degree AV block with catheter ablation of a ventricular nodal pathway manifesting as concealed and manifest junctional beats. In this very rare circumstance where concealed junctional extrasystoles are suspected, an EPS and possible ablation may be considered [14]. (See "Invasive diagnostic cardiac electrophysiology studies".)

His bundle electrocardiography, performed as part of an invasive EPS, shows that the nonconducted A wave (P wave on surface ECG) is followed by a His deflection, and not infrequently, a split His potential due to slowed intra-Hisian conduction (waveform 5). Rarely, proximal His block does not demonstrate a His potential with the nonconducted A wave (P wave on the surface ECG), falsely suggesting that the block is in the AV node [3,15,16].

DIAGNOSIS

In nearly all cases, the diagnosis of Mobitz type II second-degree AV block can be made in a patient with an irregular pulse or suggestive symptoms (eg, fatigue, dyspnea, presyncope, and/or syncope) by obtaining a surface ECG. (See 'ECG findings' above.)

For patients with 2:1 AV block in whom the distinction between Mobitz type I and Mobitz type II second-degree AV block cannot be made using the surface ECG alone, a long rhythm strip should be obtained or a previous ECG examined to try to find evidence of constant PR intervals preceding a nonconducted P wave, as well as to identify nonconducted P waves in a pattern other than 2:1 (eg, 3:2, 4:3, etc) that would suggest Mobitz type I second-degree AV block. Additionally, carotid sinus massage may be performed, or intravenous atropine administered in those patients where carotid sinus massage may be unwanted because of concern for vascular disease, to help distinguish the level of AV block. If the diagnosis remains uncertain following these measures, invasive electrophysiology studies can definitively diagnose the type of AV block and accurately identify the level of the block.

MANAGEMENT

Initial management — The initial management of the patient with Mobitz type II second-degree AV block depends on the presence and severity of any signs and symptoms related to the ventricular rate (algorithm 1). Unstable patients require immediate pharmacologic therapy and, in most instances, should also receive temporary pacing to increase heart rate and cardiac output.

Unstable patients — Patients with Mobitz type II second-degree AV block who are hemodynamically unstable should be urgently treated with a beta-adrenergic agonist (eg,

isoproterenol, dopamine, dobutamine, or epinephrine) if myocardial ischemia is unlikely [13] and, in most instances, with temporary cardiac pacing (either with transcutaneous or, if immediately available, transvenous pacing). Atropine is generally avoided in patients with Mobitz type II second-degree AV block, as the block is generally infranodal. Rarely, atropine or other agents can worsen infranodal block by increasing sinus rate without improving conduction.

Signs and symptoms of hemodynamic instability include hypotension, altered mental status, signs of shock, ongoing ischemic chest pain, and evidence of acute pulmonary edema. Dopamine may be administered in hypotensive patients, while dobutamine is an option for patients with heart failure symptoms. This approach is similar to the patient who presents with unstable third degree (complete) AV block. (See "Advanced cardiac life support (ACLS) in adults", section on 'Bradycardia' and "Third-degree (complete) atrioventricular block", section on 'Unstable patients'.)

Stable patients — Patients with Mobitz type II second-degree AV block who are hemodynamically stable do not require urgent therapy with atropine or temporary cardiac pacing. However, Mobitz type II second-degree AV block is by nature unstable and frequently progresses to third degree (complete) AV block, so patients should be continuously monitored with transcutaneous pacing pads in place in the event of clinical deterioration. In addition, most stable patients continue to have symptoms related to the bradycardia and will require identification and treatment of any reversible causes or permanent therapy with an implantable pacemaker.

Further management — Once unstable patients have been stabilized, and while stable patients are being monitored, reversible causes of Mobitz type II second-degree AV block such as myocardial ischemia, increased vagal tone, hypothyroidism, hyperkalemia, and drugs that depress conduction should be addressed prior to determining whether implantation of a permanent pacemaker is required (algorithm 2).

- Patients with Mobitz type II second-degree AV block in the setting of an acute myocardial infarction should be treated with temporary pacing and revascularization; following revascularization, most conduction abnormalities will improve or resolve and will not require permanent pacing. (See "Conduction abnormalities after myocardial infarction", section on 'Summary and recommendations'.)

- Patients with Mobitz type II second-degree AV block felt to be medication-induced should be observed while the offending agent or agents are withdrawn; such patients will often have improvement or resolution of AV block following removal of the medication.

- Patients with Mobitz type II second-degree AV block in the setting of hyperkalemia should receive therapy to reduce serum potassium levels; similarly, patients with hypothyroidism should receive thyroid replacement therapy. If Mobitz type II second-degree AV block subsequently resolves, a permanent pacemaker is not usually needed. (See "Treatment and prevention of hyperkalemia in adults" and "Treatment of primary hypothyroidism in adults".)

- Patients with Lyme carditis and associated heart block frequently do not require permanent cardiac pacing. Mobitz type II second-degree AV block typically improves to lesser degrees of AV block within one week, and more minor conduction disturbances usually resolve within six weeks. As such, while these patients may initially require temporary cardiac pacing, permanent cardiac pacing should be reserved for patients with persistent high grade AV block following an adequate course of therapy for Lyme disease. (See "Lyme carditis".)

If no reversible causes are present, definitive treatment of Mobitz type II second-degree AV block involves permanent pacemaker placement in most patients [13,17]. Dual-chamber (ie, atrioventricular) pacing to maintain AV synchrony is preferred (rather than single chamber right ventricular pacing) in most patients due to the favorable hemodynamic benefits of AV synchrony (algorithm 3). Unlike asymptomatic patients with Mobitz type I second-degree AV block who do not require any specific therapy, patients with Mobitz type II second-degree AV block have a high likelihood of progressing to symptomatic Mobitz type II second-degree AV block or complete heart block and should be considered candidates for pacemaker insertion on initial presentation [13,18,19]. (See "Permanent cardiac pacing: Overview of devices and indications", section on 'Acquired AV block' and "Modes of cardiac pacing: Nomenclature and selection".)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Arrhythmias in adults" and "Society guideline links: Cardiac implantable electronic devices".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading

level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "Patient education: Bradycardia (The Basics)" and "Patient education: Heart block in adults (The Basics)")

SUMMARY AND RECOMMENDATIONS

- **Definition** – Atrioventricular (AV) block is defined as a delay or interruption in the transmission of an impulse from the atria to the ventricles due to an anatomic or functional impairment in the conduction system. In second-degree AV block, some atrial impulses fail to reach the ventricles.
  - In Mobitz type I second-degree AV block, there is progressive PR interval prolongation for several beats preceding a nonconducted P wave. (See 'Introduction' above and 'Definition' above.)
  - In Mobitz type II second-degree AV block, the PR interval remains unchanged prior to a P wave that suddenly fails to conduct to the ventricles (waveform 5). (See 'ECG findings' above.)
- **Etiology** – The potential etiologies of Mobitz type II second-degree AV block include reversible and irreversible conditions (pathologic, iatrogenic, and idiopathic) that are similar to other degrees of AV block (table 1). Common potentially reversible causes include myocardial ischemia and medications. (See 'Etiology' above.)

  All patients with suspected Mobitz type II second-degree AV block should be questioned about any history of heart disease, both congenital and acquired, as well as any recent cardiac procedures or medications that could predispose to AV conduction abnormalities. (See 'Etiology and reversible causes' above.)

- **Clinical presentation** – Most patients with Mobitz type II second-degree AV block will present with some degree of symptoms, though the severity of the symptoms can be quite variable. Symptoms may include fatigue, dyspnea, chest pain, presyncope, syncope, or sudden cardiac arrest. (See 'Signs and symptoms' above.)

- **Management** – The management of patients with Mobitz type II second-degree AV block depends on the presence or absence of symptoms, the hemodynamic status of the patient, the response to initial therapy, and the identification of any potentially reversible causes (algorithm 1). (See 'Management' above.)

  - Patients with Mobitz type II second-degree AV block who are **hemodynamically unstable** should be urgently treated with a beta-adrenergic agent and temporary cardiac pacing (either with transcutaneous or, if immediately available, transvenous pacing). (See 'Unstable patients' above.)

  - Patients with Mobitz type II second-degree AV block who are **hemodynamically stable** do not require urgent therapy with atropine or temporary cardiac pacing. However, Mobitz type II second-degree AV block is by nature unstable and frequently progresses to third degree (complete) AV block, so patients should be continuously monitored with transcutaneous pacing pads in place in the event of clinical deterioration. (See 'Stable patients' above.)

  - **Address reversible causes** – Reversible causes of Mobitz type II second-degree AV block such as myocardial ischemia, increased vagal tone, hypothyroidism, hyperkalemia, and drugs that depress conduction should be addressed prior to determining whether permanent pacemaker implantation is required (algorithm 2).

  - **If irreversible** – For patients with Mobitz type II second-degree AV block who do not have a reversible etiology, we recommend implantation of a permanent pacemaker (**Grade 1A**). We implant a dual chamber DDD pacemaker whenever possible in an effort to maintain physiologic AV synchrony.

ACKNOWLEDGMENT

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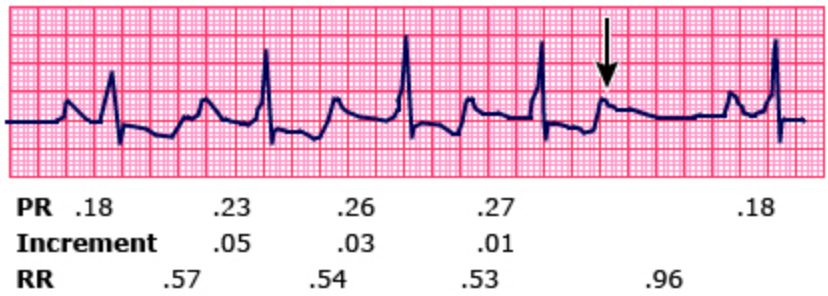
GRAPHICS

Electrocardiogram showing Mobitz type I (Wenckebach) atrioventricular block



Single-lead electrocardiogram showing Mobitz type I (Wenckebach) second-degree atrioventricular block with 5:4 conduction. The characteristics of this arrhythmia include: a progressively increasing PR interval until a P wave is not conducted (arrow), a progressive decrease in the increment in the PR interval, a progressive decrease in the RR interval, and the RR interval that includes the dropped beat (0.96 s) is less than twice the RR interval between conducted beats (0.53 to 0.57 s).

Courtesy of Morton Arnsdorf, MD.

Graphic 73051 Version 7.0

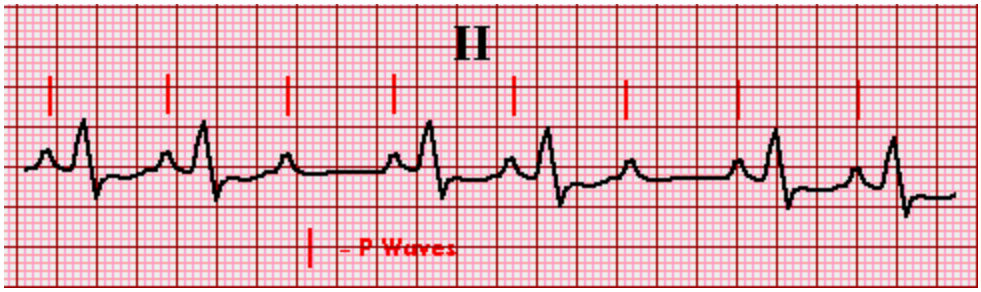
Normal rhythm strip

Normal rhythm strip in lead II. The PR interval is 0.15 sec and the QRS duration is 0.08 sec. Both the P and T waves are upright.

Courtesy of Morton F Arnsdorf, MD.

Graphic 59022 Version 3.0

Single lead electrocardiogram (ECG) showing Mobitz type II second degree atrioventricular (AV) block



The third and sixth P waves are not conducted through the AV node (there is no associated QRS complex). The PR interval is constant prior to and after the non-conducted beats.

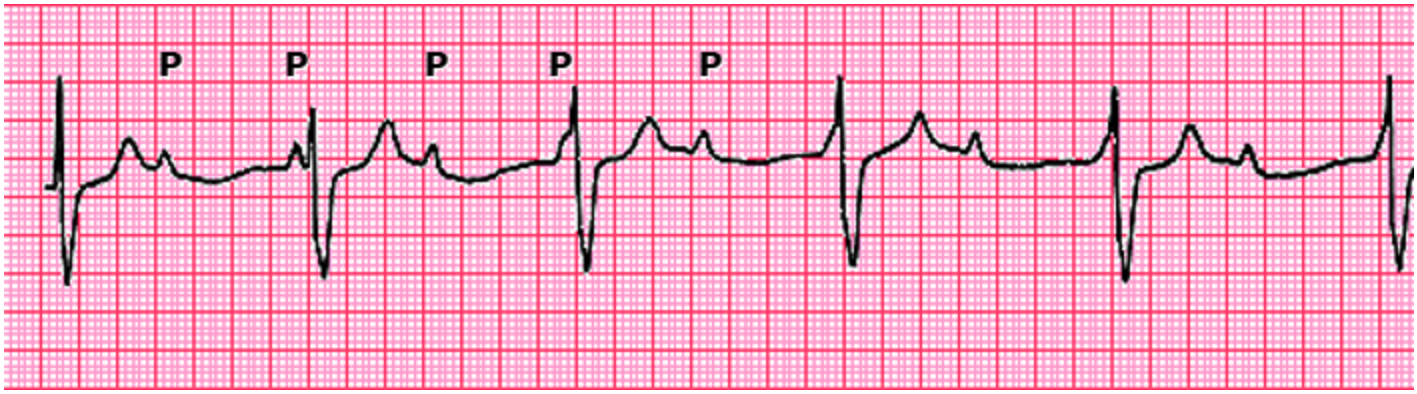
Graphic 58649 Version 4.0

Sinus rhythm

The normal P wave in sinus rhythm is slightly notched since activation of the right atrium precedes that of the left atrium. The P wave is upright in a positive direction in leads I and II. A P wave with a uniform morphology precedes each QRS complex. The rate is between 60 and 100 beats per minute and the cycle length is uniform between sequential P waves and QRS complexes. In addition, the P wave morphology and PR intervals are identical from beat to beat.

Graphic 69872 Version 2.0

Single-lead electrocardiogram (ECG) showing sinus rhythm with third-degree (complete) AV block



Sinus rhythm with third-degree (complete) heart block. There is independent atrial (as shown by the P waves) and ventricular activity, with respective rates of 83 and 43 beats per minute. The wide QRS complexes may represent a junctional escape rhythm with underlying bundle branch block or an idioventricular pacemaker.

Courtesy of Ary Goldberger, MD.

Graphic 72863 Version 7.0

Normal rhythm strip

Normal rhythm strip in lead II. The PR interval is 0.15 sec and the QRS duration is 0.08 sec. Both the P and T waves are upright.

Courtesy of Morton F Arnsdorf, MD.

Graphic 59022 Version 3.0

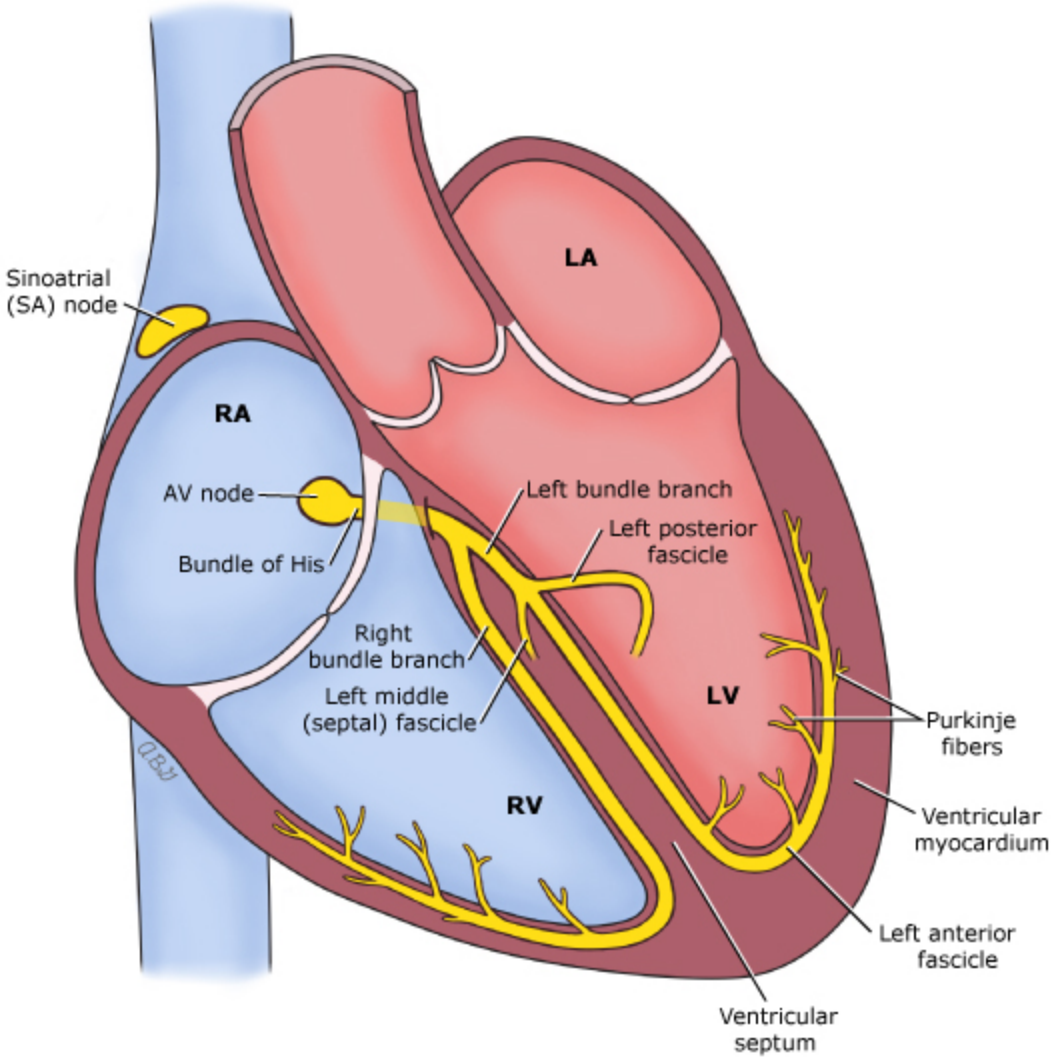
Major causes of atrioventricular (AV) block

Physiologic and pathophysiologic
Increased vagal tone
Progressive cardiac conduction system disease
With fibrosis and/or sclerosis (Lenegre disease)
With calcification (Lev disease)
Ischemic heart disease, including acute myocardial infarction
Cardiomyopathy
Infiltrative processes (eg, sarcoidosis, amyloidosis, hemochromatosis, malignancy, etc)
Other non-ischemic cardiomyopathies (eg, idiopathic, infectious, etc)
Infections (eg, viral myocarditis, Lyme carditis)
Congenital AV block
Related to structural congenital heart disease
As part of neonatal lupus syndrome
Other
Hyperkalemia, severe hypo- or hyperthyroidism, trauma, degenerative neuromuscular diseases
Iatrogenic
Drugs
Beta blockers, calcium channel blockers, digoxin, adenosine, antiarrhythmic drugs
Cardiac surgery
Post valvular surgery, post surgical correction of congenital heart disease
Transcatheter aortic valve implantation
Catheter ablation of arrhythmias
Transcatheter closure of VSD
Alcohol septal ablation for HCM

VSD: ventricular septal defect; HCM: hypertrophic cardiomyopathy.

Graphic 62885 Version 6.0

Normal conduction system



Schematic representation of the normal intraventricular conduction system (His-Purkinje system). The Bundle of His divides into the left bundle branch and right bundle branch. The left bundle branch divides into anterior, posterior, and, in some cases, median fascicles.

AV: atrioventricular; RA: right atrium; LA: left atrium; RV: right ventricle; LV: left ventricle.

Graphic 63340 Version 6.0

Electrocardiogram (ECG) showing complete heart block in a patient with syncopal episodes who previously had shown Mobitz II type AV block

The first two beats are paced. After the pacemaker is turned off, a normally conducted beat followed with a PR interval of 0.19 sec and a LBBB morphology. The next eight P waves fail to conduct and no lower pacemaker appears to assume control of the ventricles. Restarting the artificial pacemaker led to the QRS complex at the end of the rhythm strip.

LBBB: left bundle branch block.

Courtesy of Morton Arnsdorf, MD.

Graphic 64261 Version 4.0

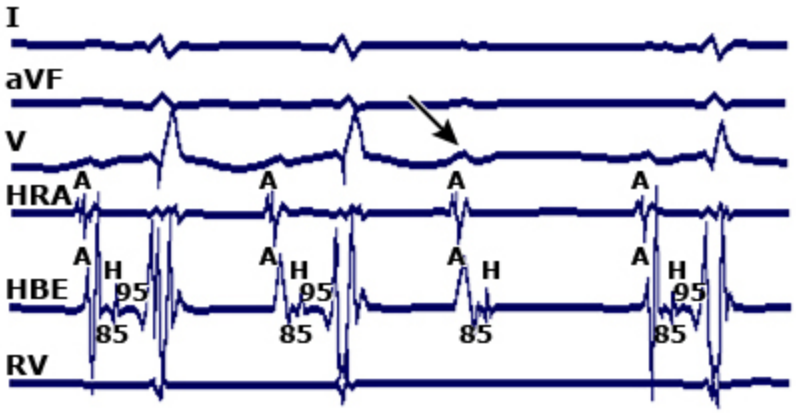
Normal rhythm strip

Normal rhythm strip in lead II. The PR interval is 0.15 sec and the QRS duration is 0.08 sec. Both the P and T waves are upright.

Courtesy of Morton F Arnsdorf, MD.

Graphic 59022 Version 3.0

Electrocardiographic and electrophysiologic features of Mobitz type II second-degree atrioventricular block



The PR and RR intervals are constant, but the third atrial beat (A) is not conducted (arrow). His bundle electrocardiography (HBE) shows constant AH (85 ms) and HV (95 ms) intervals and normal AH but no HV conduction in the nonconducted beat. The last finding indicates that the block is distal to the His bundle, in contrast with the more proximal location of Mobitz type I atrioventricular block.

Adapted from: Josephson ME, Clinical Cardiac Electrophysiology: Techniques and Interpretations, 2nd ed, Lea & Febiger, Philadelphia 1993.

Graphic 79539 Version 8.0

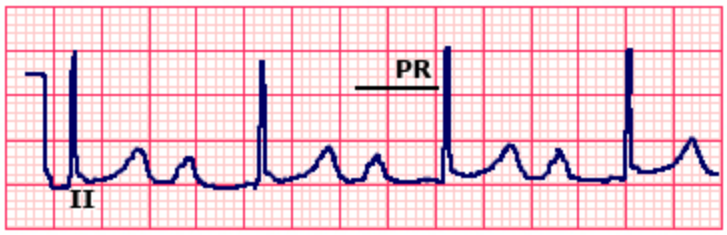
Normal rhythm strip

Normal rhythm strip in lead II. The PR interval is 0.15 sec and the QRS duration is 0.08 sec. Both the P and T waves are upright.

Courtesy of Morton F Arnsdorf, MD.

Graphic 59022 Version 3.0

Single-lead electrocardiogram (ECG) showing first-degree atrioventricular (AV) block I



Electrocardiogram of lead II showing normal sinus rhythm, first-degree atrioventricular block with a prolonged PR interval of 0.30 seconds, and a QRS complex of normal duration. The tall P waves and P wave duration of approximately 0.12 seconds suggest concurrent right atrial enlargement.

Courtesy of Morton Arnsdorf, MD.

Graphic 67882 Version 6.0

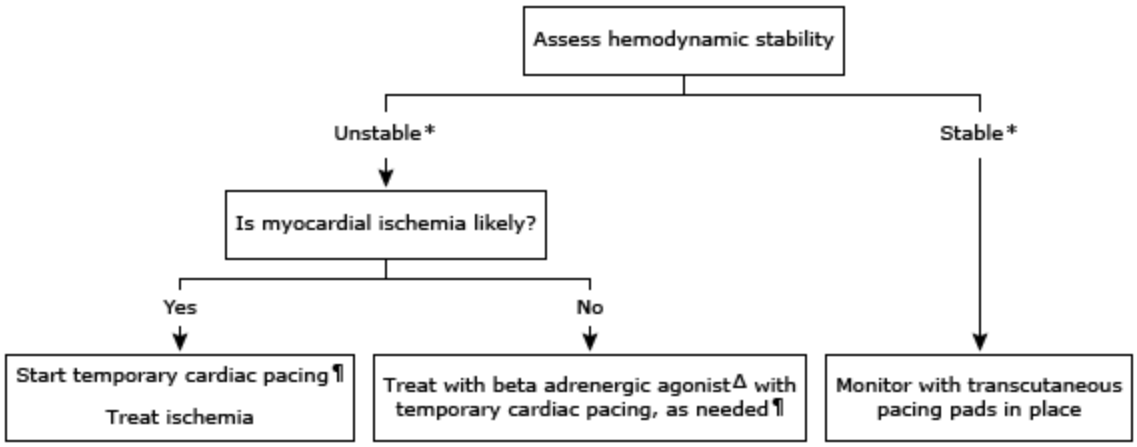
Normal rhythm strip

Normal rhythm strip in lead II. The PR interval is 0.15 sec and the QRS duration is 0.08 sec. Both the P and T waves are upright.

Courtesy of Morton F Arnsdorf, MD.

Graphic 59022 Version 3.0

Overview of acute management of Mobitz type II second-degree AV block



This algorithm discusses the acute management of Mobitz type II second-degree AV block. Refer to UpToDate content on subsequent management of this condition.

AV: atrioventricular.

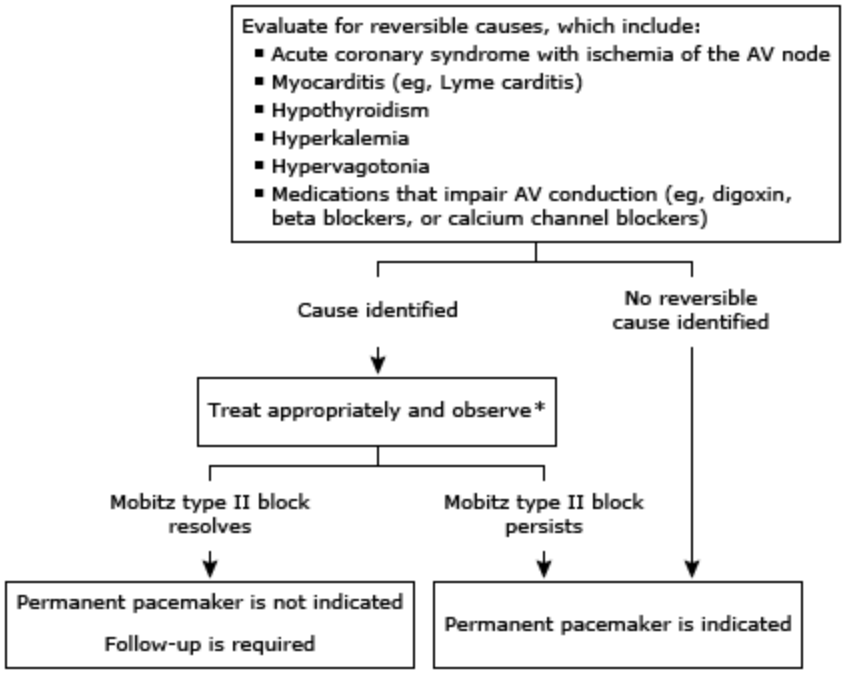
* Hemodynamic instability is identified by signs and symptoms of inadequate tissue perfusion, which include hypotension, lightheadedness, altered mental status, poor peripheral perfusion, and other signs of shock.

¶ Temporary cardiac pacing is performed with transcutaneous or transvenous pacing. Transcutaneous pacing may be initiated while access for transvenous pacing is obtained.

Δ Beta adrenergic agents which may be used in this setting include isoproterenol, dopamine, dobutamine, and epinephrine. Refer to UpToDate content regarding use of these chronotropic agents. Atropine is generally avoided in patients with Mobitz type II second-degree block as it is unlikely to be beneficial and may worsen infranodal block by increasing sinus rate without improving conduction.

Graphic 140931 Version 1.0

Mobitz type II second-degree AV block: Identifying candidates for permanent pacemaker placement



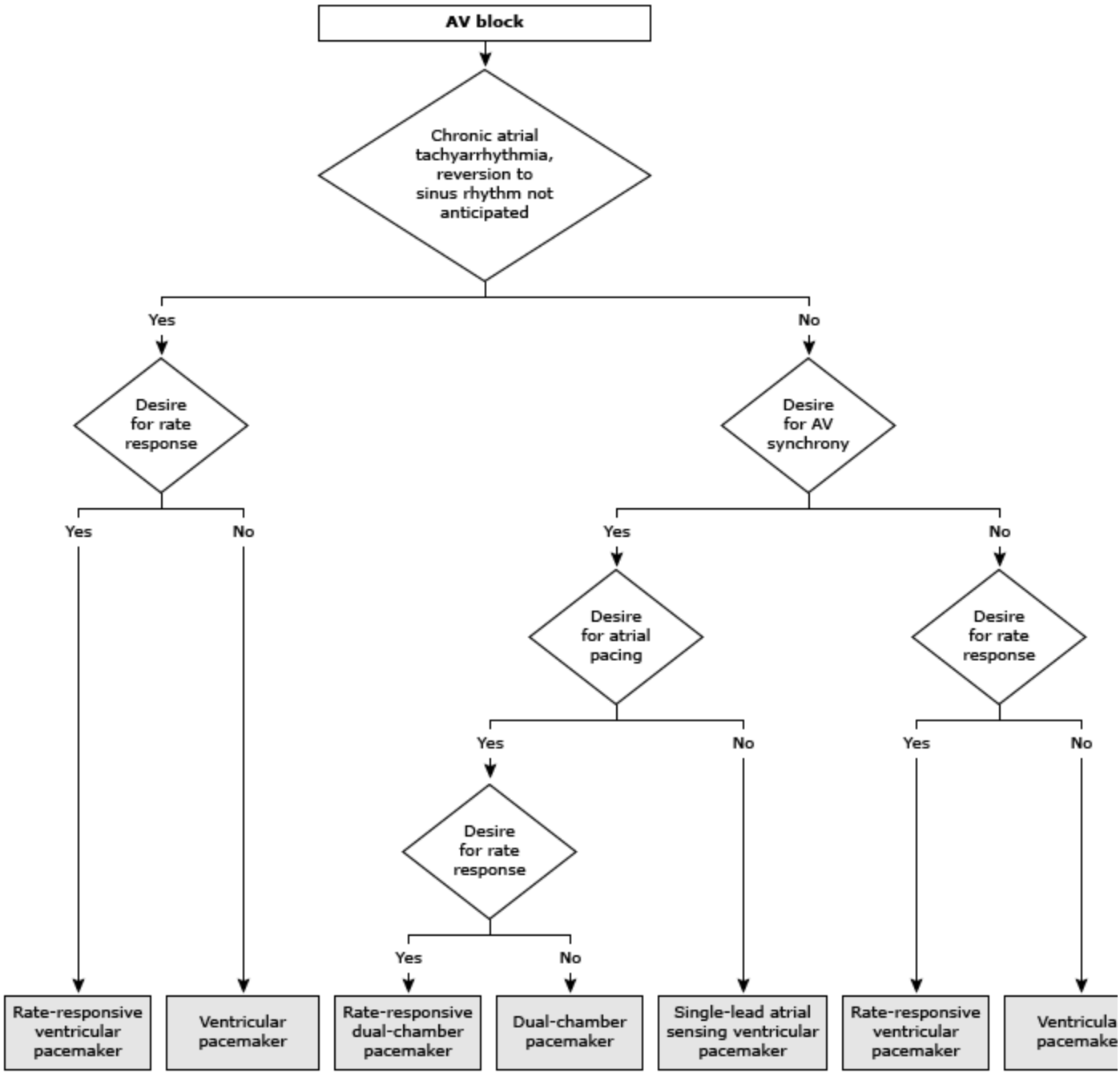
This algorithm is an aid to identifying which patients with Mobitz type II second-degree AV block require a permanent pacemaker. Patients with persistent Mobitz type II second-degree AV block are at high risk for progressing to symptomatic Mobitz type II second-degree AV block or complete heart block and therefore are candidates for permanent pacemaker placement. Dual-chamber (AV) pacing is generally preferred to maintain AV synchrony. For additional details, refer to UpToDate content on management of Mobitz type II second-degree AV block.

AV: atrioventricular.

* The time course for response to treatment of reversible causes varies depending upon the specific cause of AV conduction delay and other clinical factors.

Graphic 140930 Version 1.0

Selection of pacemaker systems for patients with atrioventricular block



Decisions are illustrated by diamonds. Shaded boxes indicate type of pacemaker.

AV: atrioventricular.

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Graphic 71370 Version 4.0

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