November 8, 2013
Special Lecture

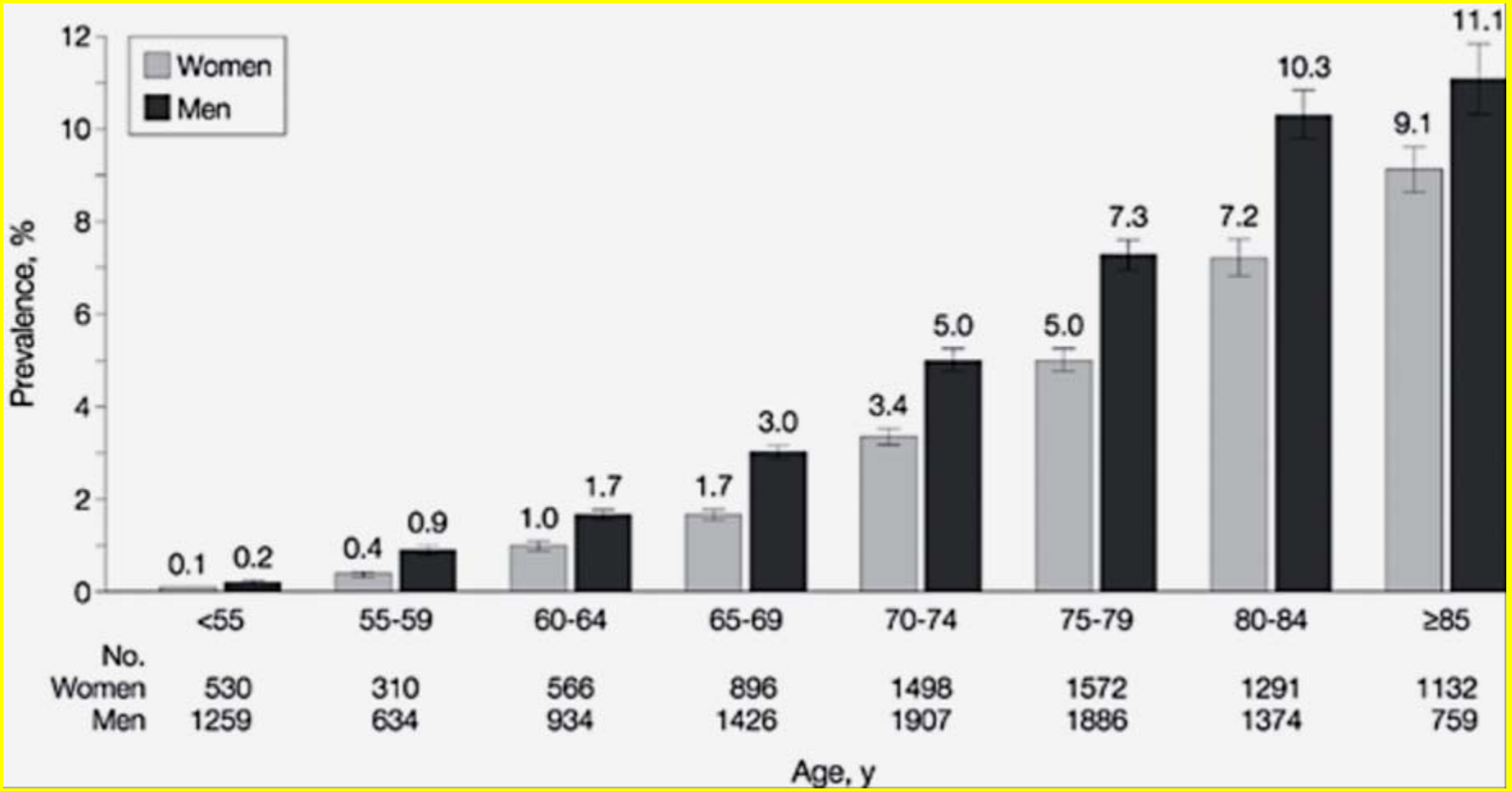
Atrial Fibrillation (AFib)

No p-waves and irregular R-R intervals

Dr. HN Mayrovitz

From: **Prevalence of Diagnosed Atrial Fibrillation in Adults: National Implications for Rhythm Management and Stroke Prevention: the AnTicoagulation and Risk Factors In Atrial Fibrillation (ATRIA) Study**

JAMA. 2001;285(18):2370-2375.



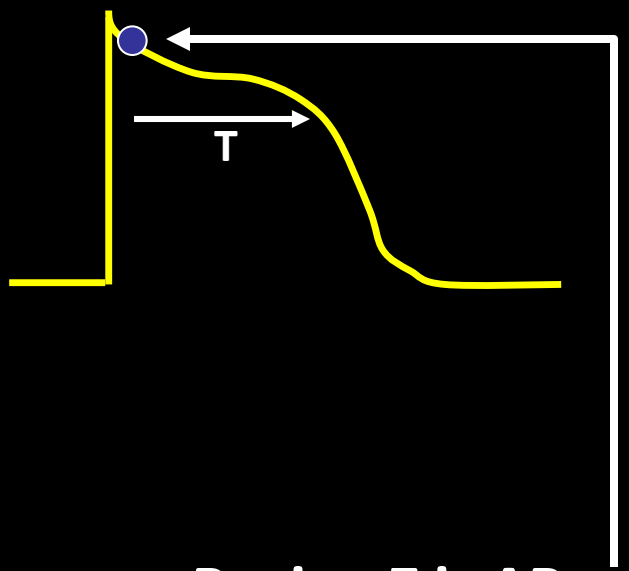
AFib Initiation and Maintenance

Major role of:
- **Ectopic Impulses**
- **Reentry Processes**

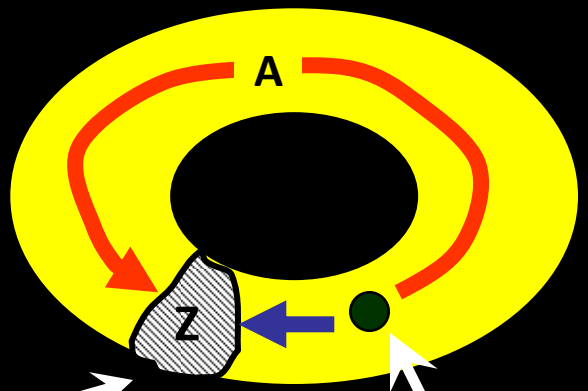
Goals
- **Summarize underlying physiology**
- **Show pathways**
- **Link to EKG**
- **Comparison to atrial flutter**

Underlying Physiology

Atrial Ectopic Impulses With Reentry



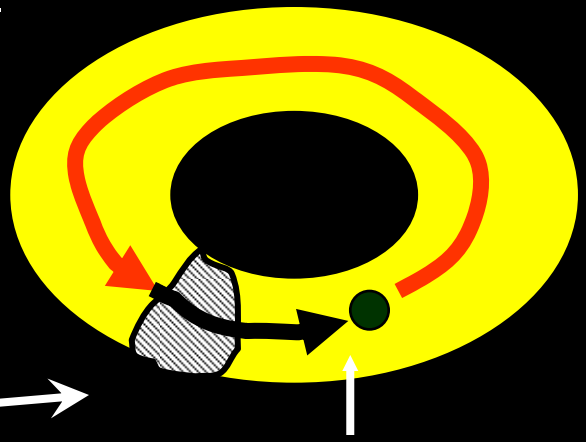
T = v x L



Region Z is AR when impulse starts

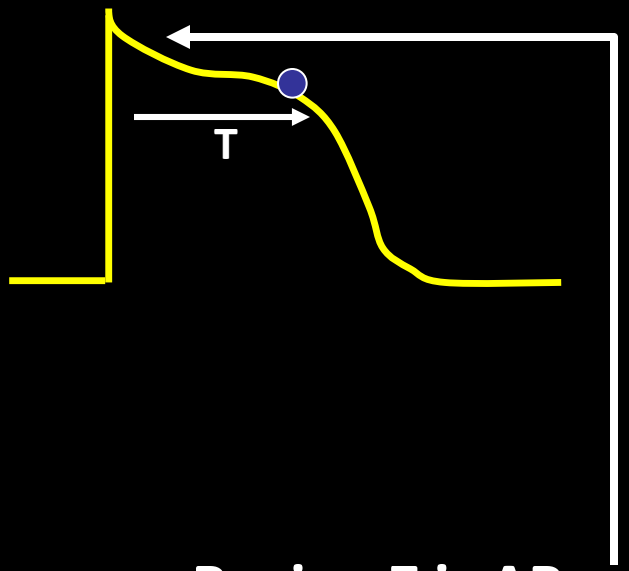
Ectopic impulse occurs between two consecutive normal SA impulses

If A reaches Z when Z no longer AR then may conduct through

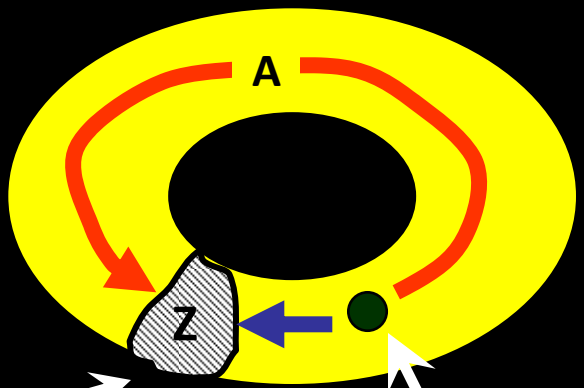


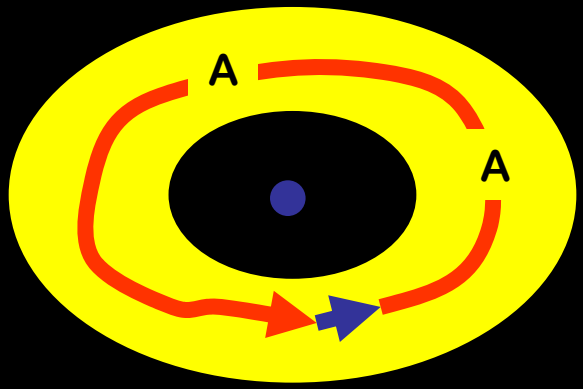
Reentry

Atrial Ectopic Impulses With Reentry



T = v x L





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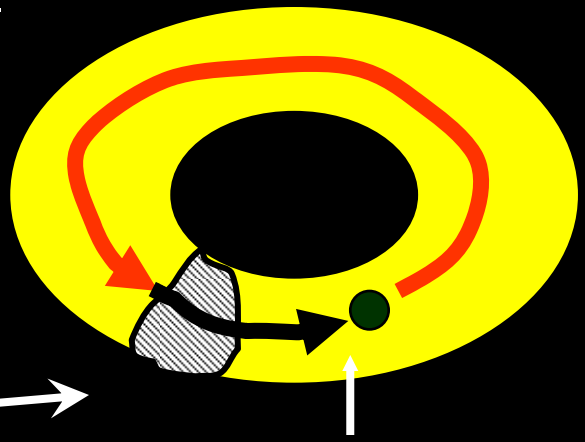
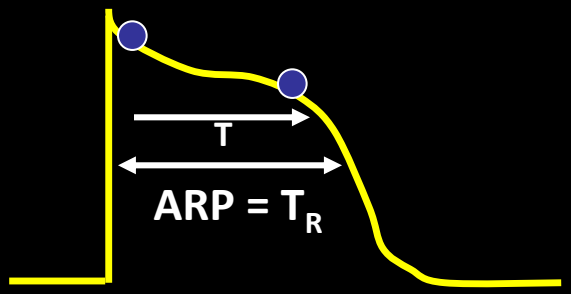


Reentry

Factors Tending to Promote Re-entry

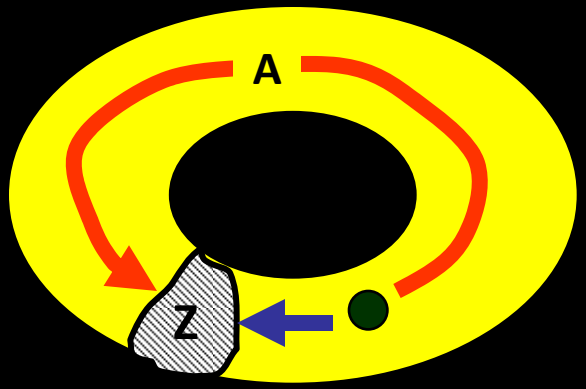


If v x L < T_R: Snuffed

If v x L > T_R: Reentry

- Decreased v
- Increased L
- Decreased T_R

$T = v \times L$

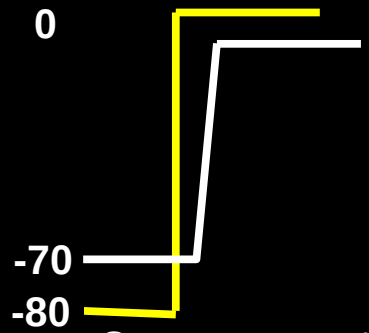


T_R is decreased

$\uparrow I_K$ $\downarrow I_{Ca}$

L is increased if Atria Enlarge

- Tissue Fibrosis
- $\downarrow I_{Na}$
  - $\downarrow$ dVm/dt
  - $\downarrow$ AP amp



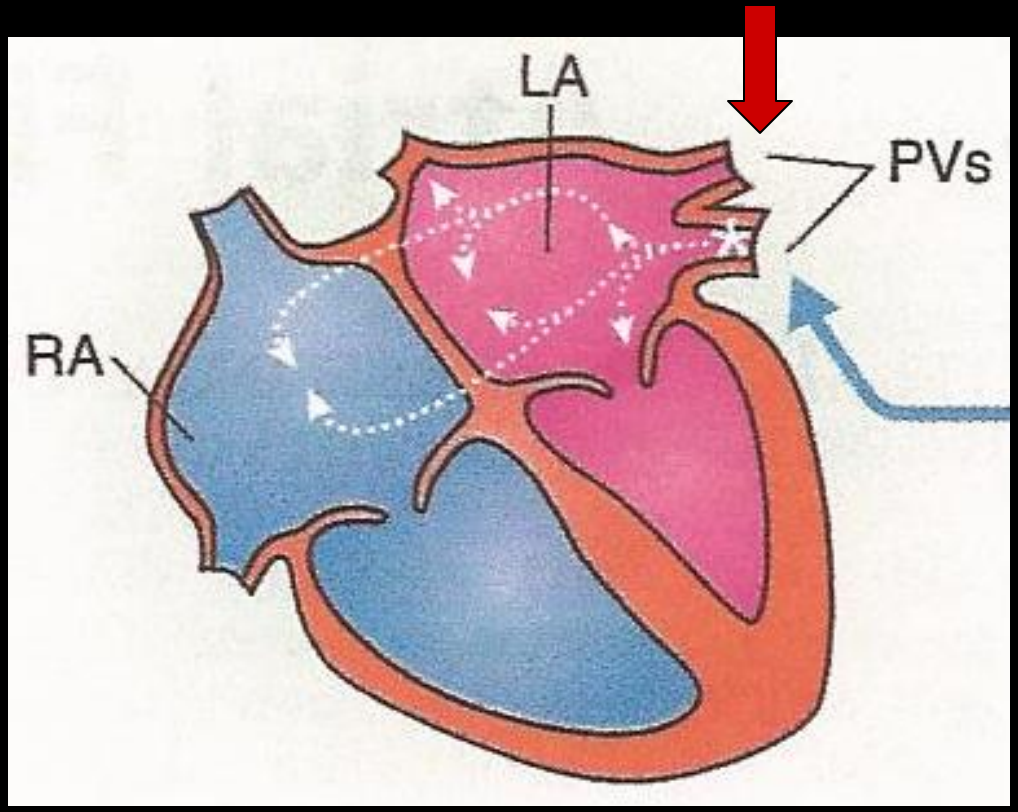
All indicated directional change favor Reentry phenomena including AFib

Excitation Events and Pathways

- Rapidly discharging ectopic focus
- Single reentrant pathway
- Multiple reentrant pathways

Rapidly Discharging Ectopic Foci

Ostia embryonic origins similar to SA and AV node tissue
Aging or disease may "re-ignite" spontaneous depolarizations

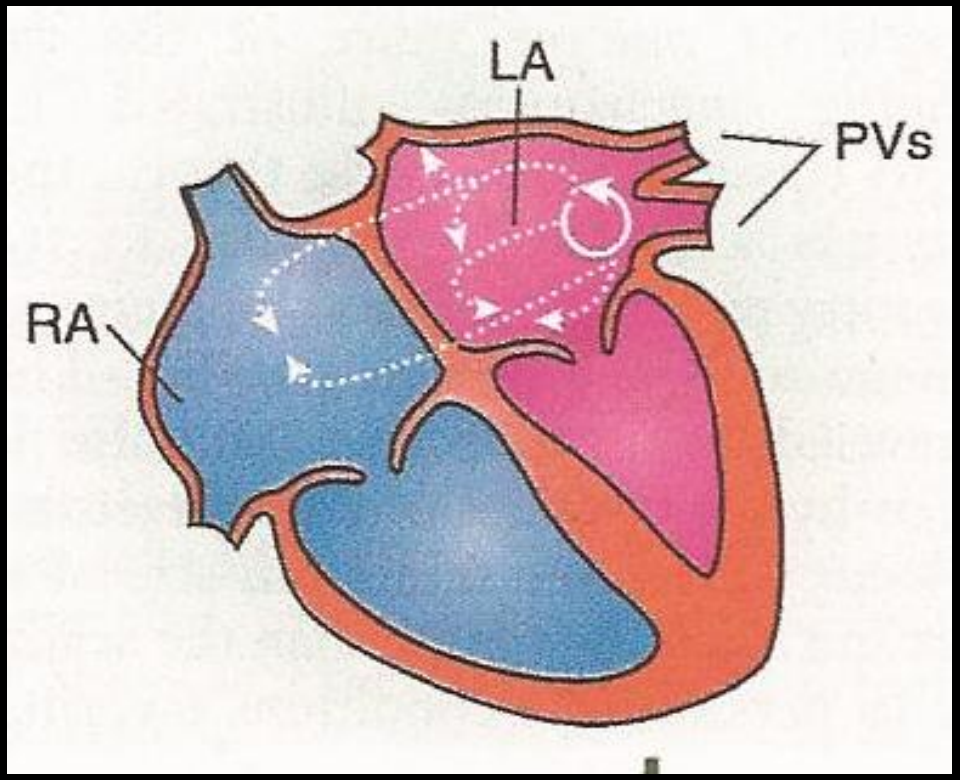


Mechanisms

DAD
EAD
+ Automaticity

Single or Multiple Ectopic Foci

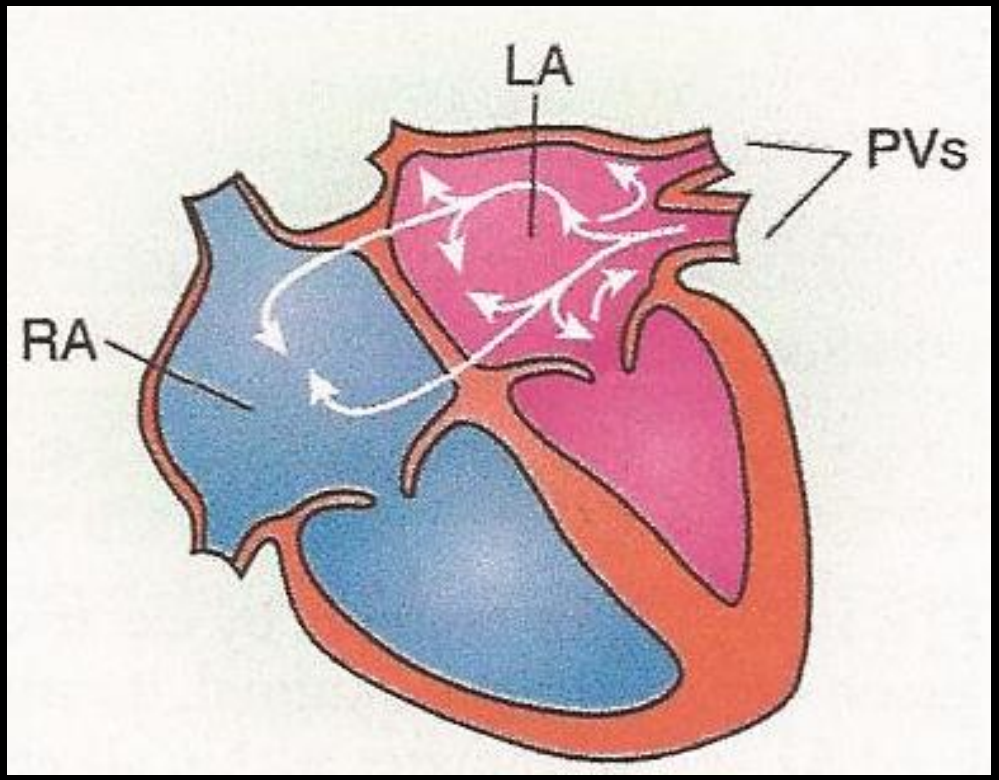
Single Circuit Reentry



Mechanisms

- Ectopic Focus
- Triggers
- Reentrant Arrhythmia

Multiple Circuit Reentry



Mechanisms

Ectopic Foci Trigger Multiple Reentrant Arrhythmias

GUIDANT

Atrial Fibrillation

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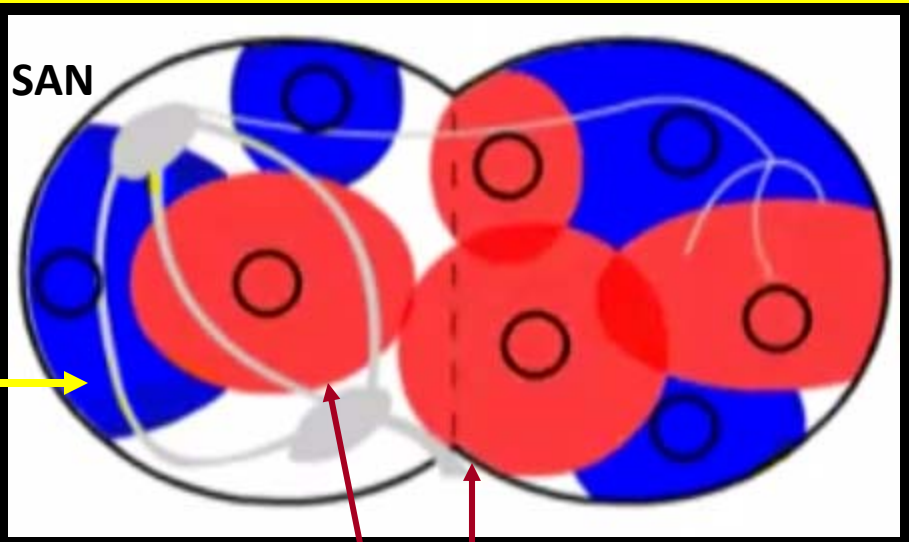
Summary
AFib FeatureS and EKG Manifestations

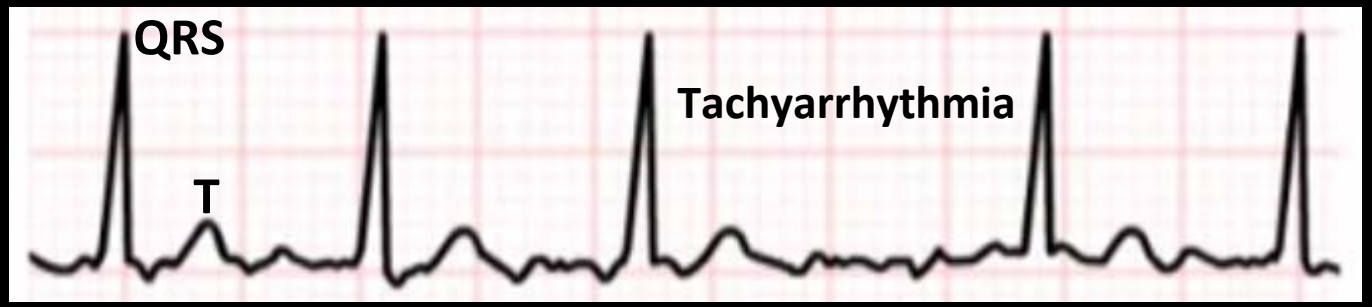
AFib Features and EKG Patterns

Depolarizing "wavelets"



Chaotic Pattern of localized depolarization regions

Refractory



"f-waves"

Chaotic disturbance of the normal isoelectric line

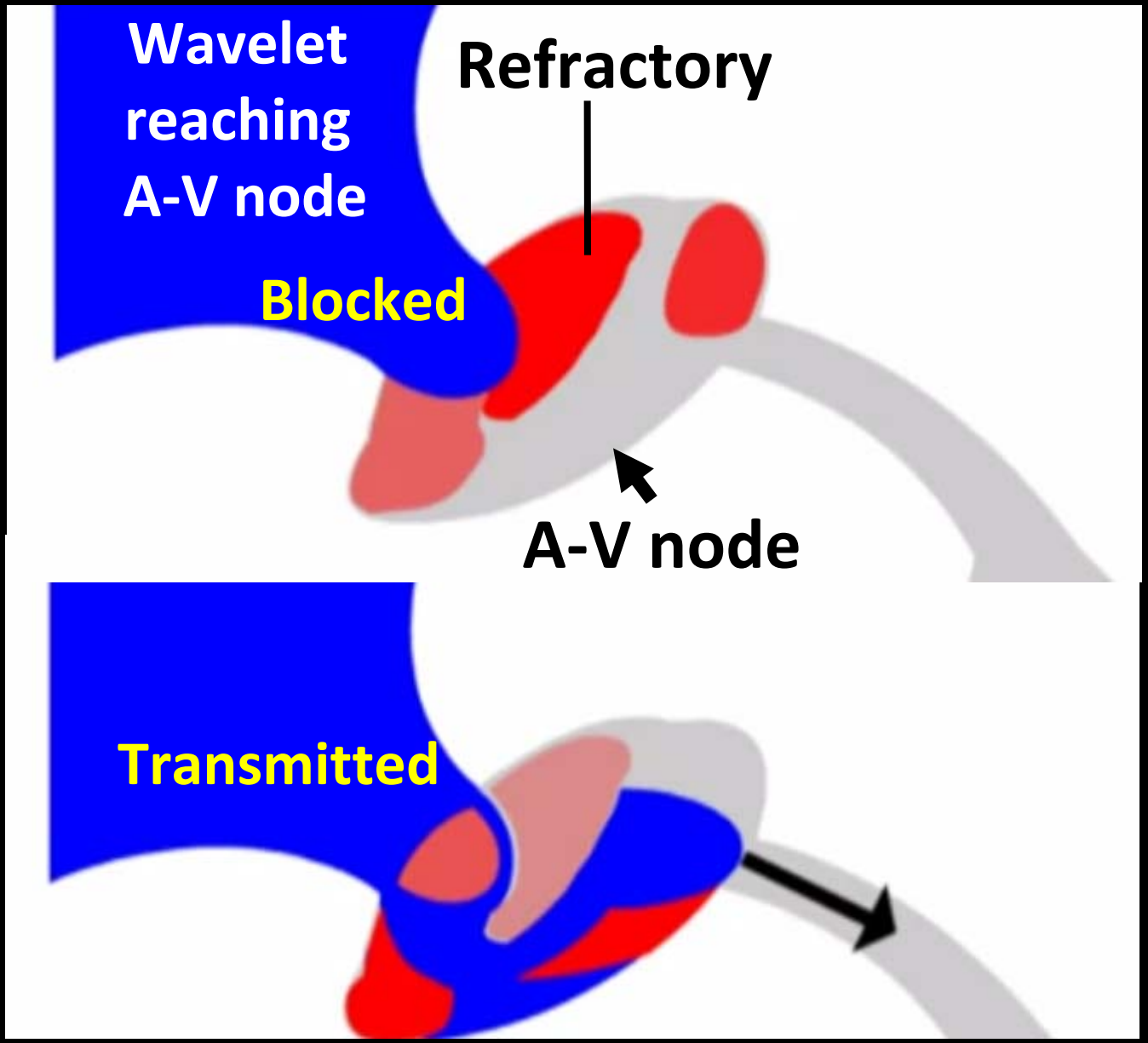
Disturbance amount depends on # of depolarizing sites

AFib Features and EKG Patterns

No p-waves and irregular R-R intervals

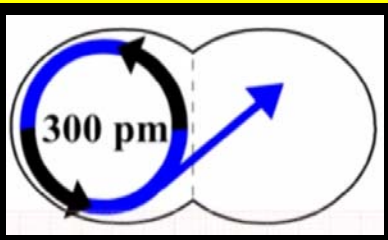
- Multiple atrial ectopic foci firing randomly
- Variable and erratic transmission through the AV node
- No organized atrial contraction
- Depolarization rates ~300-500 (400-700) per/min
- Heart disease (ischemic, hypertensive, CHF)

A-V Node Transmit or Block?



Atrial Flutter - Overview

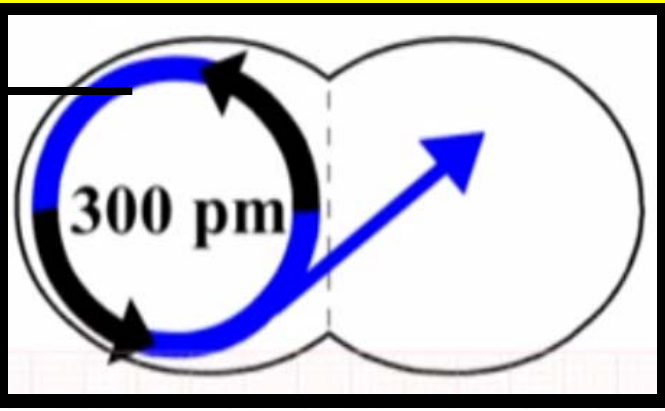
EKG picks up ectopic p-waves but only 1 in 4 gets through the AV node



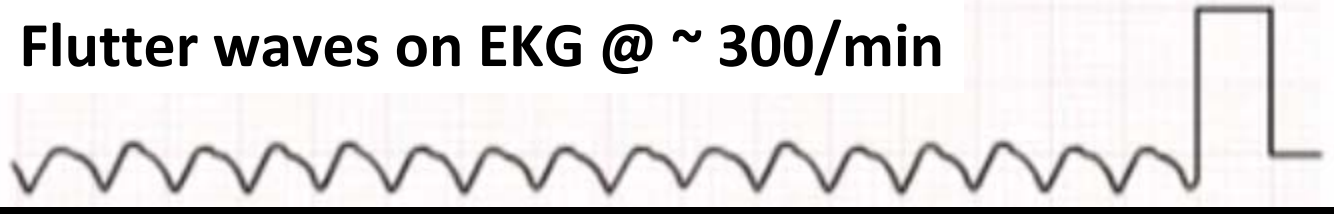
Often single Ectopic focus e.g. DAD)

- Atrial ectopic focus firing repetitively with variable transmission through the AV node.
- Atrial depolarization & contraction well coordinated
- Typical rates ~200-300 bpm
- Here – AV node responds to ¼ impulses

Atrial Flutter - Process

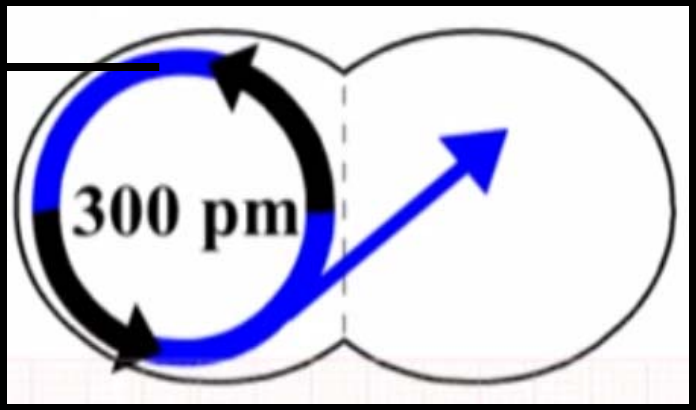


Flutter waves on EKG @ ~ 300/min



If all flutter waves passed through A-V – no time to fill!

Atrial Flutter Transmission Differences



Healthy A-V node

In the 2:1 case what is the HR?

May make diagnosis of atrial flutter more difficult!

Thank you
For your
Attention

Questions?