



Understanding the Role of ECG in Tip Placement

ARROW® VPS G4™ Device

Objectives

Clinician will be able to:

- Describe the five waveforms of the heart's electrical activity
- Understand correlation between waveform activity and the ARROW® VPS G4™ Device

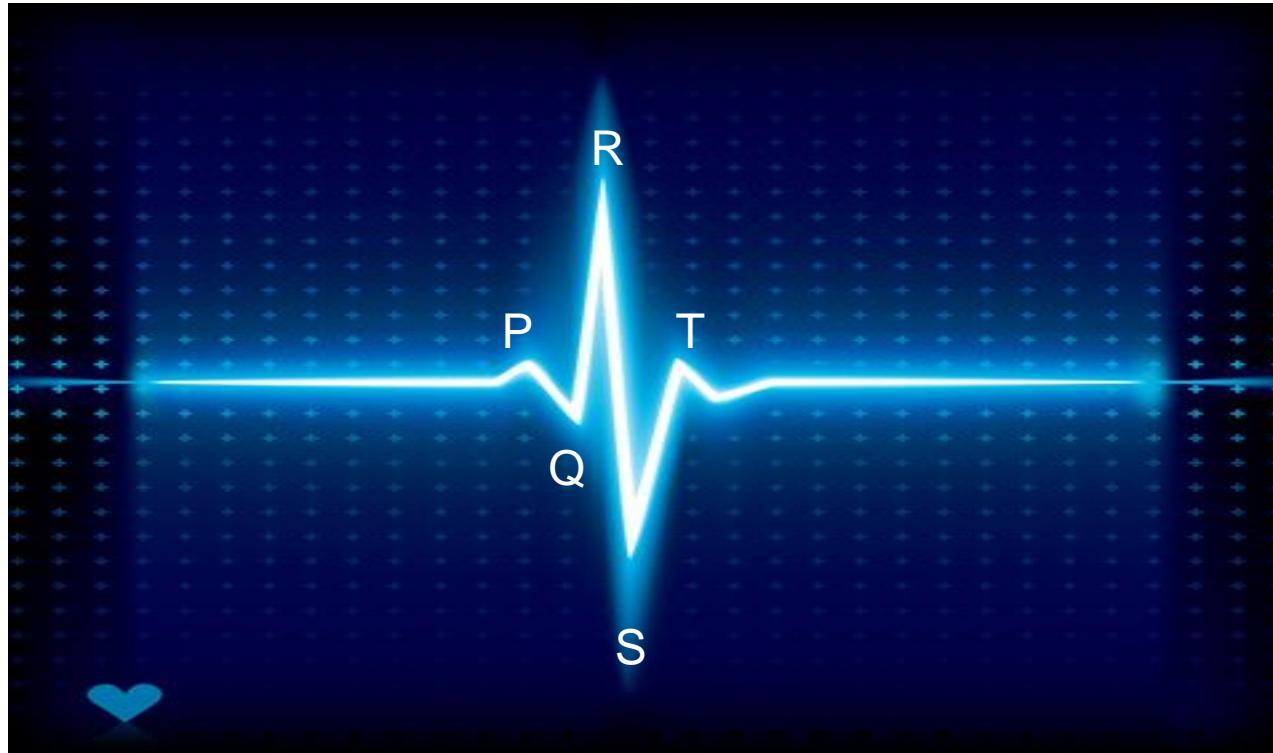
Principles of ECG: Waveforms

- An electrocardiogram (ECG) is a diagnostic test that measures and records the electrical activity of the heart
- It translates the heart's electrical activity into line tracings on paper



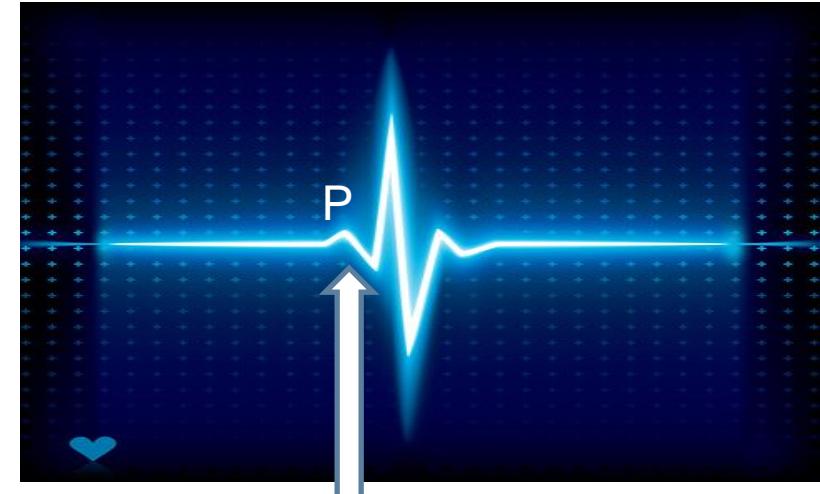
Principles of ECG: Waveforms

- A complete cardiac cycle has five identifiable waveforms
- These electrical impulse patterns are labeled P, Q, R, S, and T waves
- Each of these five waveform segments represents electrical activity within a specific area of the heart



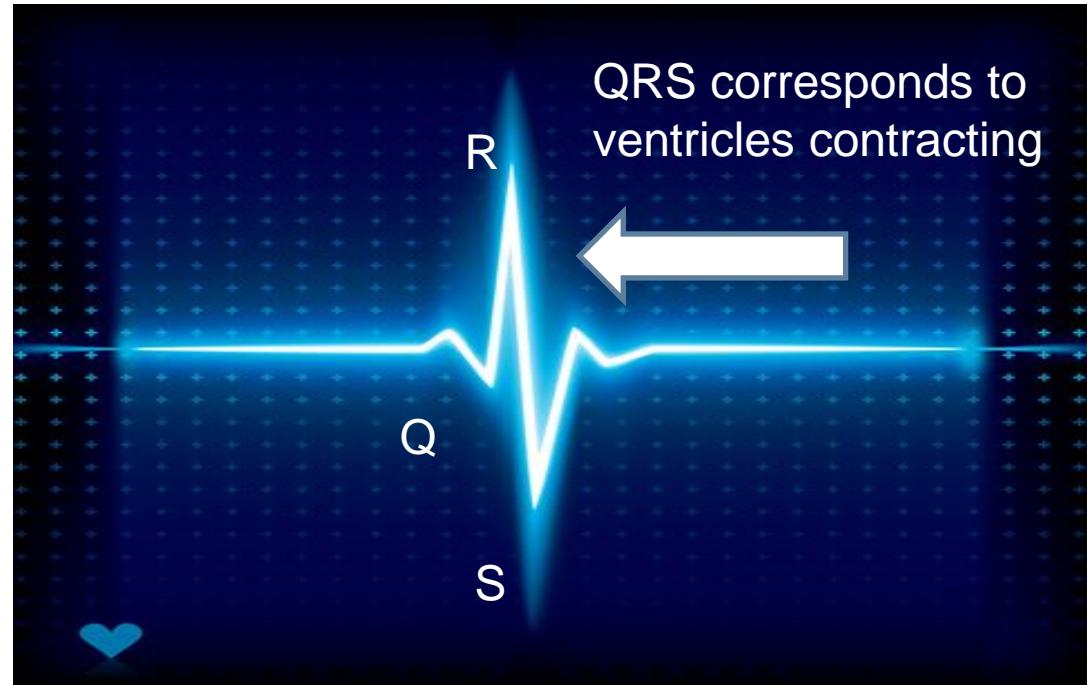
Principles of ECG: Waveforms

- The first half of the P-wave appears when the SA node activates the right atrium and reaches the AV node
- When the P-wave is complete, the left atrium and the AV node are completely activated
- The line after the P-wave indicates the activation of the AV junction
- A normal P-wave indicates both atrial chambers have contracted and begun to empty blood into the ventricles
- In a normal heart rhythm, the P-wave is rounded and positive or above the baseline



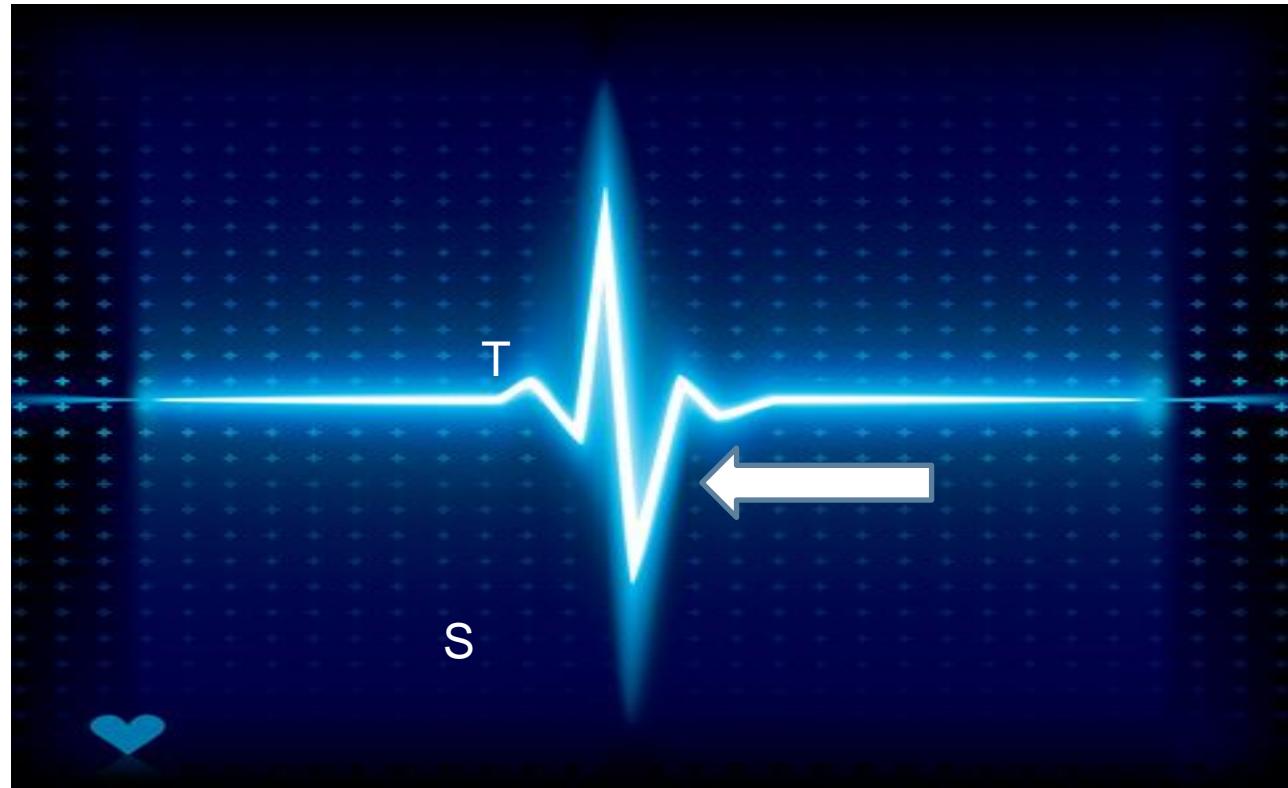
Principles of ECG: Waveforms

- The negative Q-wave indicates the ventricular septum has been activated
- The QRS complex indicates the ventricles have been activated from the inside to the outside of the surface. Depolarization has begun
- QRS Complex = ventricle contraction



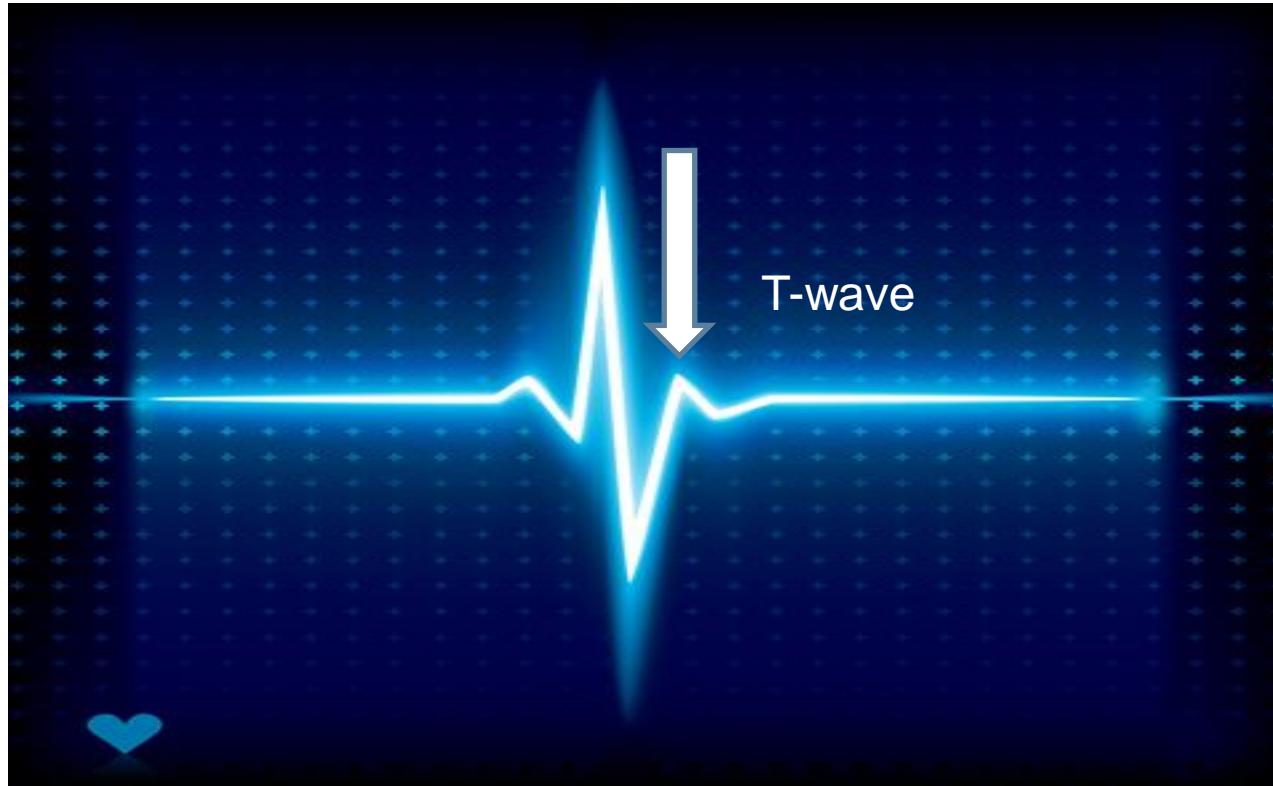
Principles of ECG: Waveforms

- The ST segment indicates the end of depolarization and the beginning of ventricular repolarization
- The ventricles are returning to an electrically ready state to receive next impulse

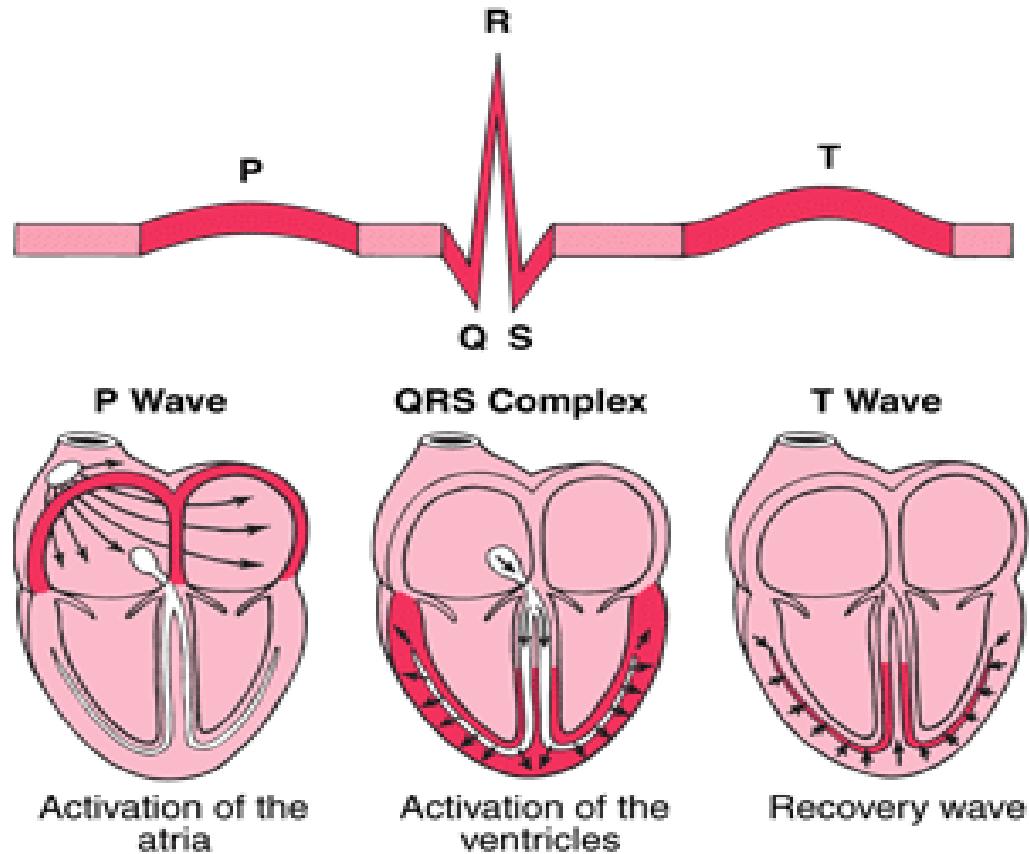


Principles of ECG: Waveforms

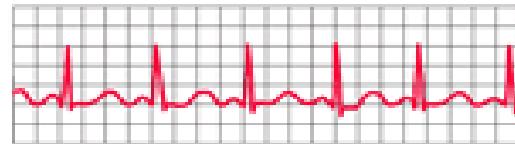
- The T-wave represents ventricular repolarization
- The ventricles are preparing to receive the next electrical impulse
- A normal T-wave is rounded



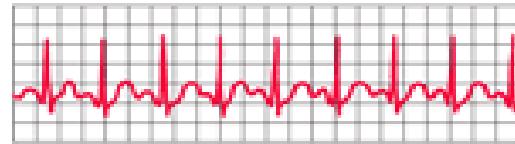
Principles of ECG: Waveforms



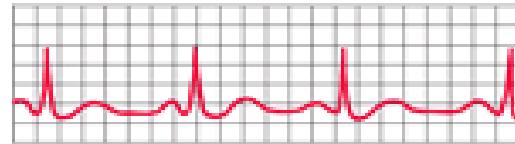
Normal Heartbeat



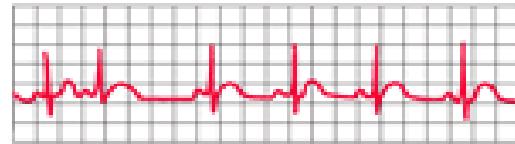
Fast Heartbeat



Slow Heartbeat



Irregular Heartbeat



Electrophysiology

Conduction

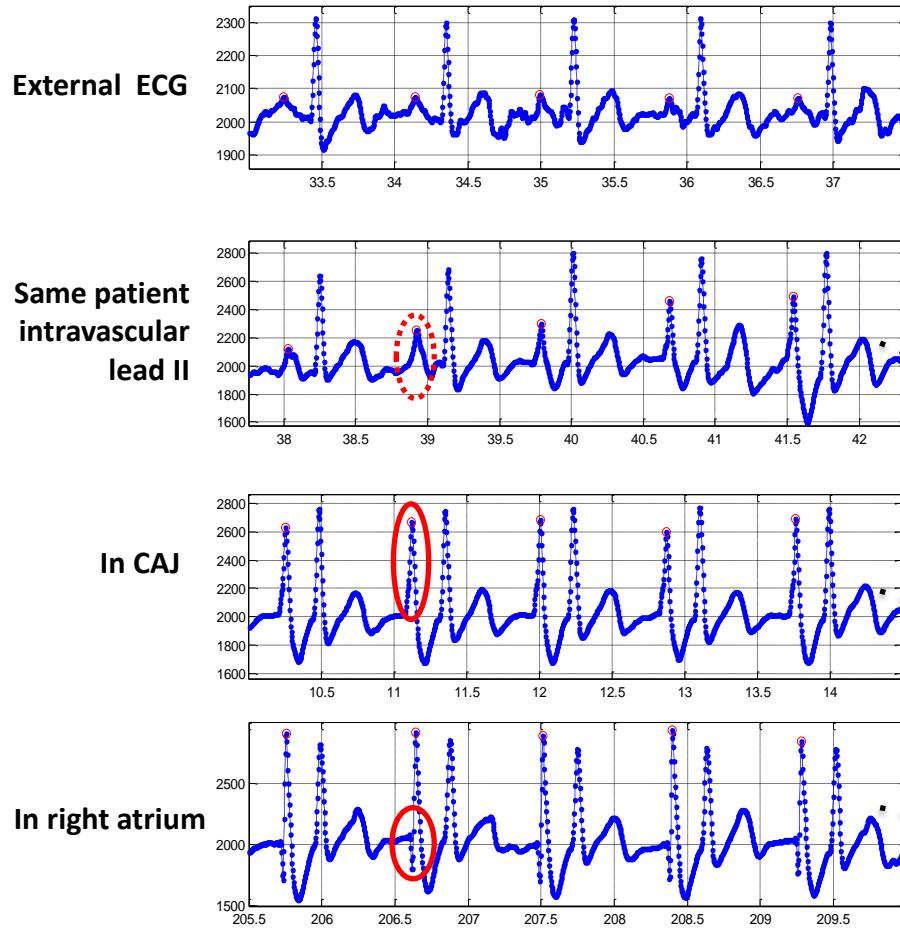
Normal Sinus Rhythm



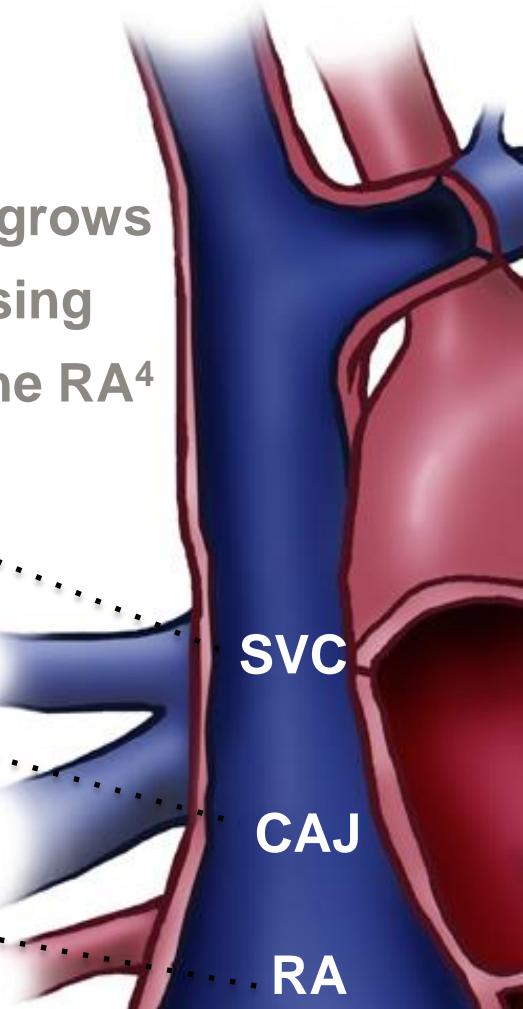
Atrial Fibrillation



P-wave Changes on Intravascular ECG Lead

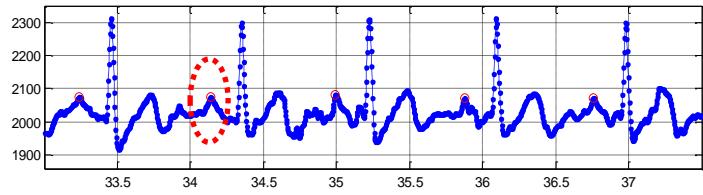


Atrial P-wave grows
with increasing
proximity to the RA⁴

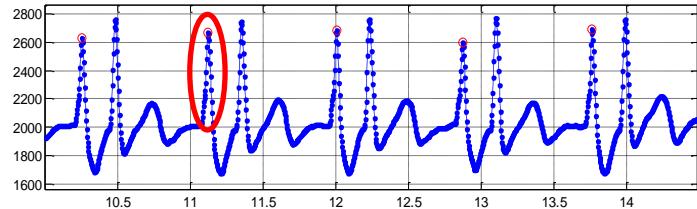


P-wave Accuracy Range Greater Than Optimal

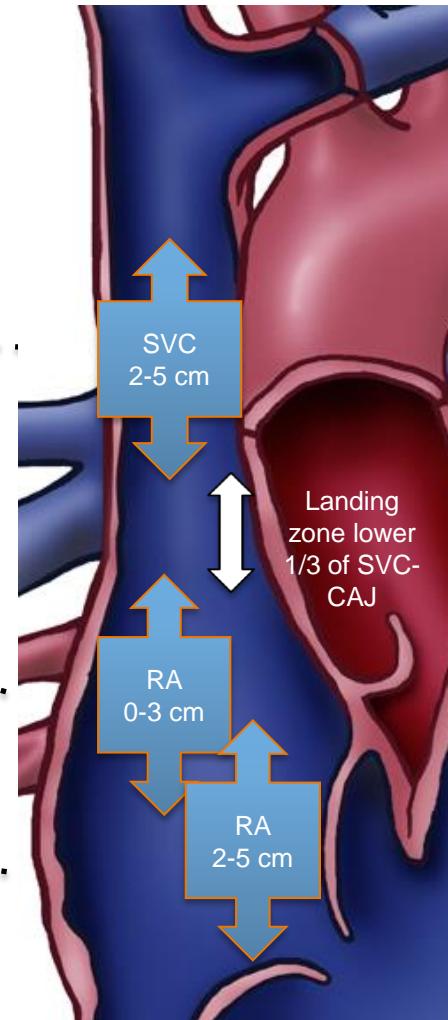
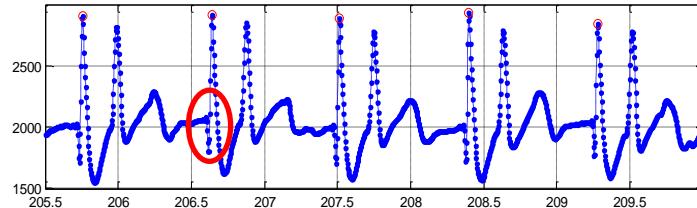
Normal
P-wave
range



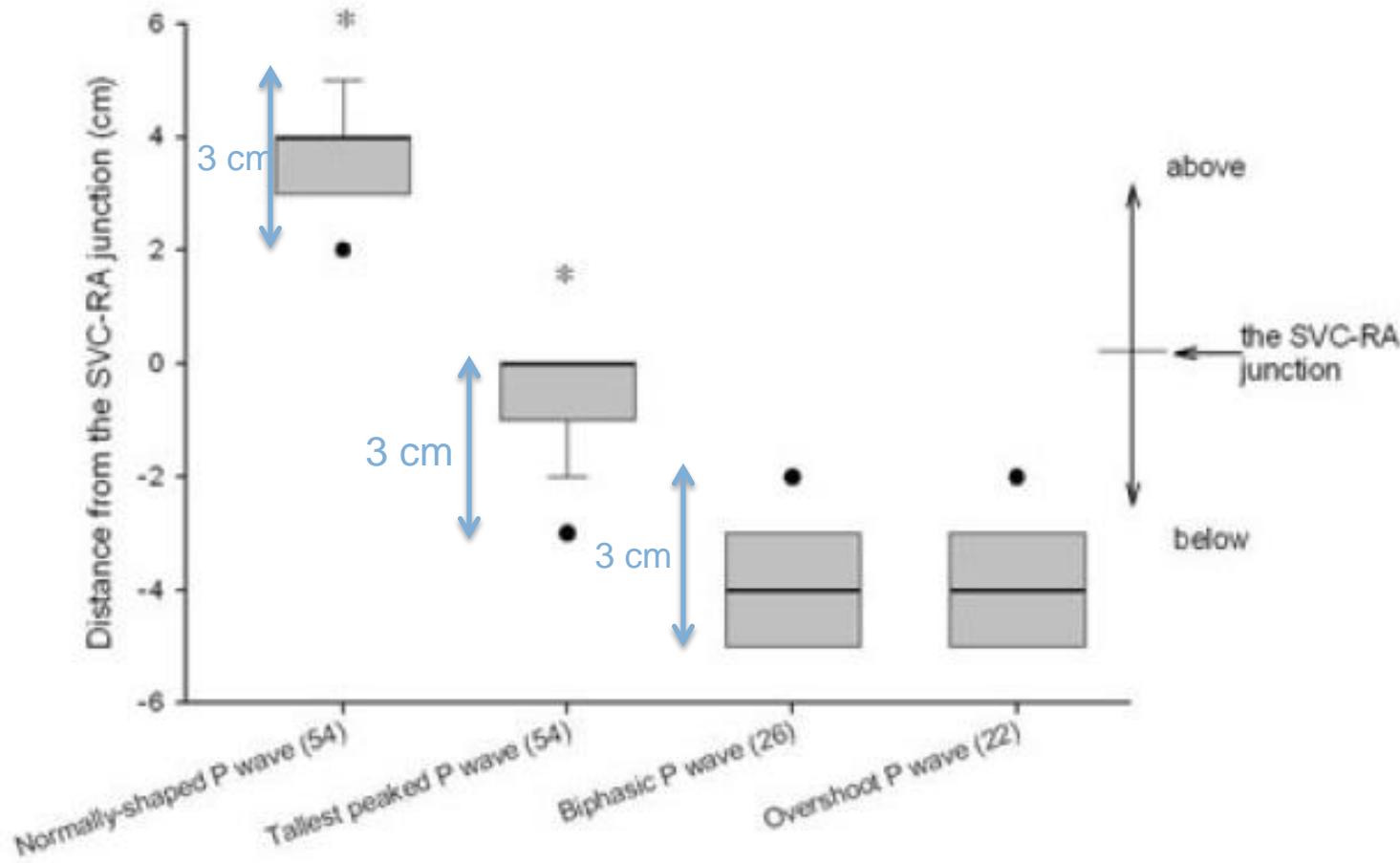
Maximal
P-wave
range



Biphasic
P-wave
range



P-wave Inconsistency



Jeon et al, CAN J ANESTH 2006 / 53: 10 / pp 978–983

ECG Principles

- Identification of P-waves is essential to understanding CVC placement using the ECG method
- Inserter must be able to recognize P-wave changes on the ECG monitor
- When inserting a central venous catheter, as the tip enters the SVC and heads toward the right atrium, the height of the P-wave changes
- Identifying changes in the P-wave, as the catheter is inserted, allows accurate identification of tip position when entering the SVC or Right Atrium