Interpreting a Postoperative 12-Lead ECG Waveform

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Scenario: This is a routine postoperative 12-lead ECG waveform of a 58-year-old Mexican man status post external and internal carotid bypass repair. He is recovering in the neurointensive care unit.

For every ECG, we recommend you systematically examine the following 9 features (check all that apply):

1. Rate
   - Normal (60-90 beats per minute)
   - Bradycardia (<60 beats per minute)
   - Tachycardia (>90 beats per minute)

2. Rhythm
   - Regular
   - Irregular

3. P waves
   - One P wave for every QRS complex
   - Fewer P waves than QRS complexes
   - More P waves than QRS complexes

4. PR interval
   - Normal (≤0.20 seconds)
   - Short (<0.08 seconds)
   - Lengthened (>0.20 seconds)
   - Not applicable

5. QRS complex duration
   - Normal (≤0.12 seconds)
   - Wide (>0.12 seconds)

6. QRS complex direction lead V1
   - Negative and ≤0.12 seconds (normal)
   - Negative and >0.12 seconds (left bundle branch block)
   - Positive and >0.12 seconds (right bundle branch block)

7. ST segments
   - Normal
   - Elevated (≥2 mm)
   - Depressed (≥2 mm)

8. T Wave
   - Normal
   - Inverted

9. QTc
   - Normal
   - Lengthened (>0.47 seconds)
Interpretation: One hundred percent ventricularly paced at 80 beats per minute.

Rationale

Unfortunately, without noting the pacemaker spikes (small vertical tick marks best seen in V3), this 12-lead ECG waveform may look pathological because of the wide QRS complexes. However, this is actually a normal functioning ventricular pacemaker. None of the QRS complexes are preceded by a P wave (paced or intrinsic). The ventricular impulses begin with a pacing spike and what follows is strikingly different from a “normal” QRS. Typically, the electrical impulse originates from the right ventricle; thus, excitation spreads aberrantly via nontraditional conduction pathways, much like a premature ventricular contraction.

Nursing Actions

The nurse should document an ECG to ensure that the pacemaker is sensing, firing, and capturing correctly. In this case, pacemaker syndrome should be evaluated because it is linked to atrioventricular asynchrony caused by single-chamber ventricular pacing. Atrioventricular asynchrony causes a reduction in cardiac output and may mimic heart failure (shortness of breath, chest pain, dizziness, etc). However, given that the patient’s current diagnosis is neurological in nature, it is fair to say that this pacemaker is functioning correctly; therefore, no nursing actions are required.

Over 2 million pacemakers have been implanted since their inception 40 years ago, and each year about 500,000 devices are implanted. Half of these implants are in new patients, while the other half are replacements. It is likely that nurses will see paced rhythms that are the patient’s baseline rather than the patient’s current problem.
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