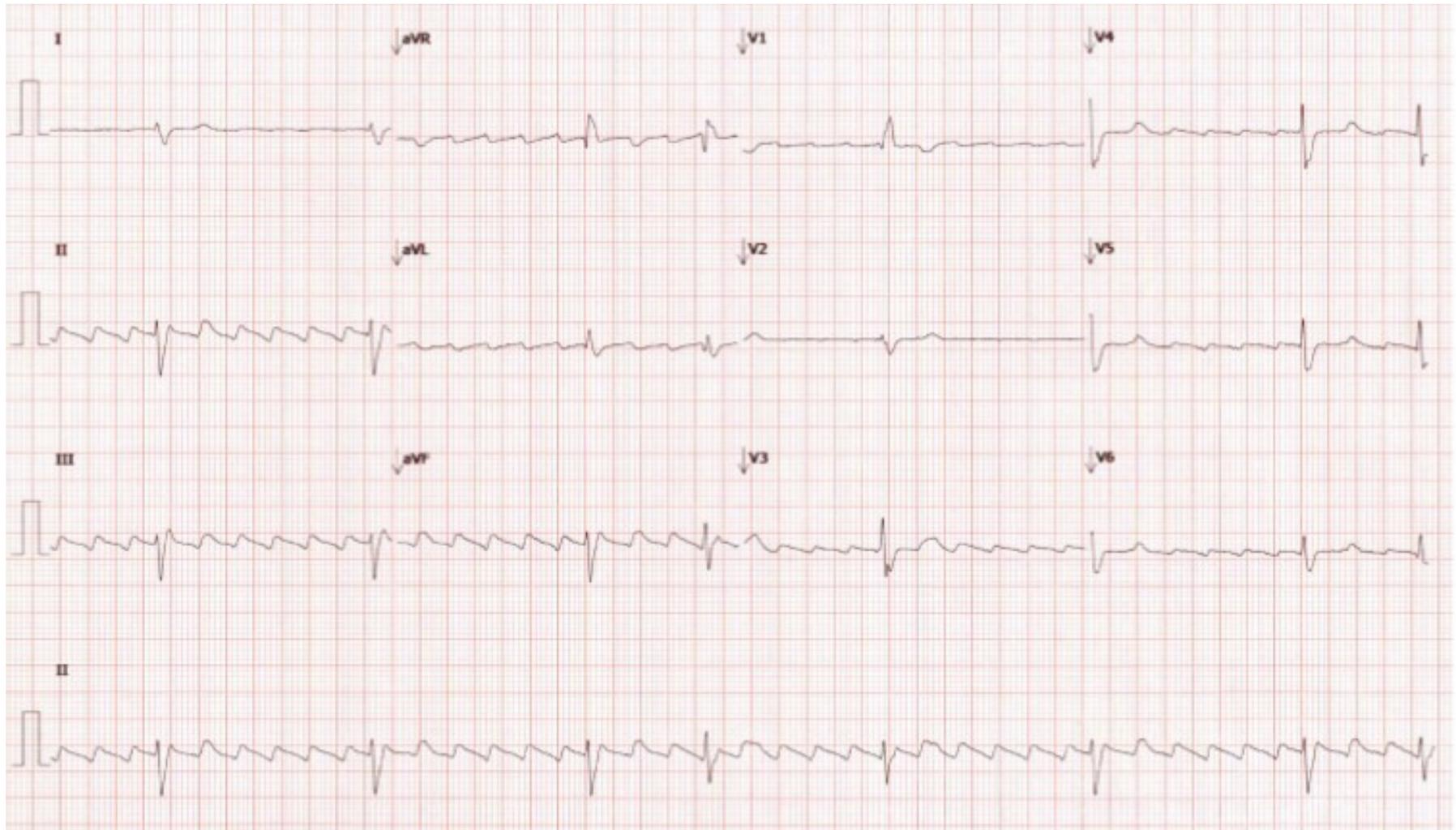


- Atrial flutter



- Rapid, regular atrial undulations flutter usually at a rate of 240–340 BPM

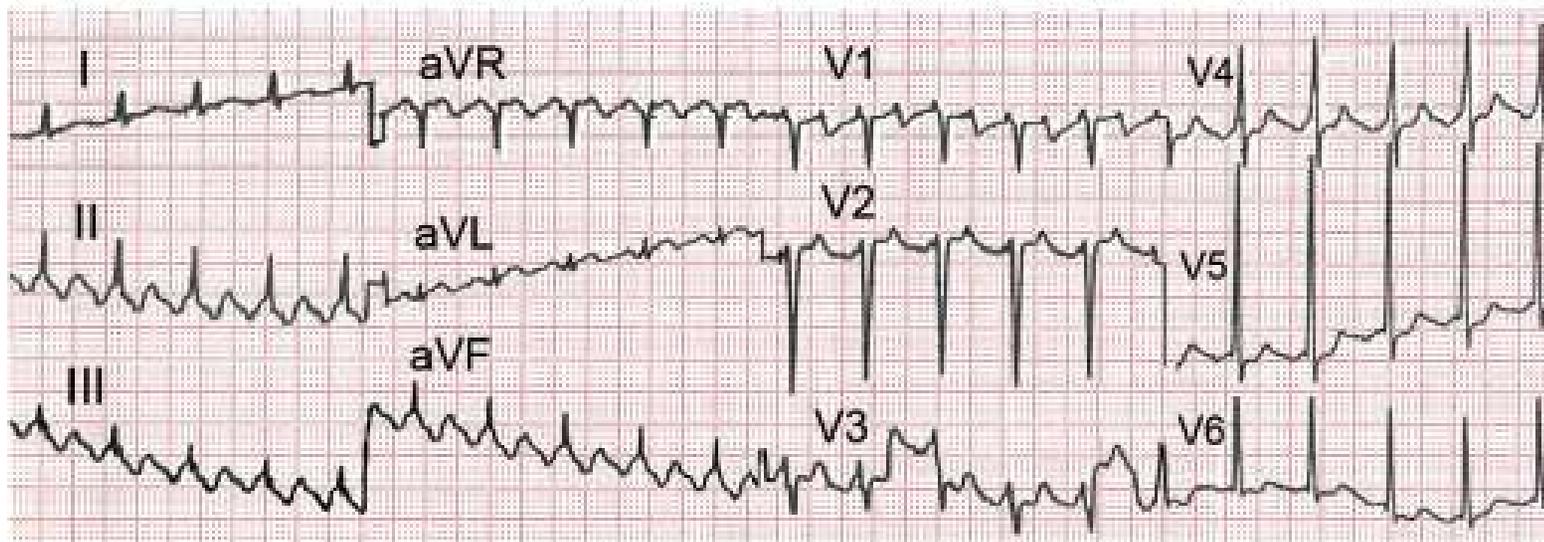
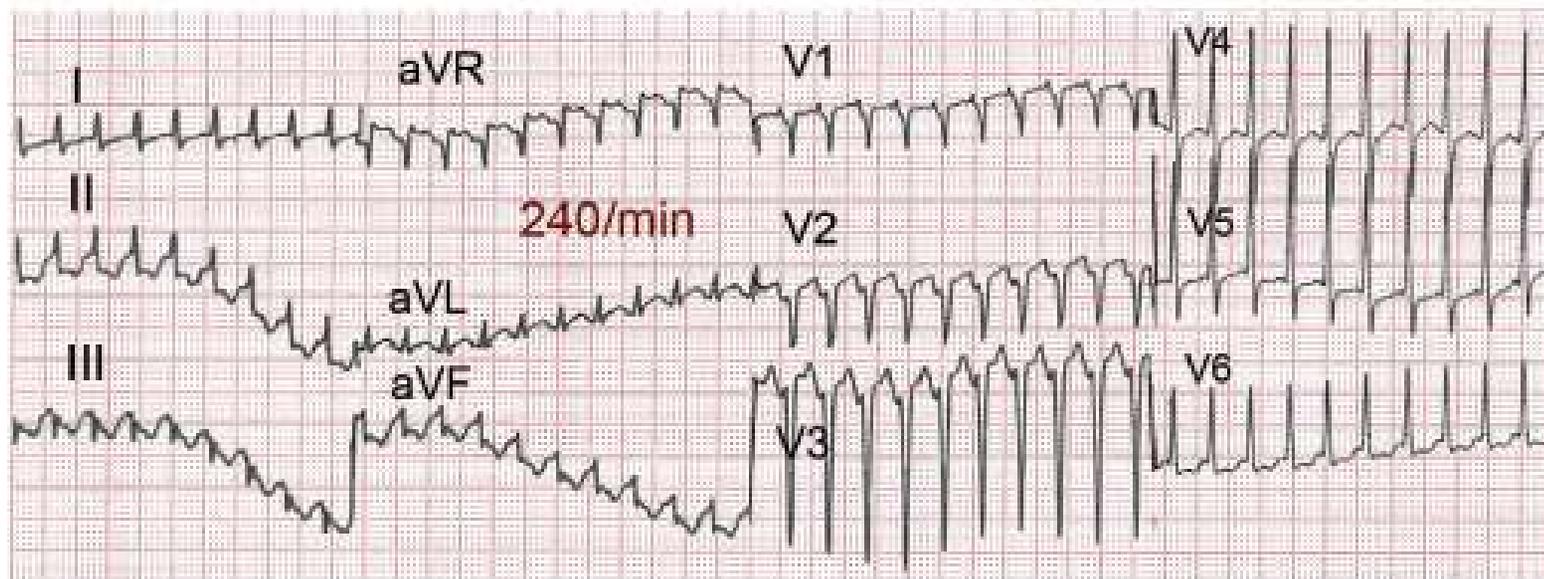
Flutter rate may be faster (> 340 BPM) in children and slower (200–240 BPM) in the presence of antiarrhythmic drugs (Type IA, IC, III) and/or massively dilated atria.

ECG artifact due to Parkinsonian tremor (4-6 cycles per second) can simulate flutter waves. Look for evidence of distinct superimposed P waves preceding each QRS complex, especially in leads I, II, or V1.

- Typical atrial flutter morphology is usually present:
  - Leads II, III, aVF: Inverted flutter waves without an isoelectric baseline (“sawtooth” or “picket-fence” look)
  - Lead V1: flutter waves often visible
- Atypical atrial flutter can exhibit upright flutter waves in inferior leads
- QRS complex may be normal or wide (if underlying BBB or aberrancy)
- Rate and regularity of QRS complexes depend on the AV conduction sequence

AV conduction ratio (ratio of flutter waves to QRS complexes) is usually fixed and an even number (e.g., 2:1, 4:1), but may vary. Odd-numbered conduction ratios of 1:1 and 3:1 are uncommon. In untreated patients,  $\geq 4:1$  block suggests the coexistence of AV conduction disease.

Atrial flutter with 1:1 AV conduction often conducts aberrantly, resulting in a wide QRS tachycardia that may be confused with VT or SVT.



*Atrial flutter with 1:1 conduction on top panel and on the bottom panel the same patient after developing 2:1 block*

Carotid sinus massage typically causes a transient increase in AV block and slowing of the ventricular response, without a change in the atrial flutter rate. At times, no effect is seen. When atrial flutter with 2:1 AV block is suspected, carotid sinus massage may unmask flutter waves and help confirm the diagnosis. Upon discontinuation of carotid sinus massage, the usual response is return to the original ventricular rate.

- Complete heart block with a junctional or ventricular escape rhythm may be present.

Consider digitalis toxicity in the setting of atrial flutter with complete heart block and junctional tachycardia.

Flutter waves can deform the QRS complex, ST segment, and T wave to mimic Q wave MI, intraventricular conduction delay, and myocardial ischemia (ST segment depression).

Atrial flutter (or atrial tachycardia) with 2:1 AV conduction often has the second P wave hidden in the QRS complex, which may be missed. Suspect atrial flutter when the ventricular rate is 150 BPM with a P wave visible between the RR intervals, and then pay close attention to the end of the QRS complex to determine if a second P wave is present.

Etiology is the same as for AFIB.