

ARRHYTHMIAS WITH ESSENTIALLY REGULAR DOMINANT RHYTHMS INTERRUPTED BY ONE OR TWO IRREGULAR BEATS (*The Premature Beats and Escapes*) (*Cont.*)

I. Dominant rhythm essentially regular, but with intermittent interruptions. These interruptions consist of: (*Cont.*)

- A. An occasional short P-P.
(*On p. 56.*)
- B. An occasional prolonged P-P.
(*On p. 56.*)
- C. An occasional short R-R.
(*On p. 58.*)
- D. An occasional short R-R
(*On p. 58.*)
- E. An occasional prolonged R-R interval.

Terminated by

- 1. A normal P wave, normal P-R interval, and normal QRS.
- 2. Same, but with a P wave during the prolonged R-R interval.
- 3. An abnormal P wave, normal P-R interval, and a normal QRS.
- 4. An abnormal P wave, a short P-R interval, and usually a normal QRS.
- 5. An abnormal QRS without a preceding P wave.

II. Dominant rhythm essentially regular. However, the rhythm of the P wave and the QRS are independent of each other, at different rates, and with an occasional interruption of the R rhythm.

1. P rate faster than or same as the R rate.

a. With recurrent shorter R-R interval, preceded by a P wave with a P-R interval of 0.12 sec. or more.

(1) Without pathologically blocked P waves.*

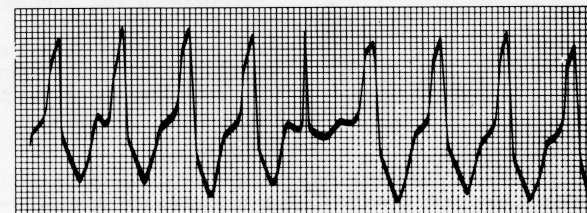
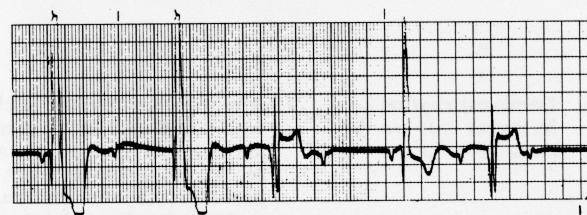
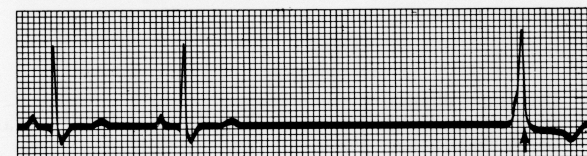
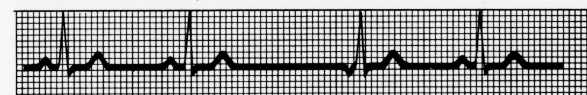
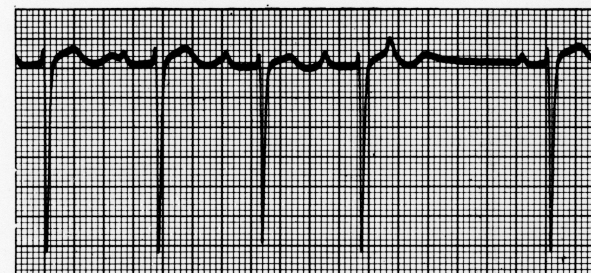
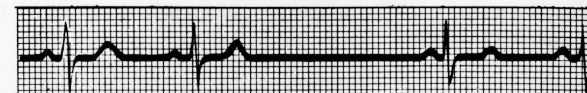
(2) With pathologically blocked P waves.*

2. R rate faster than P rate (R rate usually 150 or more).

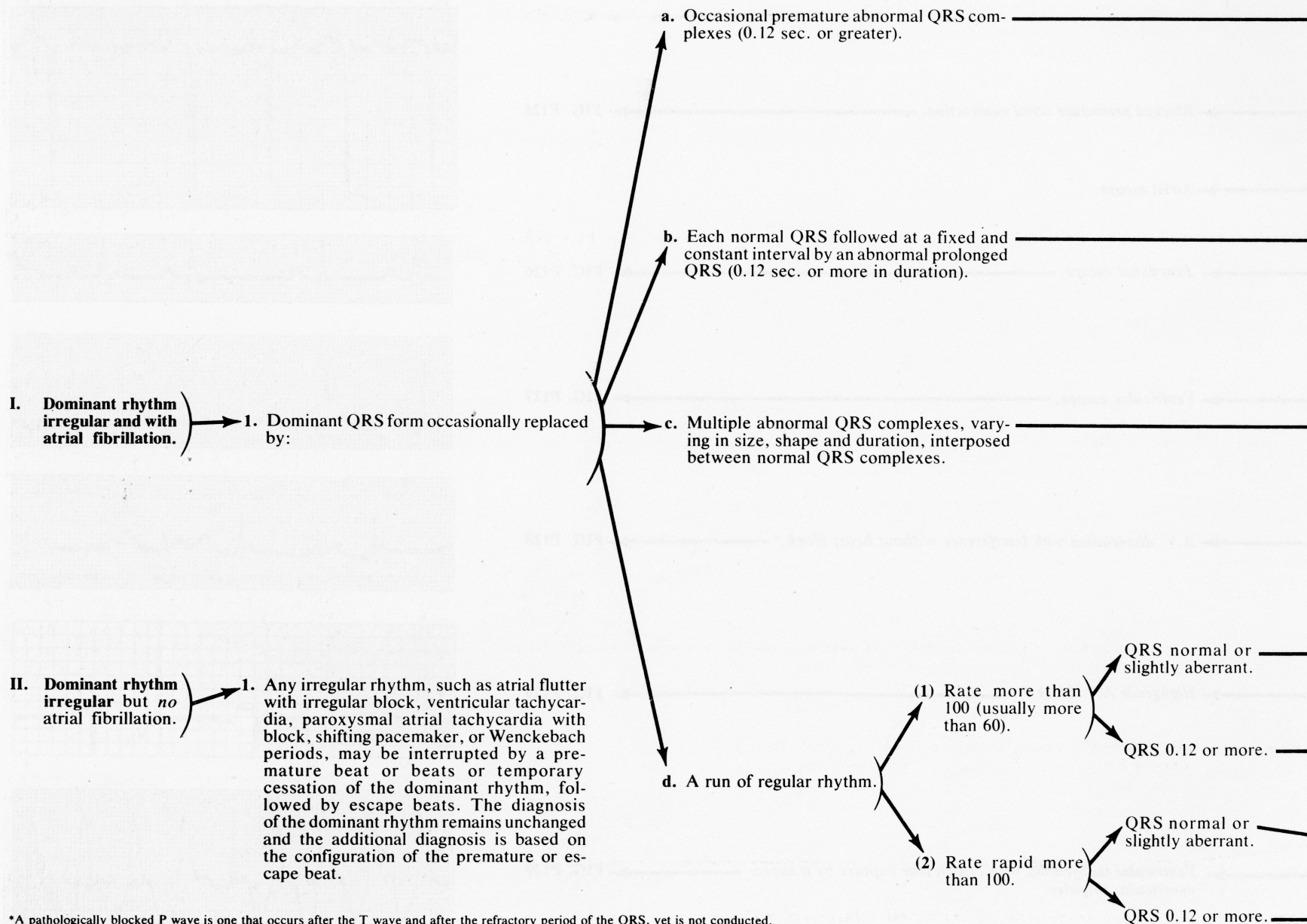
a. With an occasional short R-R interval and QRS of relatively normal form, preceded by a P with a P-R interval of 0.12 sec. or greater.

*An escape beat can occur whenever the dominant rhythm is temporarily suppressed.

- *Sinus arrest.* → FIG. P124
- *Blocked premature atrial contraction.* → FIG. P125
- *Atrial escape.*
- *Junctional escape.* → FIG. P126
- *Ventricular escape.* → FIG. P127
- *A.V. dissociation with interference without heart block.** → FIG. P128
- *Highgrade A.V. block.** → FIG. P129
- *Ventricular tachycardia with ventricular capture by a supra-ventricular impulse.* → FIG. P130



ARRHYTHMIAS WITH IRREGULAR DOMINANT RHYTHMS INTERRUPTED BY ONE OR MORE ABERRANT BEATS

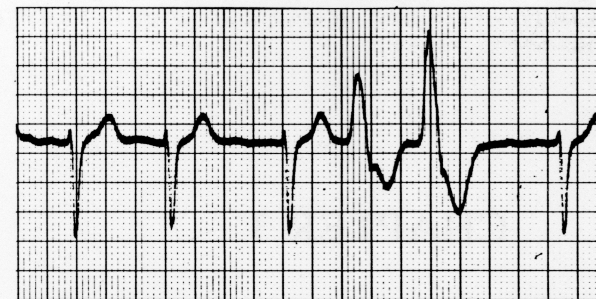


*A pathologically blocked P wave is one that occurs after the T wave and after the refractory period of the QRS, yet is not conducted.

†When the aberrant QRS shortly follows a QRS that terminates a long pause, the aberrancy may be due to the Ashman phenomenon rather than a VPC.

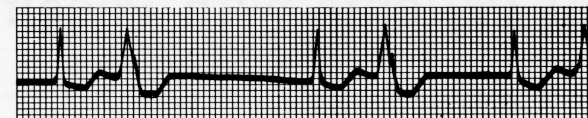
→ *Atrial fibrillation with an occasional premature ventricular contraction.* →

FIG. P131



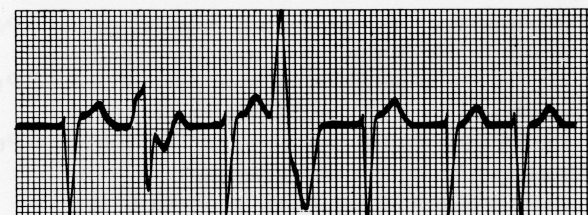
→ *Atrial fibrillation with bigeminy.* →

FIG. P132



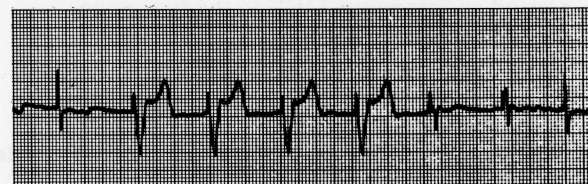
→ *Atrial fibrillation with multifocal ventricular contractions.* →

FIG. P133



→ *Junctional rhythm in atrial fibrillation.* →

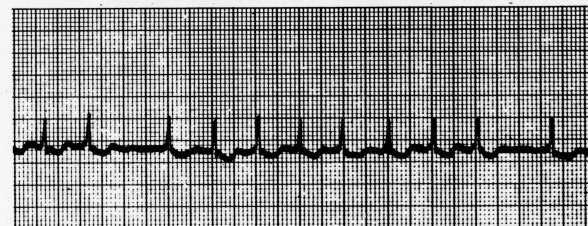
FIG. P134



→ *Nonparoxysmal ventricular tachycardia during atrial fibrillation (or junctional rhythm with aberrant conduction).* →

→ *Junctional tachycardia in atrial fibrillation.* →

FIG. P135



→ *Ventricular tachycardia or junctional tachycardia with aberrant conduction in atrial fibrillation.*

CHAPTER 3

Differential Diagnosis of the ECG of Patients with Pacemakers

GLOSSARY OF PACEMAKER TERMS*

Asynchronous pulse generator. A pulse generator in which the repetition rate (usually set before implant) is independent of the electrical and/or mechanical activity of the heart.

Atrial synchronous pulse generator. A ventricular stimulating pulse generator, the repetition rate of which is directly determined by the atrial rate.

Escape interval. The interval from the last sensed spontaneous QRS to the first pacemaker spike which depolarizes the ventricle.

Fixed rate pulse generator. *See* Asynchronous pulse generator.

Hysteresis pacemaker. A demand pacemaker whose escape interval is deliberately longer than its pacing interval.

Pacemaker. The pulse generator and electrodes.

Preset rate. The repetition rate of the specific pacemaker (automatic rate).

Pulse generator. That portion of the pacemaker assembly which includes the power source and pulse forming elements. It may also include circuitry for additional functions.

Refractory period. The time interval (specified in milliseconds) following the delivery of a pacing impulse or detection of cardiac activity during which the pulse generator sensing circuit is inactivated, that is, it does not sense.

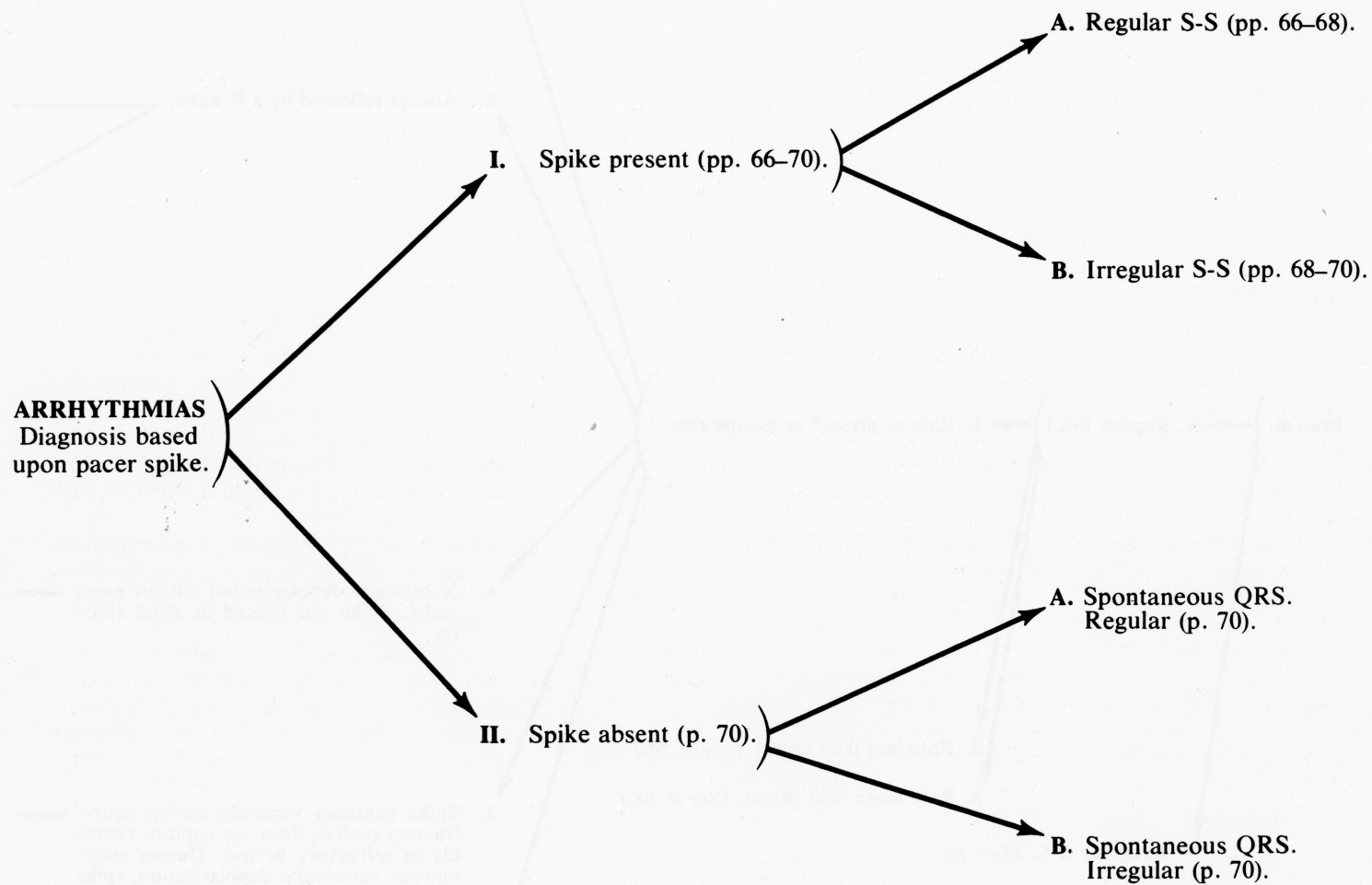
Repetition rate. The number of pulses per unit of time usually in terms of pulses per minute.

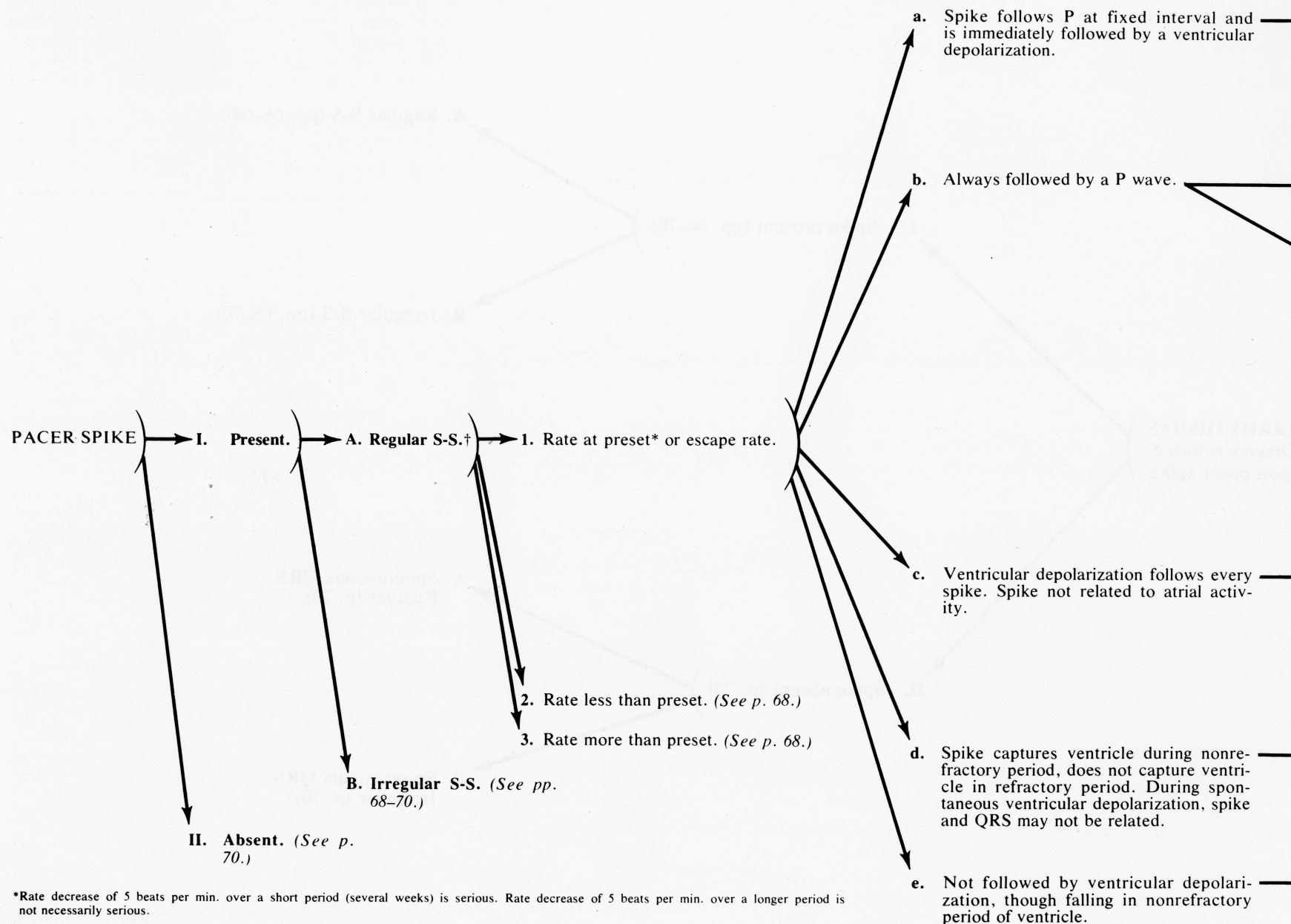
Sensitivity. The minimum value of cardiac electrical activity required to consistently trigger the pulse generator.

Ventricular inhibited (demand/standby) pulse generator (also QRS inhibited). A ventricular stimulating pulse generator which suppresses its output in response to spontaneous ventricular activity and produces an output asynchronously (paces continuously) in the absence of ventricular activity.

Ventricular synchronous, ventricular triggered pulse generator (standby). A ventricular stimulating pulse generator delivering its output synchronously with the natural spontaneous ventricular activity, and asynchronously in the absence of ventricular activity.

*Compiled with the assistance of Dr. Seymour Furman.



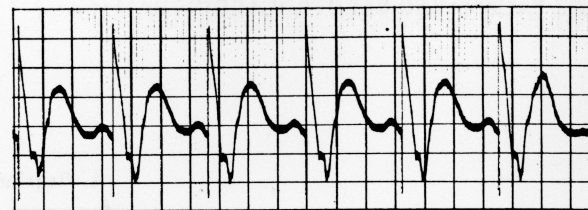


*Rate decrease of 5 beats per min. over a short period (several weeks) is serious. Rate decrease of 5 beats per min. over a longer period is not necessarily serious.

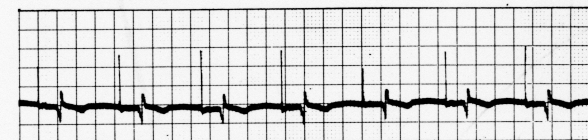
†Spike to spike.

‡The specific escape interval, refractory period, and preset fixed rate of the individual pacemaker must be known to interpret proper function.

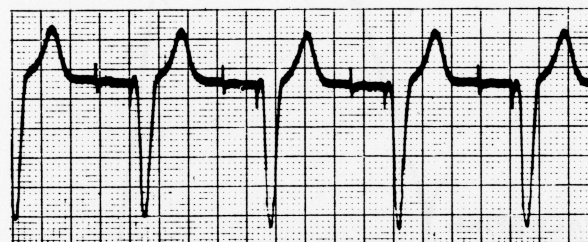
→ *Atrial synchronous pacemaker with regular sinus rhythm.* → FIG. SS1



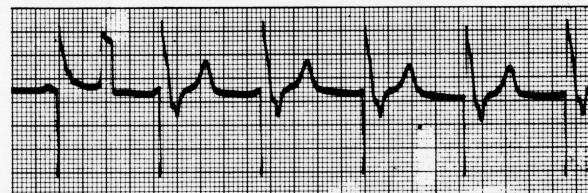
→ *Properly functioning atrial pacemaker.* → FIG. SS2



→ *Properly functioning atrioventricular pacemaker.* → FIG. SS3



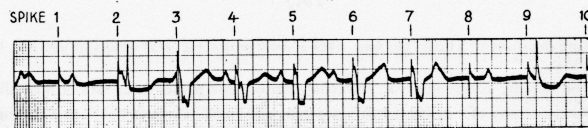
→ *Fixed rate pacemaker‡ (or demand pacemaker acting as fixed rate).* → FIG. SS4

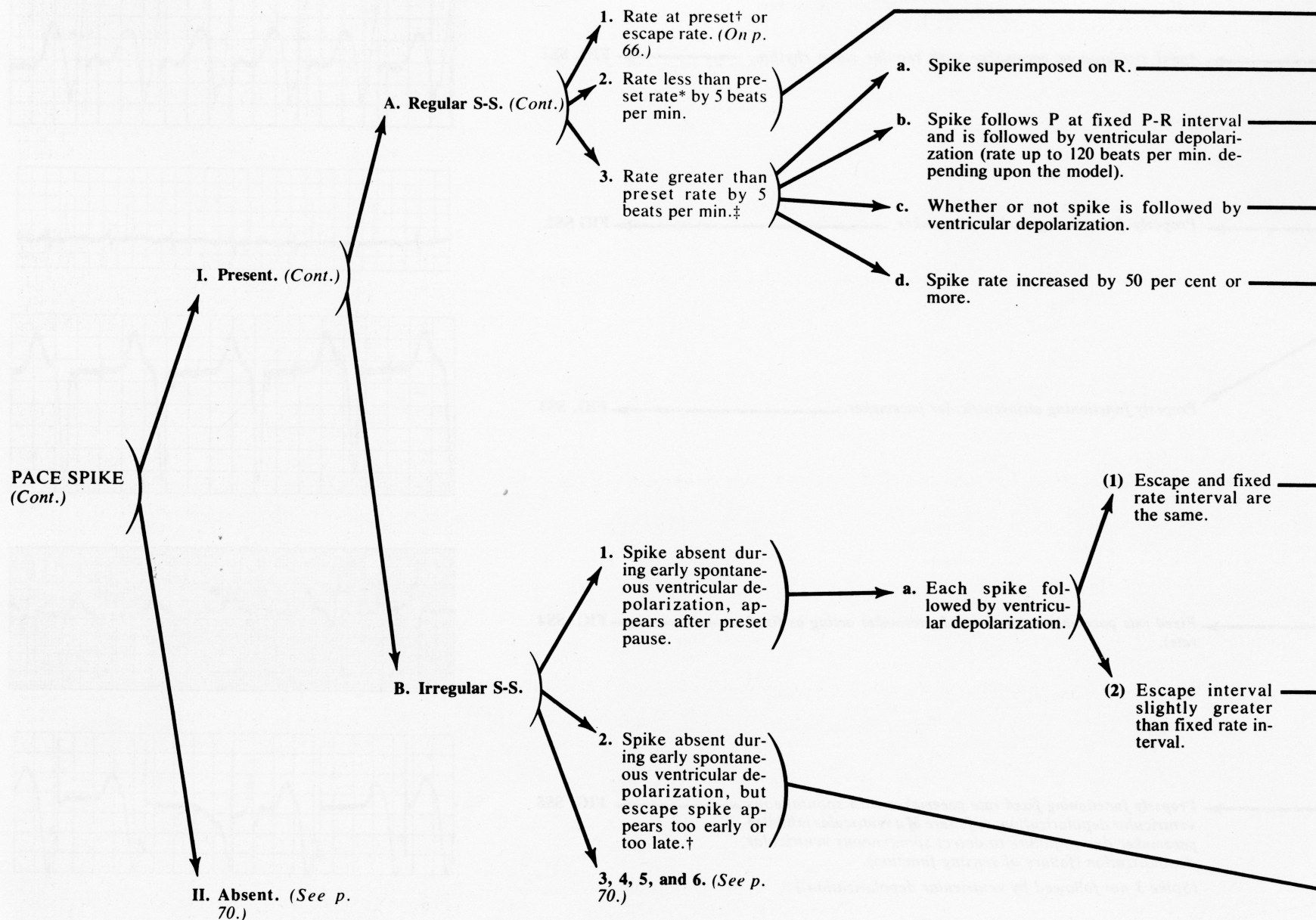


→ *Properly functioning fixed rate pacemaker with spontaneous ventricular depolarization; or failure of a ventricular inhibited pacemaker due to failure to detect spontaneous ventricular depolarization (failure of sensing function).
(Spike 3 not followed by ventricular depolarization.)* → FIG. SS5



→ *Malfunctioning fixed rate pacemaker or malfunctioning demand pacemaker in fixed rate mode.
(Spike 1, 2, 8, and 9 not followed by ventricular depolarization.)* → FIG. SS6





*Rate decrease of 5 beats per min. over a short period (several weeks) is serious. Rate decrease of 5 beats per min. over a longer period is not necessarily serious.

†The specific escape interval, refractory period, and preset fixed rate of the individual pacemaker must be known to interpret proper function.

‡Rate increase of 5 or more beats per min. of a fixed rate pacemaker or demand pacemaker in a fixed rate mode is abnormal.

Malfunctioning fixed rate pacemaker or malfunctioning ventricular inhibited pacemaker in fixed rate mode.

Ventricular synchronous pacemaker with spontaneous heart rate greater than escape rate.

Atrial synchronous pacemaker.

Malfunctioning of pacemaker if fixed rate or ventricular inhibited in fixed rate mode.

Runaway pacemaker† (malfunction).

Properly functioning demand pacemaker (ventricular inhibited).

Properly functioning hysteresis demand pacemaker.

Malfunctioning† demand pacemaker (failure to detect spontaneous QRS or resetting on T or P wave). (Spike after complexes 4 and 5 are too early.)

FIG. SS7

FIG. SS8

FIG. SS9

FIG. SS10

FIG. SS11

