**ATRIAL FIBRILLATION**

**GOAL**

The purpose in this blog is to review the characteristics and criteria of the Normal Sinus Rhythm and Atrial Fibrillation.

**General Concepts**

First let usreview the electrical characteristics and physiology of the rhythm strip of Normal Sinus Rhythm(NSR).

**Normal Sinus Rhythm**

**Overview Normal Sinus Rhythm: The salient points I wish to make regarding the normal sinus rhythm are as follows**:

1 . The source of the electrical signal is the SA node. It is automatically generated at a rate of 60-100 impulses per minute.

2 . The depolarization signal travels across the atrial myocardium in a wavelike manner generating the P-wave.

3 . The AV node is then depolarized, then propagates thru the Bundle of HIS.

4 . The septum is depolarized, then the right and left ventricles ---this produces the QRS complex . Notice the timing and direction of these wavefronts.

5 . The ventricular myocardium then repolarizes (generating the T-wave ) and the cycle repeats itself.

6 . The signal propagates slowly across the AV node causing a PR interval length of 0.12–0.20 sec.

7 . **The depolarization of the following special electrical conduction tissues:**(**produces only a tiny voltage and in fact they are so small that they are not visible on the standard rhythm strip.  (**Therefore, do not look for it, you will never find it.)

* SA node
* Atrial automaticity tissue
* AV node
* AV junction
* The HIS Bundle and all its branches
* Terminal Purkinje Cells

**PEARL**:

My streetsmart recommendation is to make a habit of photocopying the rhythm strip you are analyzing and freely mark on it with a pencil — trial and error indicating P-waves, QRS complexes, T-waves, where you believe the special electrical conduction tissues’ voltage would be (if it were visible) etc. This will give you the freedom to mark, spindle, erase, and mutilate the strip without injury to the original strip.

The animated diagram below demonstrates the development of the P-QRS-T waves Note the color coding and time sequence of each wave of depolarization and repolarization.

**COURTNEY\_\_\_Place adobe Flash of animated NSR here**

**Reminder regarding the Animations**:
To the **right**of each heart illustration are numbered bullets.  **Clicking**on each of these bullets, **one at a time**, will highlight the electrical activity of the heart as well as the corresponding tracing on the rhythm strip.  Each numbered bullet also has a corresponding set of labels which are hidden from view but will appear on the rhythm strip by clicking ” LABELS ” in the ” More Information ” rectangle in the lower right hand corner of the web page.

Also, remember that you can **review**material already covered by clicking on the arrows at the left-hand side of the screen to scroll up or down.

**Let us now deviate from the norm and more specifically outline the characteristics of Atrial Fibrillation.**

**Atrial Fibrillation**

We will consider the scenario where the atrial tissue does not follow the electrical properties as discussed above.[on the contrary, the ventricles tissues do follow the above rule]. Atrial fibrillation is characterized by the atrial automaticity tissues chaotically and randomly discharging at multiple foci (**electrically quivering**).  This break in the normal synchronous wavefront depolarization of the atrial myocardium will result in a “quivering of the baseline instead of a well formed P-wave”.  These are called fibrillation waves and are often seen merely as artifact-appearing voltages or nearly flatline signals.
Mechanically, the atrium is not contracting but is also quivering — however this is not synonymous with death, since the systolic blood pressure is supplied by the left ventricle.
The AV node is bombarded with random irregular signals from the atrium and responds to this bombardment with an irregularly-irregular rhythm.
The signal initiates its trip across the AV node, then the HIS bundle, all its branches and terminates in the Purkinje fibers, then propagates across the septum,LV and RV ventricle myocardium.  This occurs via the normal pathway and we would therefore expect the QRS to appear as NORMAL SHAPED.  This is indeed the case.

The other descriptive characteristics of atrial fibrillation relate to its rate of ventricular response:

Atrial Fibrillation with rapid ventricular response (average >100 bpm)
Atrial Fibrillation with slow ventricular response (average <60 bpm)
Atrial Fibrillation with controlled ventricular response (average 60- 100 bpm)

We therefore conclude that the characteristics of atrial fibrillation are as follows:

1. Absent P-waves
2. Irregularly-irregular rhythm (accordion-like) with normal shaped QRS complexes

Let us view the electrical activity of the atria and ventricles in the form of an animated graphic arts diagram as shown below. The electrical and mechanical activity of the atrium is demonstrated as a “quivering” mass in the animated diagram shown below. You will recall that in NSR the Left/Right atrium contract during diastole and empty their contents into the Left/Right chambers respectively. In AF, the atria do not empty as efficiently and the hemodynamics is compromised. ------- |\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_---------------------------------------------------------------------------\

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**CLINICAL PEARL**

You will frequently find it to be challenging to make the diagnosis of atrial fibrillation in the setting of severe tachycardia ( > 150 bpm ). This is because it is more difficult to appreciate the rate fluctuations, presence or absence of P-waves and presence or absence of a pattern. In this circumstance my advice is as follows :

Ask for a 2 minute rhythm strip, spread it out on the desk or floor and meticulous look for a pattern. If there is none and there are no P-waves >->->->->-> it is

 atrial fibrillation with rapid ventricular response.

**RISKS ASSOCIATED WITH ATRIAL FIBRILLATION**

1…..syncope

2…..dizziness

3…..weakness

4…..angina

5…..pulmonary embolus

6…..Thrombotic embolus (potentially to any artery)

7…..TIA

8…..CVA

9…..CHF

10…..MI

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**TREATMENT OPTIONS**

1…..Medications

a…Goal to convert to NSR if possible.

 b…Goal to decrease or increase rate.

 c…Anticoagulant/antiplatelets to prevent/stabilize mural thrombus.

2…..Surgery (Including ablation therapy)

3…..Consider electrical cardioversion.

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**DISORDERS ASSOCIATED WITH ATRIAL FIBRILLATION**

1…..Hypertension

2…..ASCVD

3…..Hx MI

4…..Hypoxemia

5…..sepsis

6…..infection

7…..Hx Rheumatic Fever

8…..WPW

9…...Cardiac valvular disease

19….Diabetes mellitus

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