

OBSTETRICAL ULTRASOUND FETAL ARRHYTHMIA PROTOCOL (OBEC2)

****All exams will be accompanied by either a Detailed Anatomy (UOBC) or Follow up OB exam (OBF). See separate protocol and image requirements for completion of these exams.**

SCANNING PROTOCOL FOR FETAL ARRHYTHMIA:

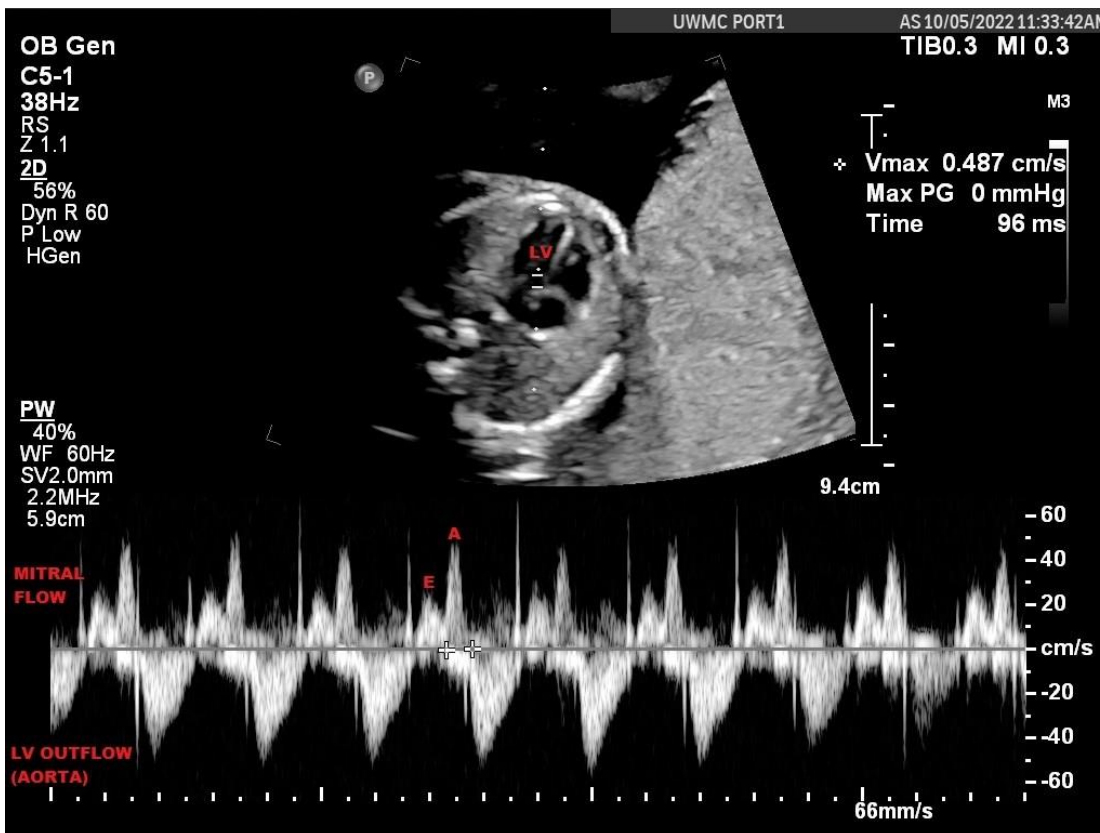
1. **Heart rate** measured with spectral doppler at the aortic valve.
2. **Color Doppler** showing inflow (mitral/tricuspid) and outflow (AO/PA)
3. **M-Mode:** Document atrial and ventricular rates in the same view to show the relationship of the atria and ventricles.
 - Take at least 2 m-mode still images and 2 m-mode cine clips.
 - Change sweep speed as needed to evaluate the rhythm.
 - Use RA and LV if possible, by placing the M-mode diagonal across the heart in a 4C view.



M-mode through the right atrium and left ventricle showing normal sinus rhythm. (Of note, this was acquired on the EPIC and the AMM angle function was utilized to obtain M-Mode through the RA/LV - this function is controlled by the second knob from the left under the touch screen)

WHEN ABLE TO PROPERLY PREFORM, ALSO INCLUDE: (Skip if unfamiliar with these views)

4. **Spectral doppler of Ascending Aorta** with decreased sweep speed to see global picture of regularity/irregularity.
5. **Spectral doppler of mitral inflow/aortic outflow** to establish PR interval using multiple sweep speeds. See below.

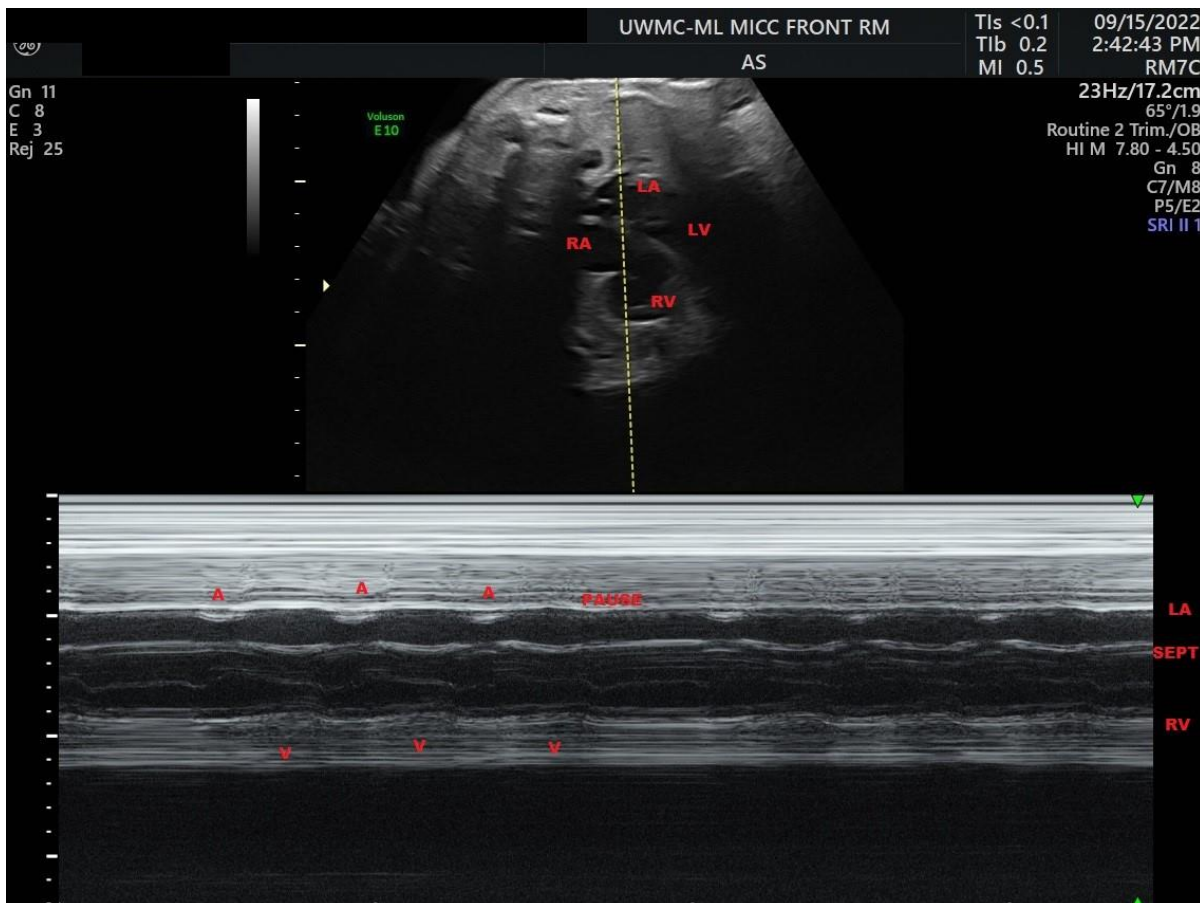


TO MEASURE PR INTERVAL:

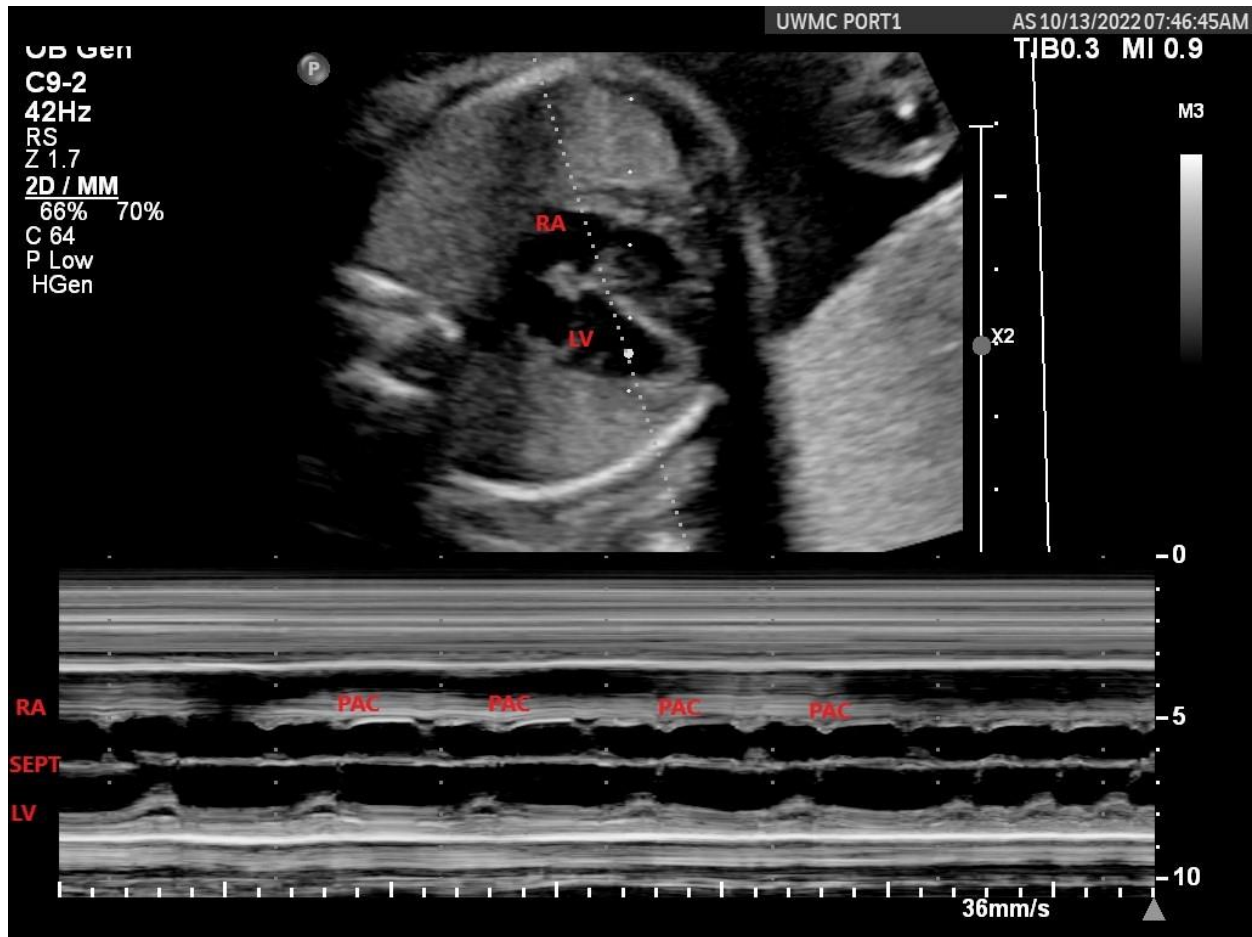
- The spectral gate should be placed adjacent to the anterior mitral valve leaflet (adjacent to the IVS) and angled slightly superior so as to be in the junction between the mitral and aortic valves. There is continuity of the anterior mitral valve leaflet and the left aortic valve leaflet, thus resulting in the spectral doppler of the mitral inflow and aortic outflow simultaneously.
- Measure the time from the start of the A-wave (atrial contraction) to the start of systole (ventricular contraction). This measures the time between the atrial contraction and the ventricular contraction. This measurement should be reported in ms (milliseconds) - Normal is less than 140 ms.
- Use multiple sweep speeds to show the rhythm an
- **E-wave:** represents early diastole in which there is passive ventricular filling caused by the pressure gradient.
- **A-wave:** represents late diastole in which there is active ventricular filling caused by atrial contraction.

PREMATURE ATRIAL CONTRACTIONS (PACs):

- Premature atrial contractions (PACs) are the most common type of fetal arrhythmia.
- **CHARACTERIZATION OF PACs** is by frequency and electrical conductivity (conducted vs blocked)
 - **Frequency:** every other beat is bigeminy (example 2), every third beat is trigeminy (example 1), every fourth beat is quadrigeminy...etc.
 - **Electrical Conductivity:**
 - **Conducted PACs** (see example 1) are when there is a ventricular beat that follows the premature atrial contraction (1:1 ratio of atrial to ventricular contractions). The electrical impulse is transmitted throughout the heart, but the heart needs to reset after the abnormal beat, resulting in a prolonged pause between beats. This is usually noted by the long pause after the ventricular contraction as the electrical current “resets” to normal sinus rhythm after the PAC.
 - **Blocked PACs** (see example 2) are when there is an atrial contraction and no ventricular contraction that follows. (The electrical current is blocked at the AV node and does not make its way to the bundle of His to stimulate ventricular contraction, thus creating a 2:1 ratio of atrial to ventricular contractions).



Example 1: Trigeminy conducted PAC



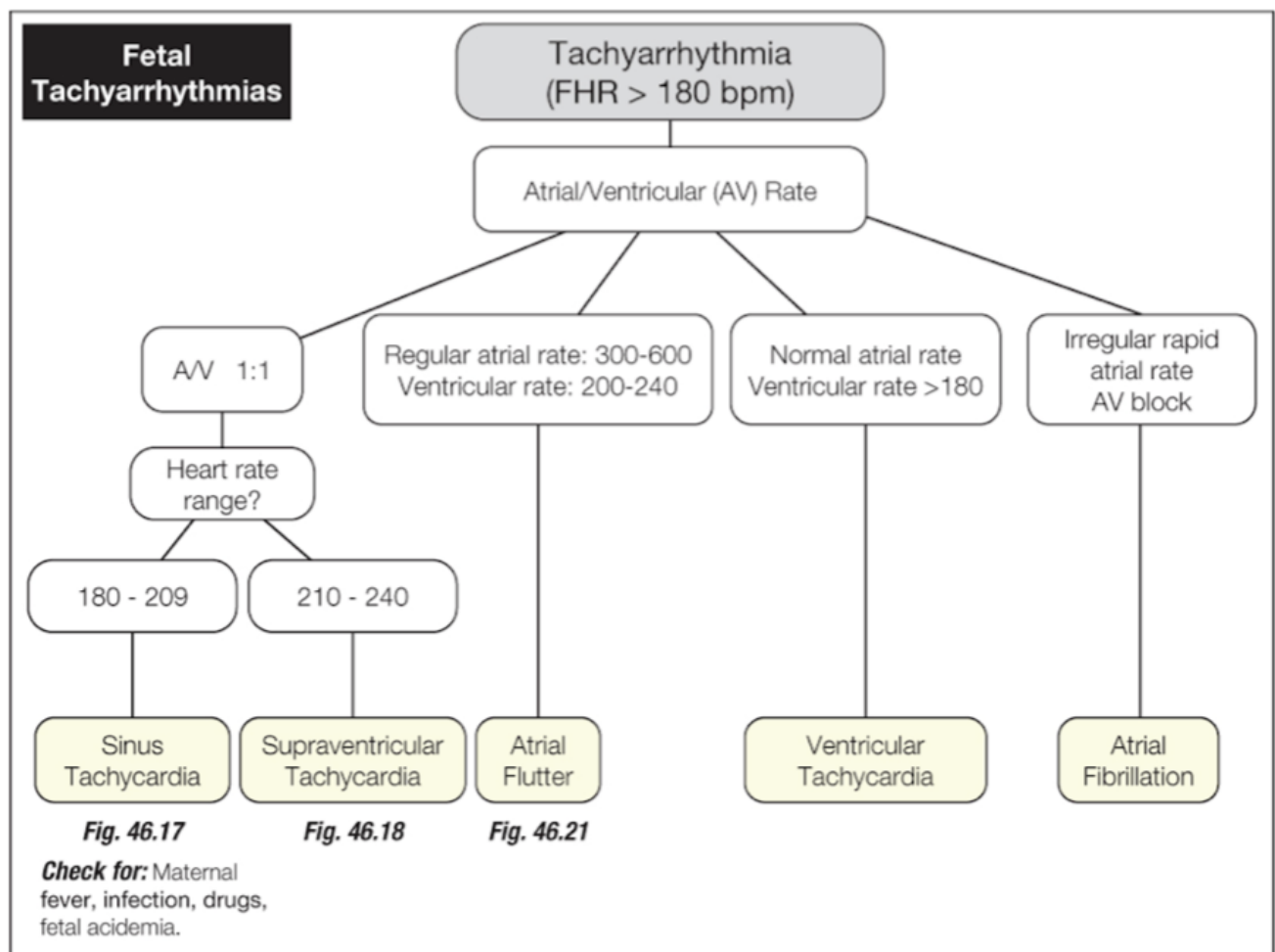
Example 2: Bigeminy blocked PAC with return to sinus rhythm at the end of the M-mode.

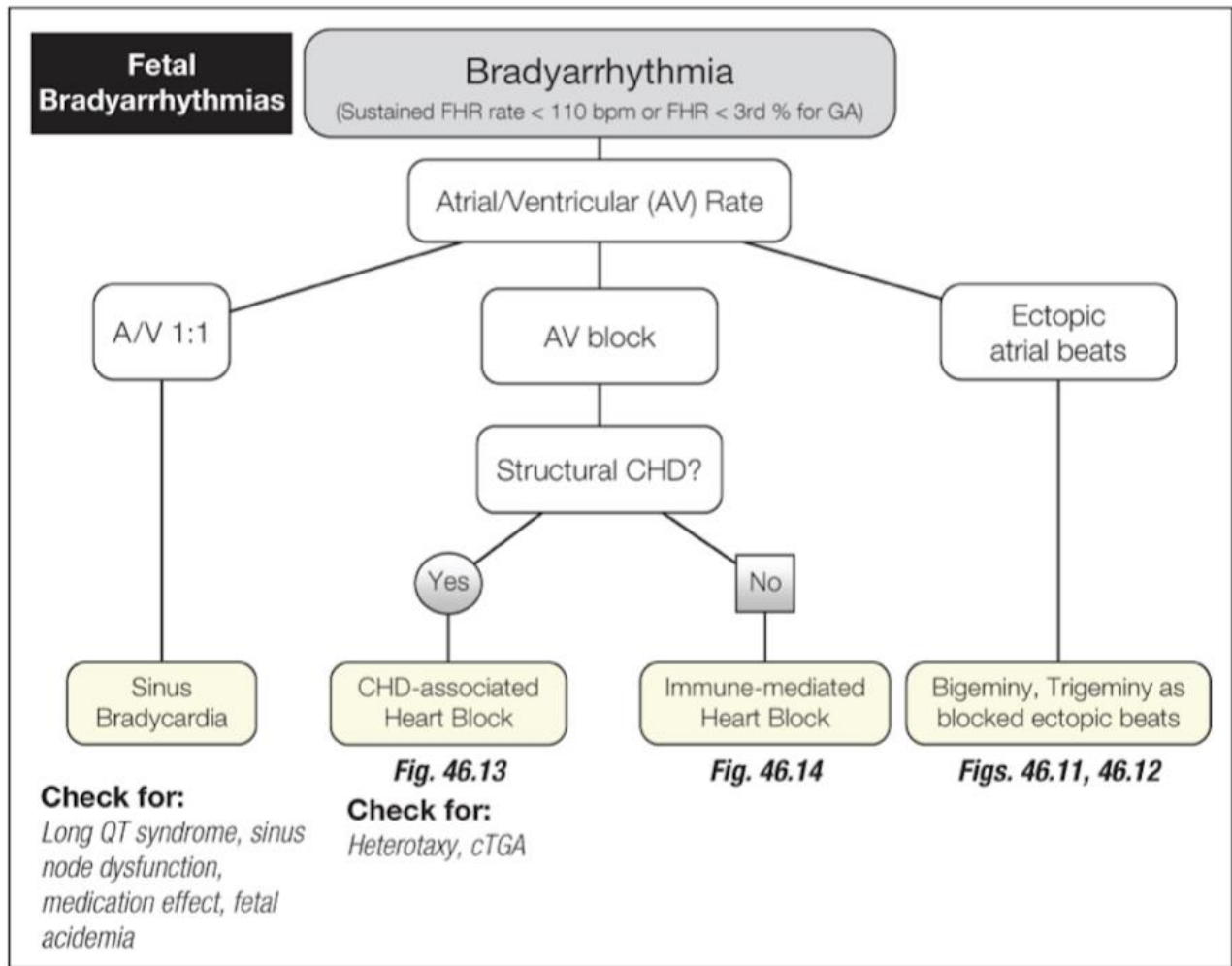
OTHER IRREGULAR RHYTHMS:

- **Sinus Tachycardia:** 1:1 ratio of atria to ventricular contraction. Heart rate of 180-200 bpm with preservation of heart rate variability (you should see active changes in the heart rate).
- **Supraventricular Tachycardia:** 1:1 ratio of atria to ventricular contraction with a *persistent* heart rate above 180 bpm, typically 210-240 bpm with lack of heart rate variability.
- **Atrial Flutter:** 2:1 ratio of atria to ventricular contraction in which the atrial contraction rate is 300-600 bpm with a slower ventricular rate, typically 220-240 bpm.
- **Sinus Bradycardia:** 1:1 ratio of atria to ventricular contractions with a heart rate less than 110 bpm.
- **Premature ventricular contractions (PVCs):** Very rarely will the ectopic beat originate from the ventricle. There will be regular atrial contractions and irregular ventricular rhythm.
- **Complete Atrioventricular Block (CABV/complete heart block):** When there is a dissociation between the atrial and ventricular contractions and ventricular bradycardia. Often seen in left atrial isomerism and congenitally corrected transposition of the great arteries.

OTHER IRREGULAR RHYTHMS continued:

- **First degree heart block:** Prolonged AV interval with a 1:1 ratio of atria to ventricular contractions with a PR interval of 150 milliseconds or greater
- **Second degree heart block:**
 - **Type 1:** Lengthening of the AV interval until one impulse is blocked, resulting in a slow, irregular heart rate
 - **Type 2:** Normal AV interval with blocked impulses, commonly resulting in 2:1 ratio of atria to ventricular contractions. The heart rate will be slow and regular.
- **Third degree heart block:** Complete interruption of the atria/ventricular conduction and the atria and ventricles beat independently. The ventricular heart rate will be regular and bradycardic.





FETAL ARRHYTHMIA PROTOCOL HISTORY

	Date	Changes made	By whom
Created	5/17/2022		
Updated	11/15/2022	New images and additional information.	Manjiri Dighe Annie Sauvage Renee B Fitz