

A high-speed photograph of a water splash forming a heart shape. The water is clear and glistening, with several droplets captured in mid-air around the central heart. The background is a soft, light blue gradient.

AVNRT

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AV Nodal Re-entrant Tachycardia

♥ Re-entrant rhythm confined
to the AV node

A large, clear water droplet is captured in mid-fall, just above a pool of water. The droplet is perfectly spherical and highly reflective, showing highlights and shadows. As it hits the water, it creates a complex splash with multiple smaller droplets and a crown-like structure of water rising around the point of impact. The background is a soft, light blue gradient, and the overall scene is brightly lit, emphasizing the clarity and movement of the water.



♥ The most common regular tachycardia

♥ Seen in all age groups although symptoms typically start after 20 years of age

♥ Seen in both genders but more common in females

♥ Usually occurs in the absence of structural heart disease

♥ Rates 150 – 250 bpm

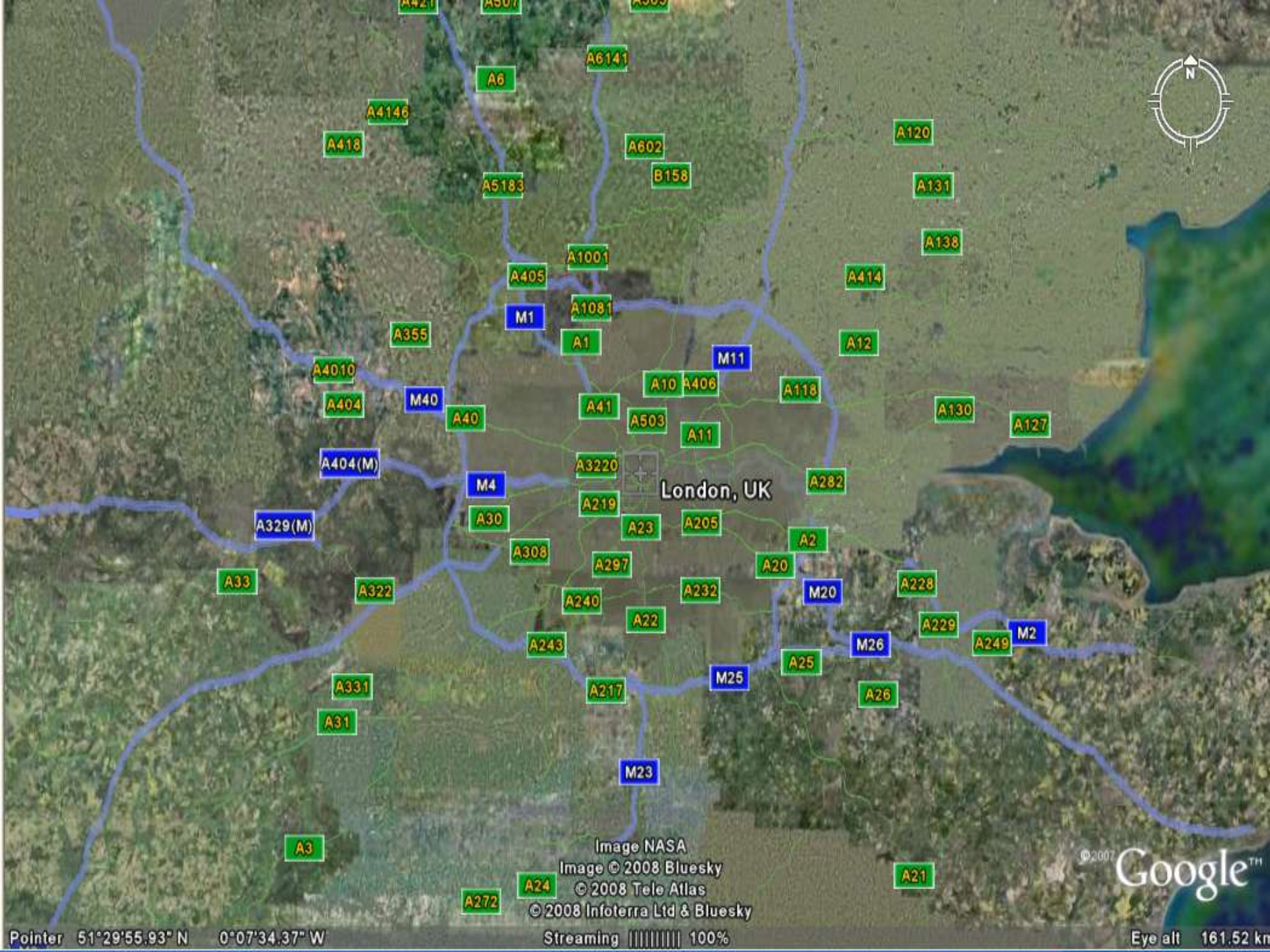
AV Node



♥ First described in 1906

♥ Remains somewhat ill understood

♥ The AV node consists of a complex of fibres interposed between true atrial fibres and the His bundle.



London, UK

Image NASA

Image © 2008 Bluesky

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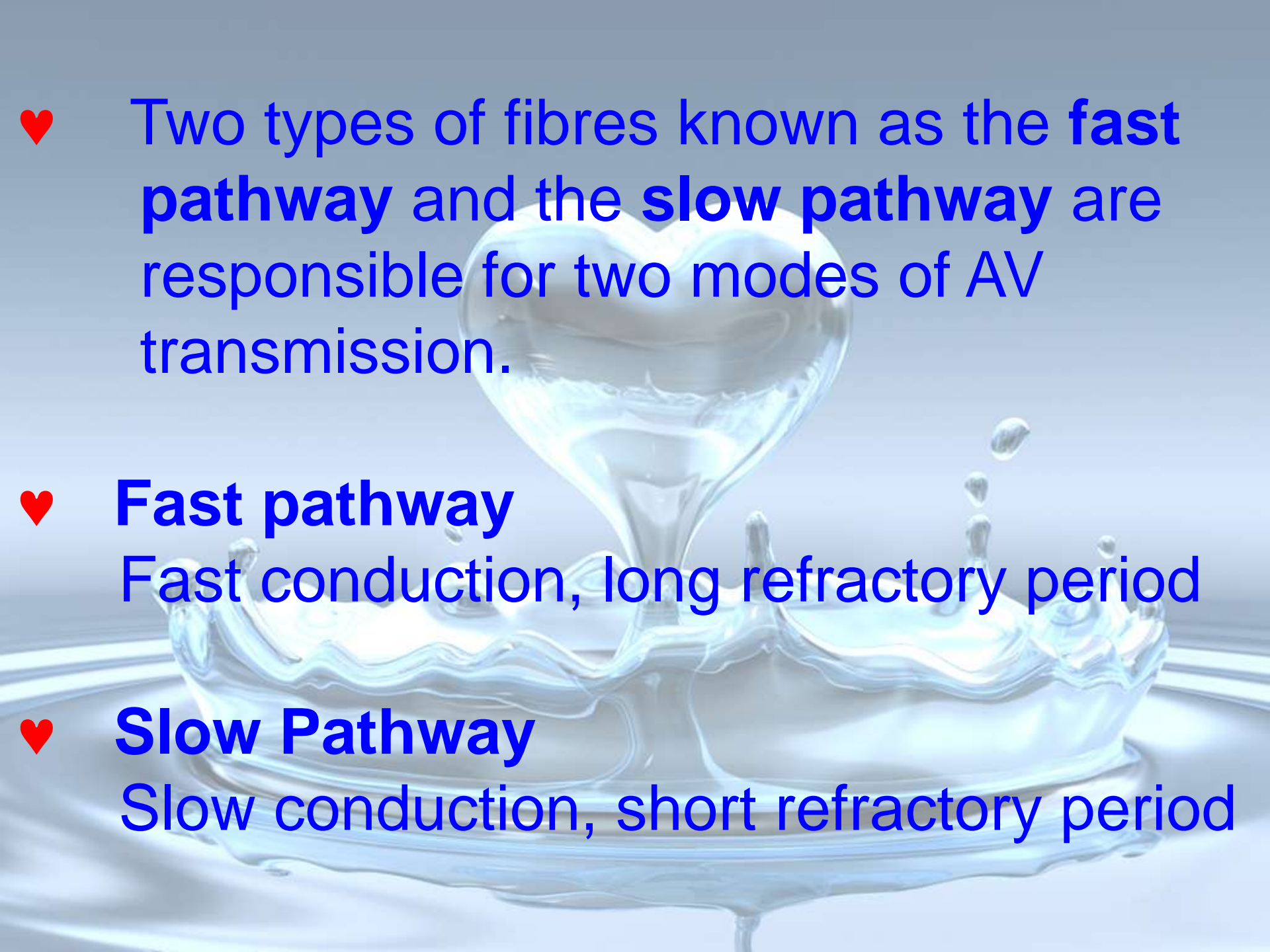
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Pointer 51°29'55.93" N 0°07'34.37" W

Streaming ||||| 100%

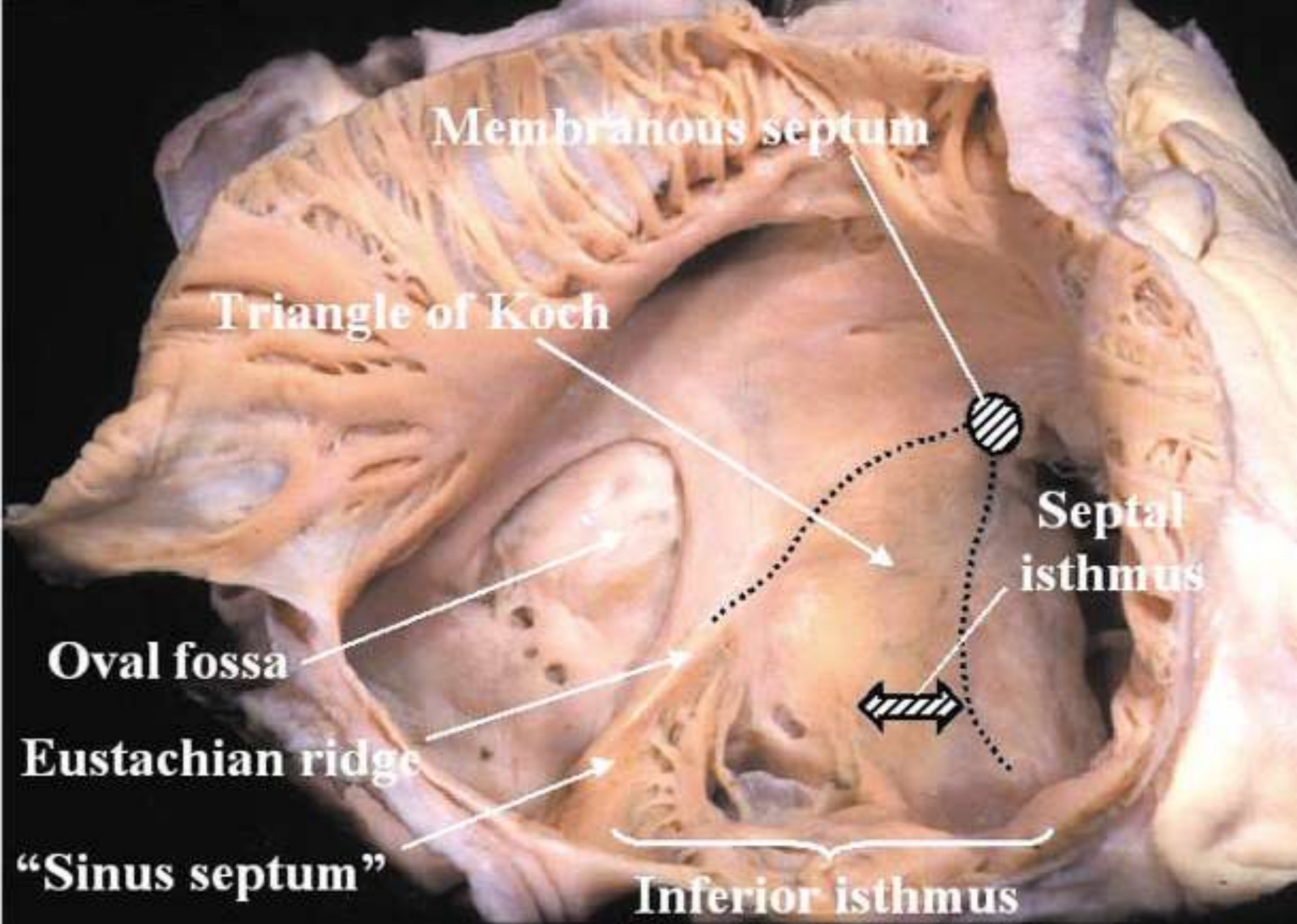
Eye alt 161.52 km



♥ Two types of fibres known as the **fast pathway** and the **slow pathway** are responsible for two modes of AV transmission.

♥ **Fast pathway**
Fast conduction, long refractory period

♥ **Slow Pathway**
Slow conduction, short refractory period



Membranous septum

Triangle of Koch

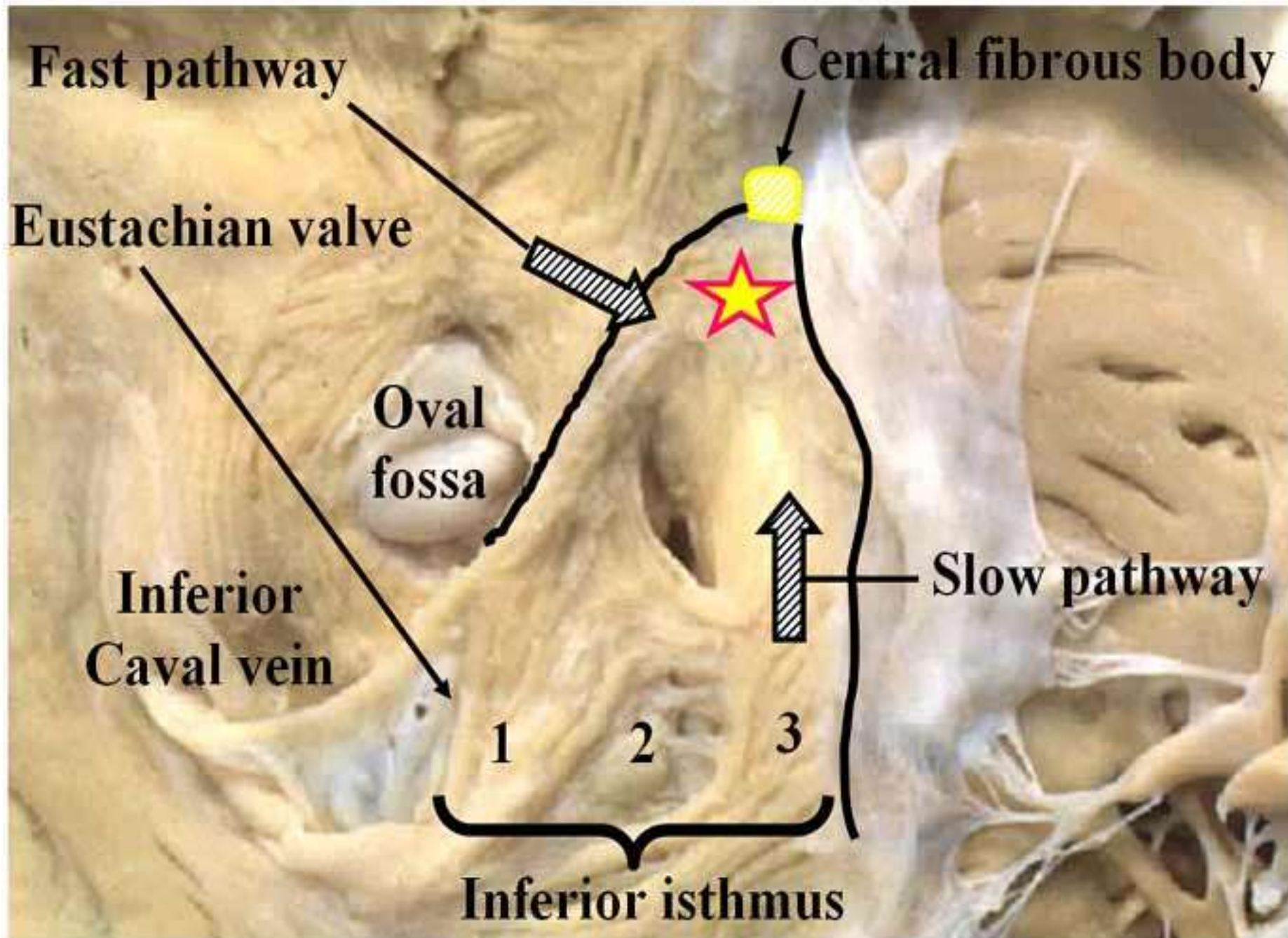
Oval fossa

Eustachian ridge

“Sinus septum”

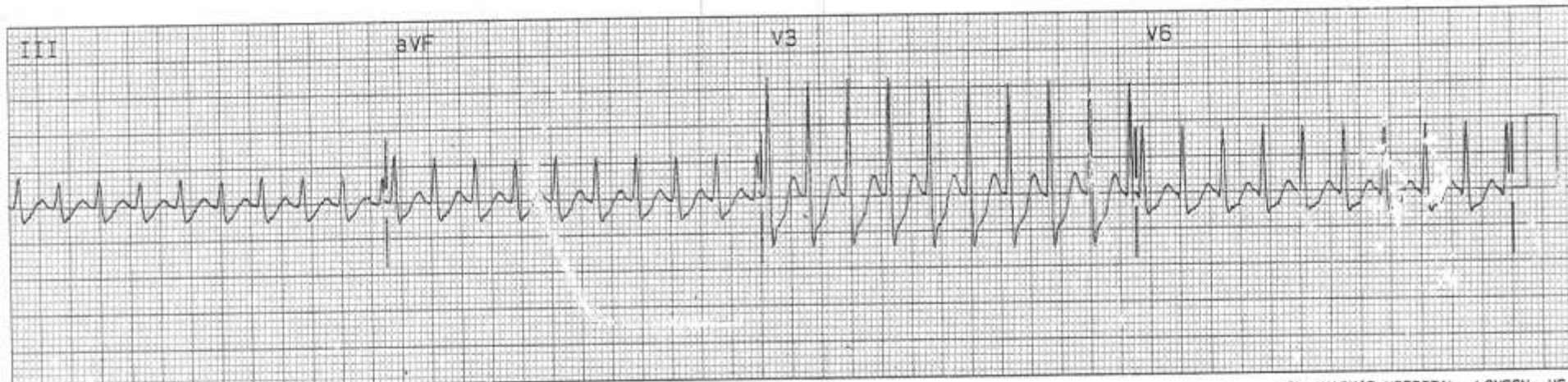
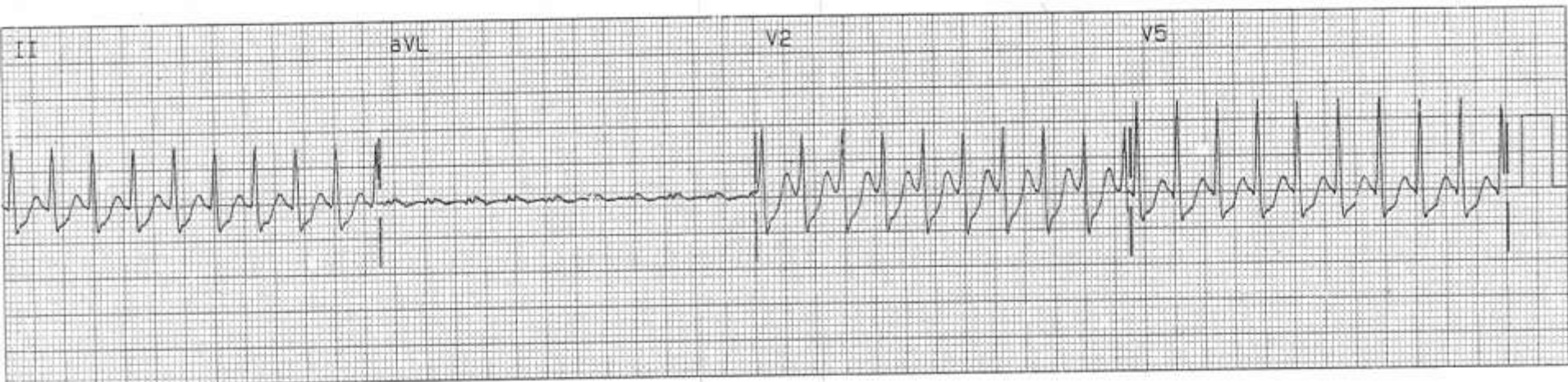
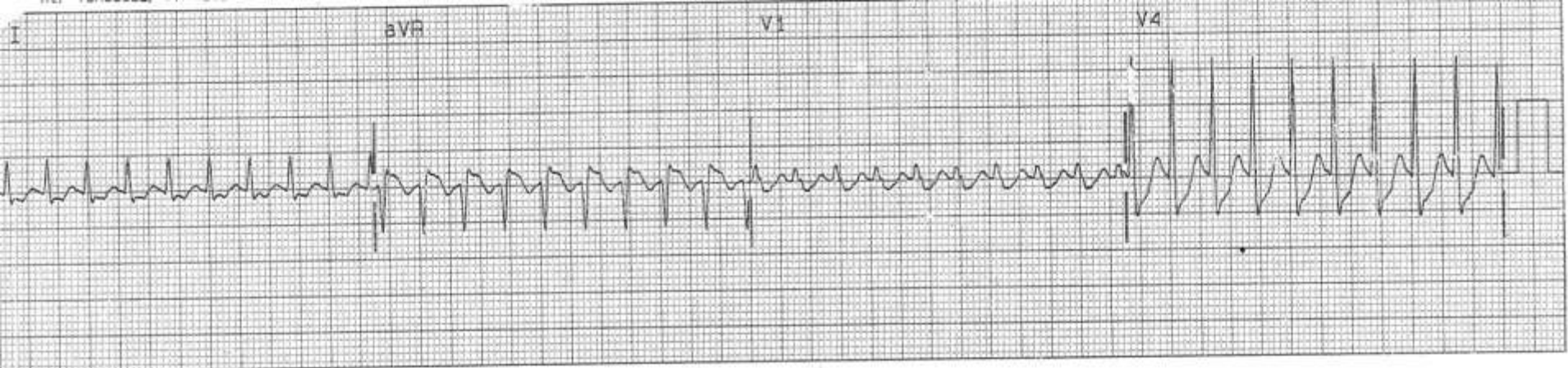
Septal isthmus

Inferior isthmus



Induction Mechanism

- ♥ Known as dual AV nodal physiology
- ♥ The fast and slow fibres form the circuit for AVNRT
- ♥ Atrial premature stimuli conduct first via the fast pathway but then switch to the slow pathway when very premature.



Differential Diagnosis



♥ Atrial tachycardia

♥ AVNRT

♥ AV re-entrant tachycardia
(AVRT)

♥ Atrial flutter

The 12-Lead ECG in AVNRT



♥ **Narrow complex tachycardia.**

A narrow QRS is produced when the ventricles are activated rapidly by the specialised His-Purkinje system.

♥ Each revolution of the circuit generates an impulse that exits the AV node via the His bundle to activate the ventricles.

Exceptions

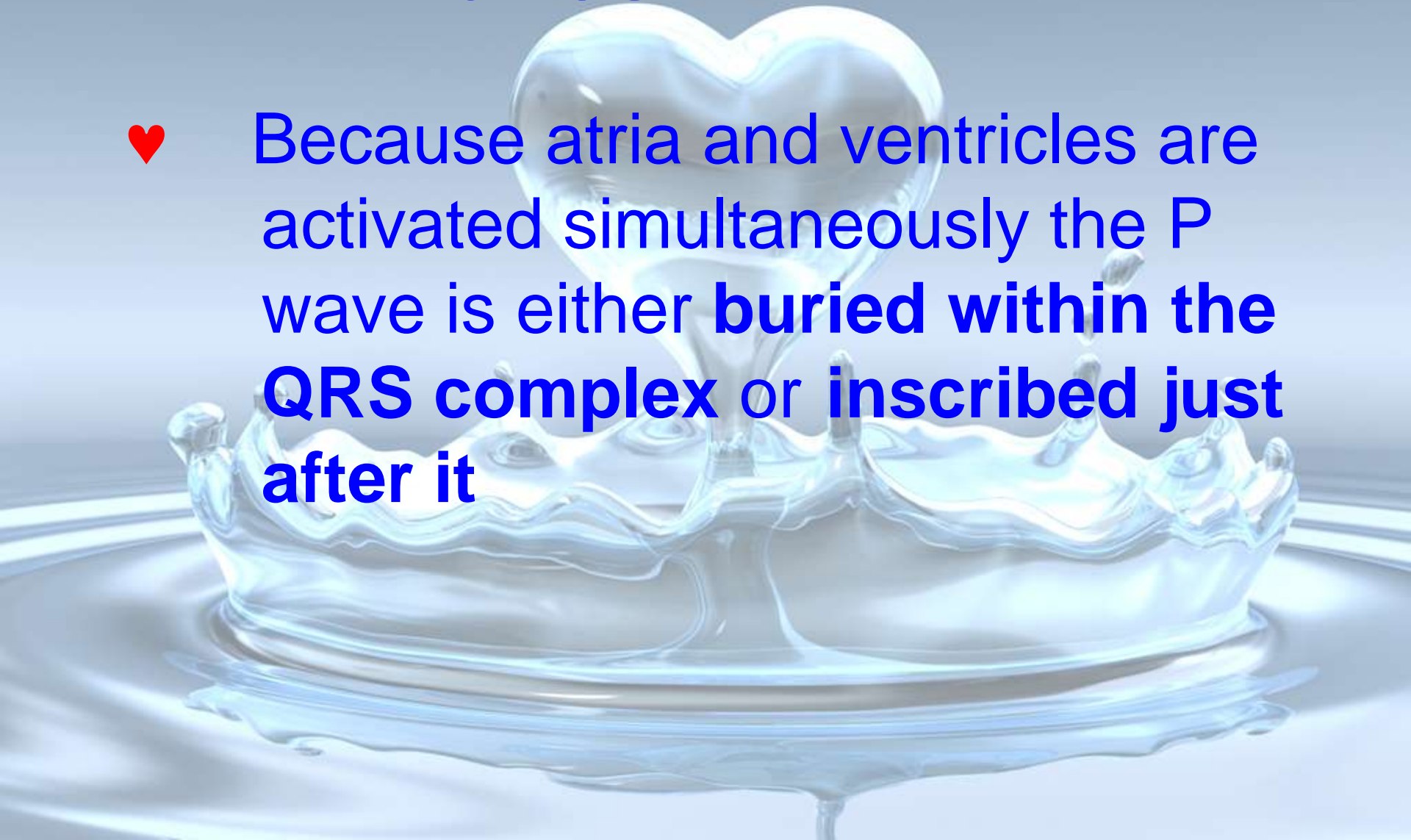
The QRS in AVNRT can occasionally be broad if:

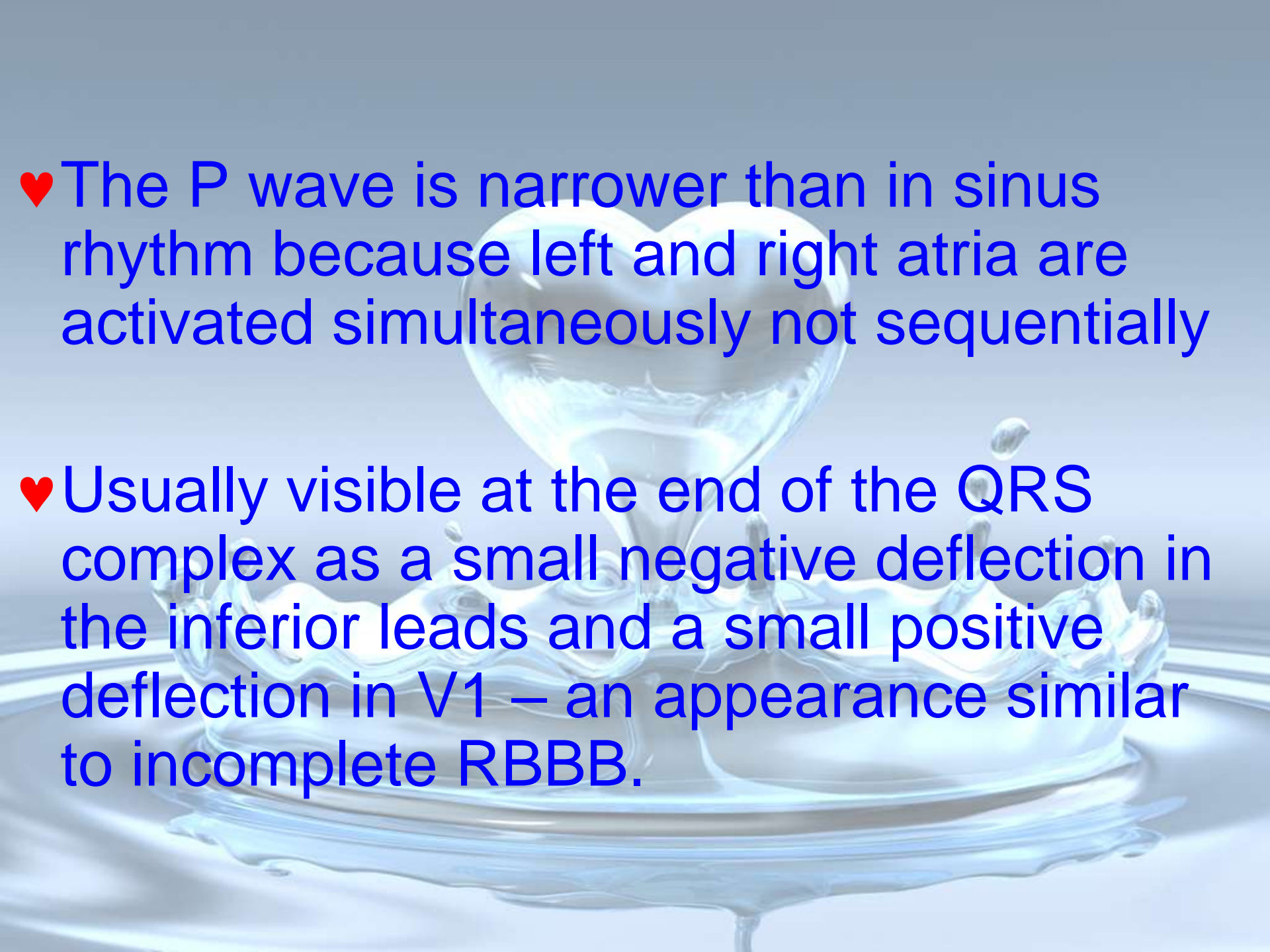
- ♥ Part of the His-Purkinje system fails to cope with the high rate (rate related bundle branch block)
- ♥ or where there is pre-existing conduction system disease.

P waves in AVNRT

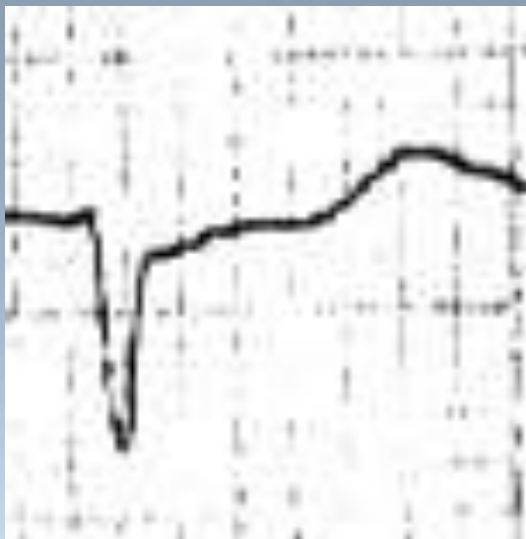


Because atria and ventricles are activated simultaneously the P wave is either **buried within the QRS complex** or **inscribed just after it**

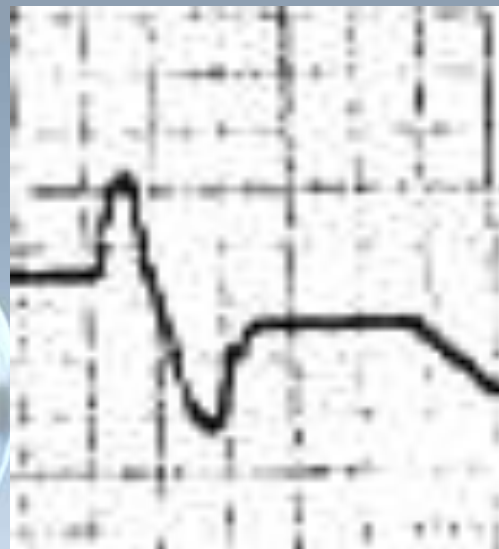


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- ♥ The P wave is narrower than in sinus rhythm because left and right atria are activated simultaneously not sequentially
 - ♥ Usually visible at the end of the QRS complex as a small negative deflection in the inferior leads and a small positive deflection in V1 – an appearance similar to incomplete RBBB.

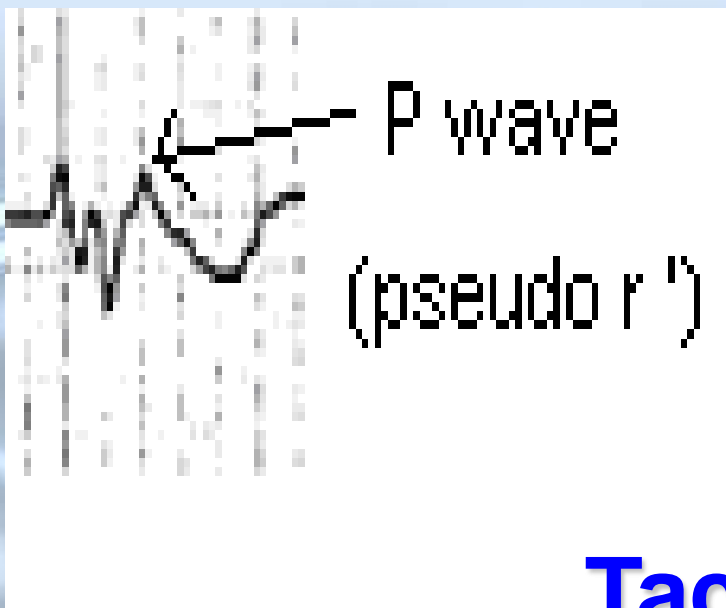
Sinus rhythm



Lead V1



Lead III

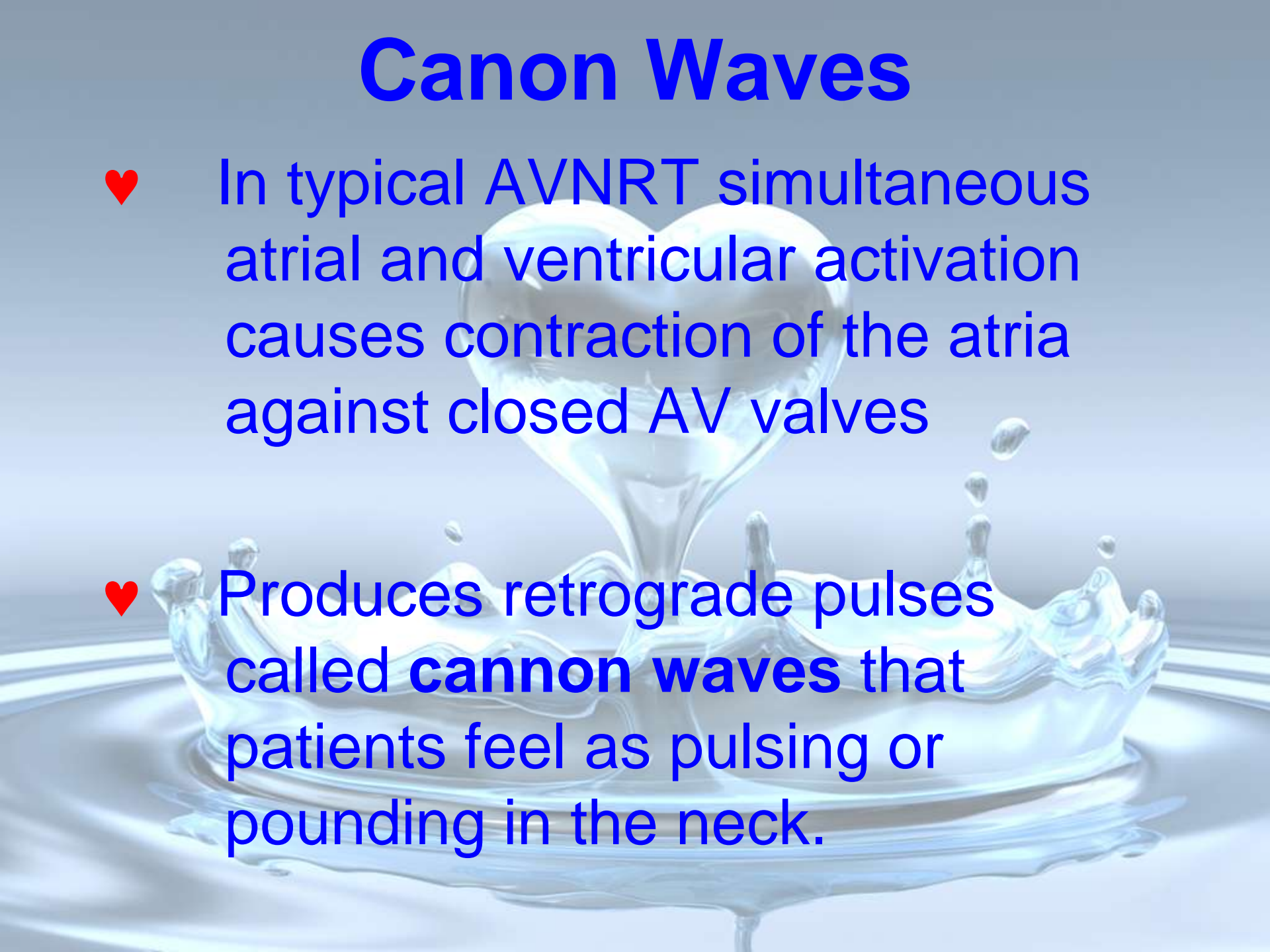


Tachycardia



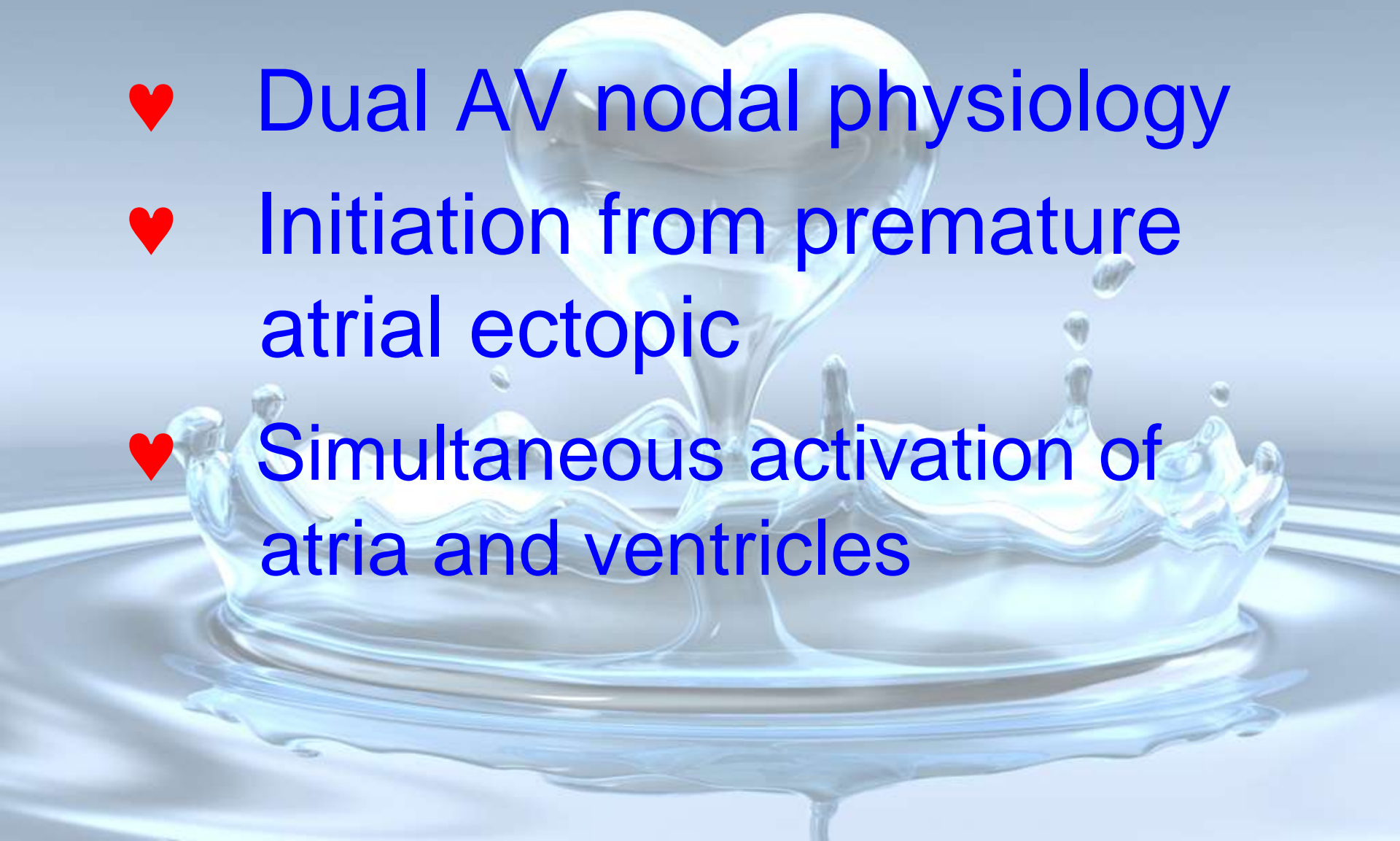
Canon Waves

- ♥ In typical AVNRT simultaneous atrial and ventricular activation causes contraction of the atria against closed AV valves
- ♥ Produces retrograde pulses called **cannon waves** that patients feel as pulsing or pounding in the neck.



AVNRT and EP

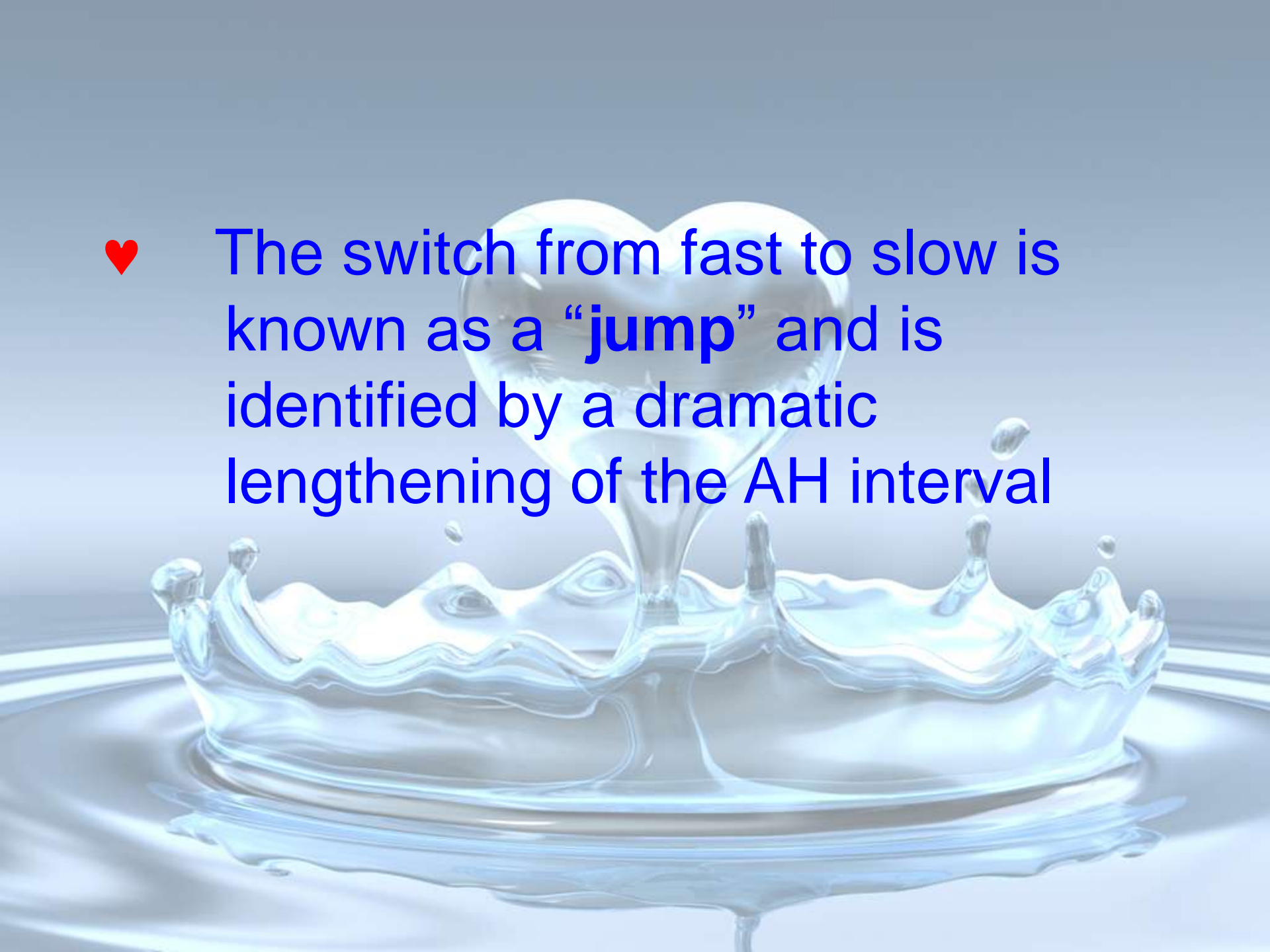
- ♥ Dual AV nodal physiology
- ♥ Initiation from premature atrial ectopic
- ♥ Simultaneous activation of atria and ventricles

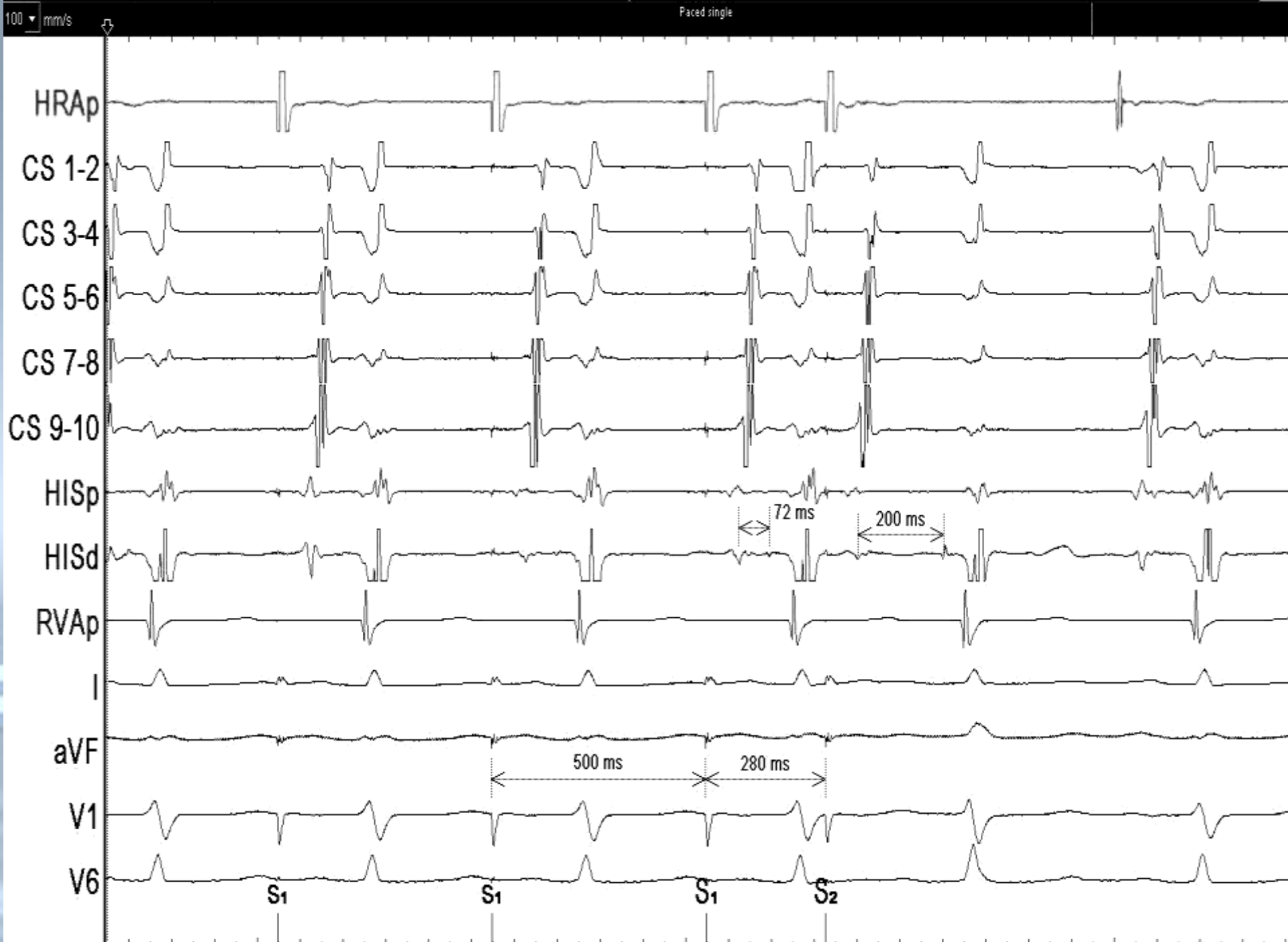






The switch from fast to slow is known as a “**jump**” and is identified by a dramatic lengthening of the AH interval



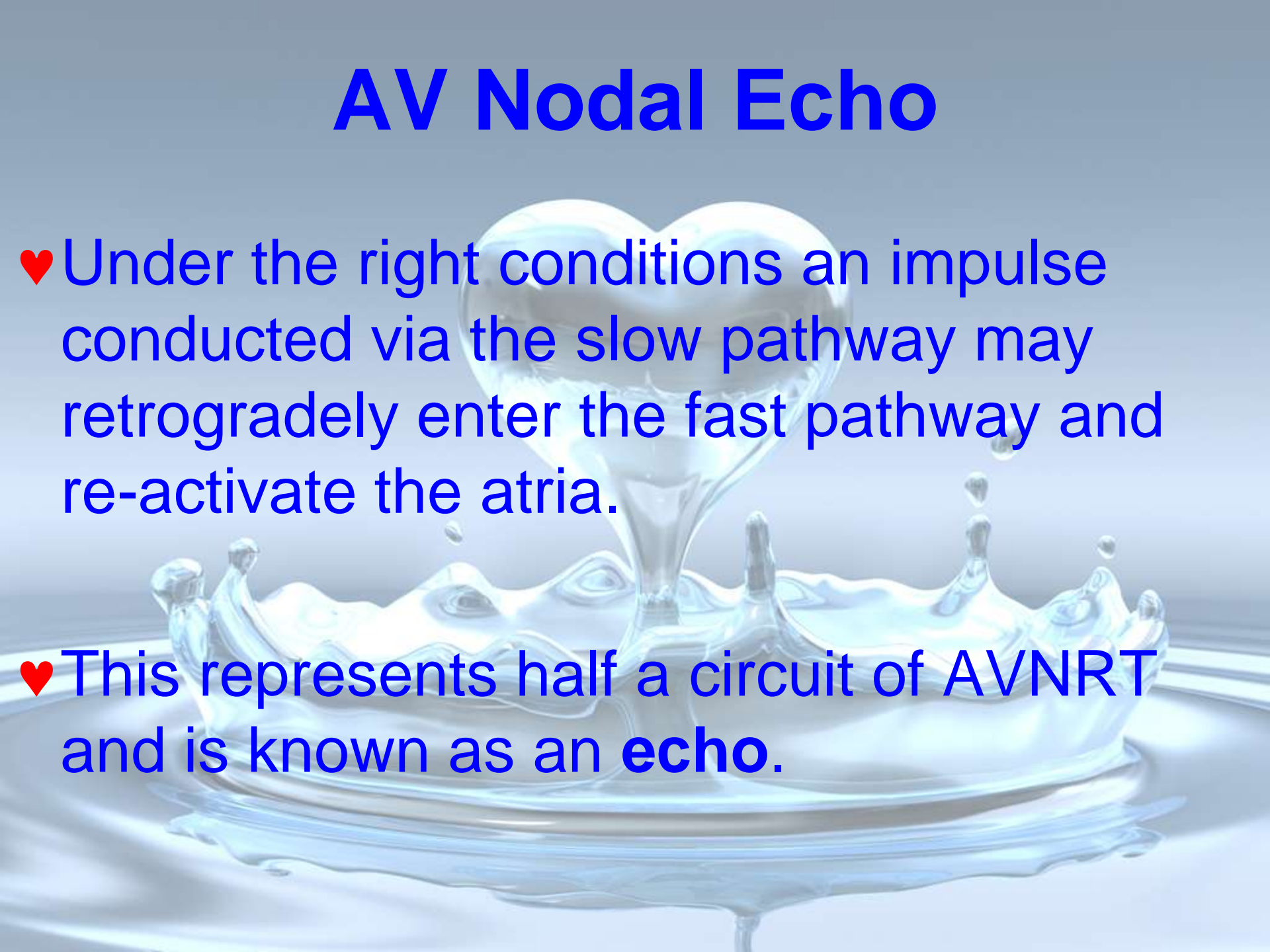




AV Nodal Echo

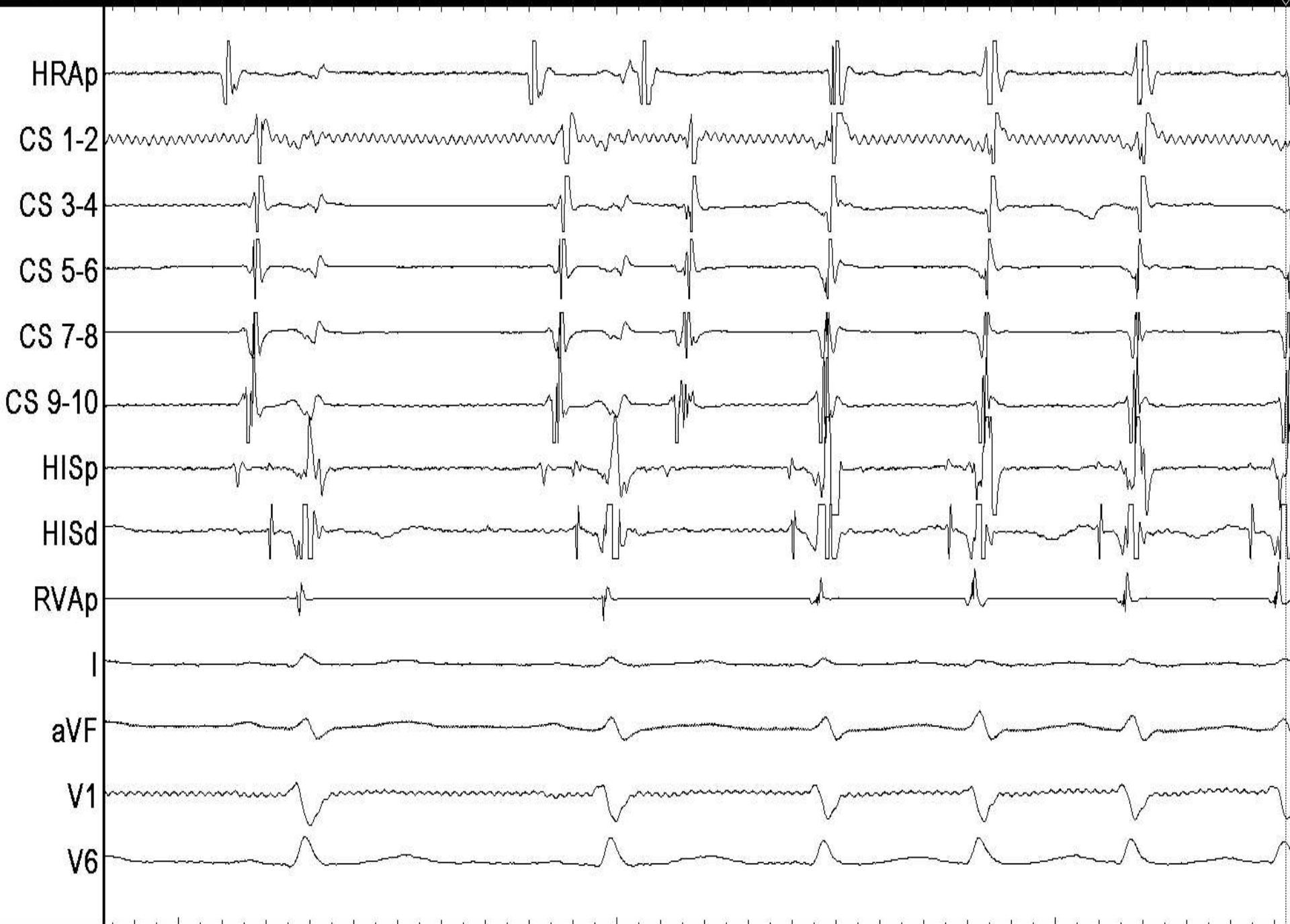
♥ Under the right conditions an impulse conducted via the slow pathway may retrogradely enter the fast pathway and re-activate the atria.

♥ This represents half a circuit of AVNRT and is known as an **echo**.



Typical AVNRT – the complete circuit

- ♥ A premature atrial beat “blocks” in the fast pathway but is conducted toward the compact AV node by the slow pathway.
- ♥ The impulse emerges from the compact node via the His bundle to activate the ventricles
- ♥ Simultaneously activates the atria via the fast pathway and completes the circuit by re-entering the slow pathway.



Reset and Entrainment

- ♥ Using these manoeuvres you can identify whether the ventricles are part of the circuit
- ♥ AVNRT is confined to the AV node
- ♥ If ventricles are remote from the circuit you can eliminate AVRT
- ♥ VAAV response indicates Atrial Tachycardia

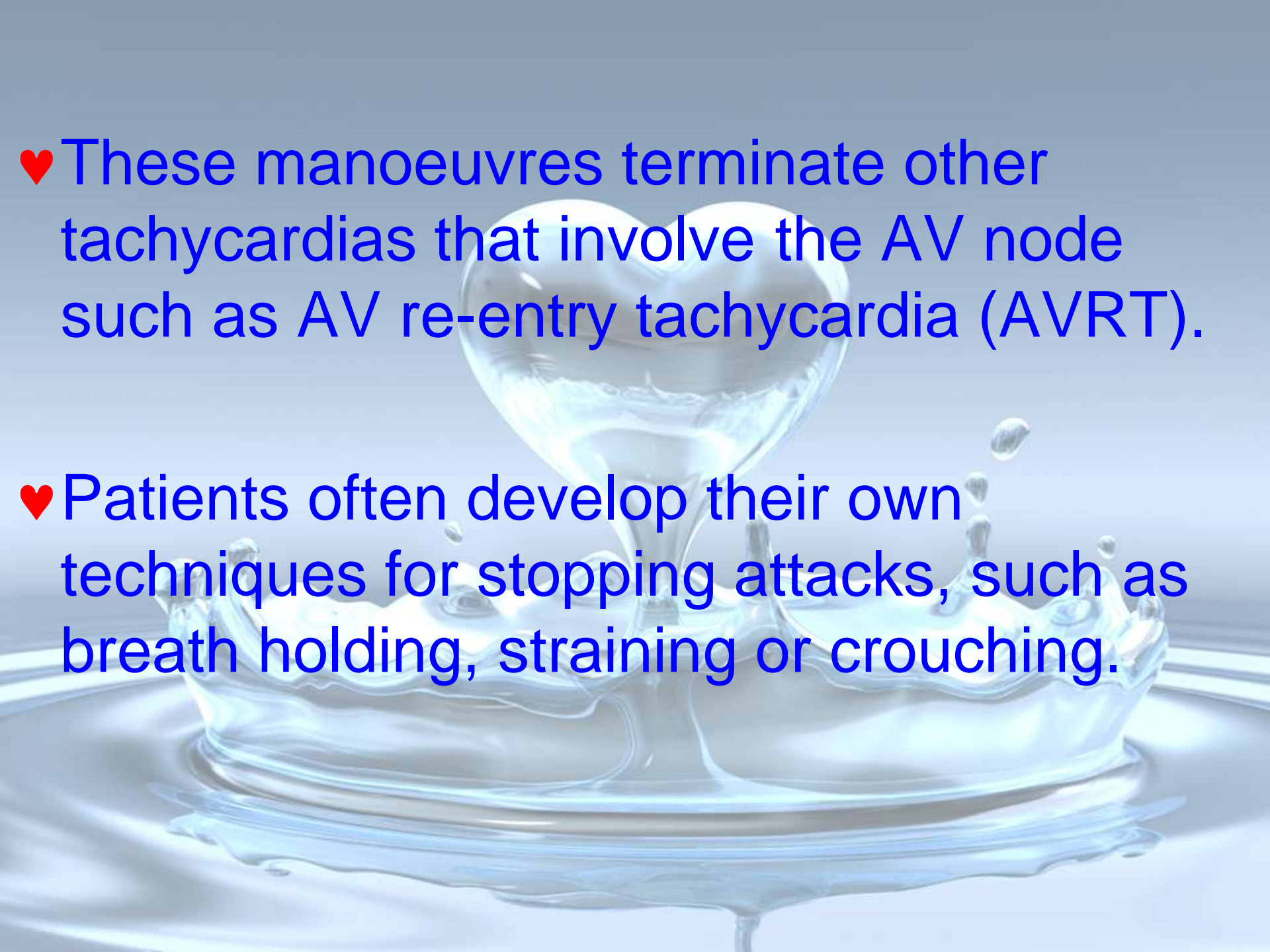
Termination of AVNRT



♥ Interventions that affect AV conduction can help terminate AVNRT.

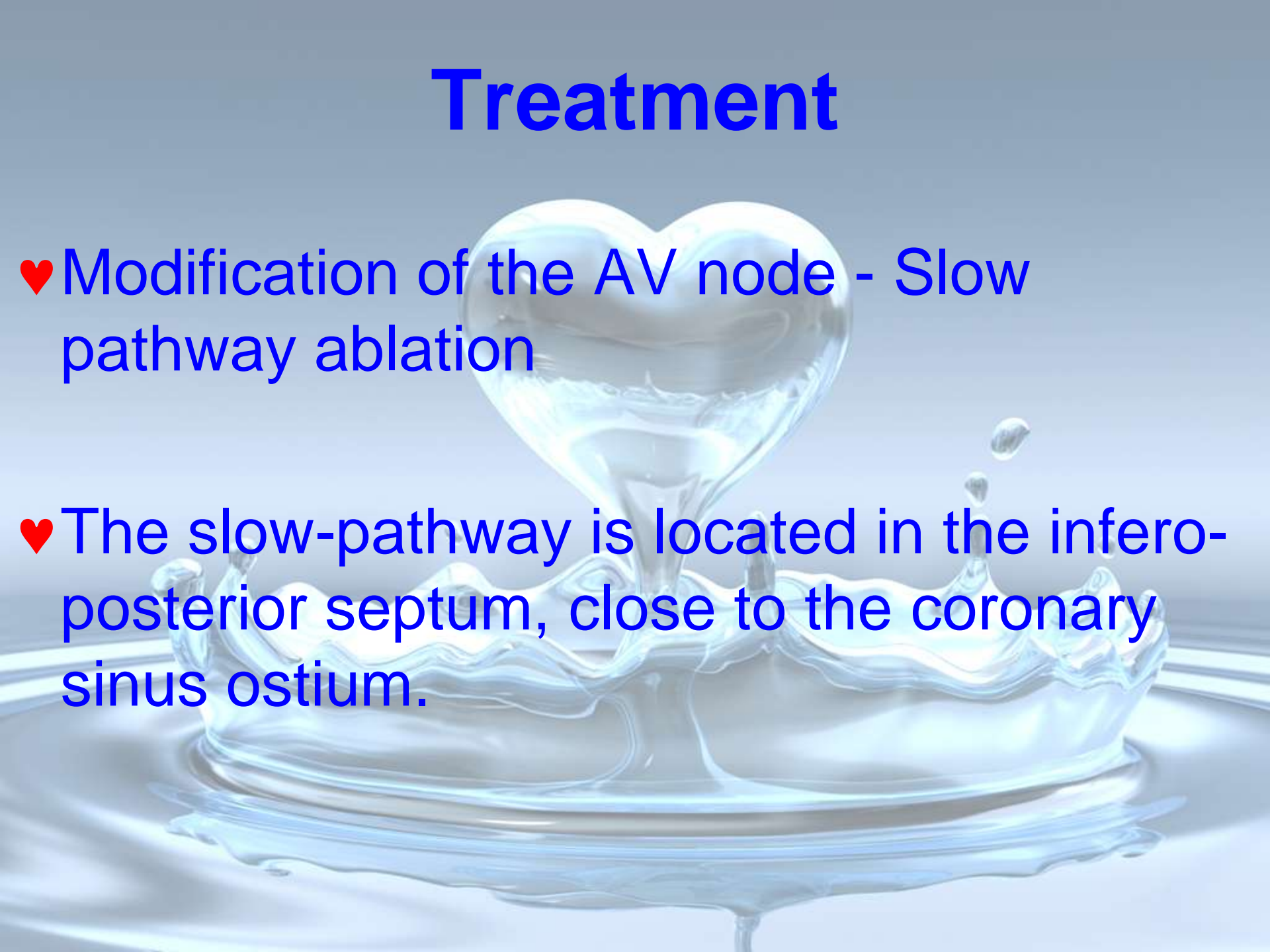
E.g. Carotid sinus massage or Valsalva manoeuvres.

♥ Drugs that cause AV block such as Adenosine

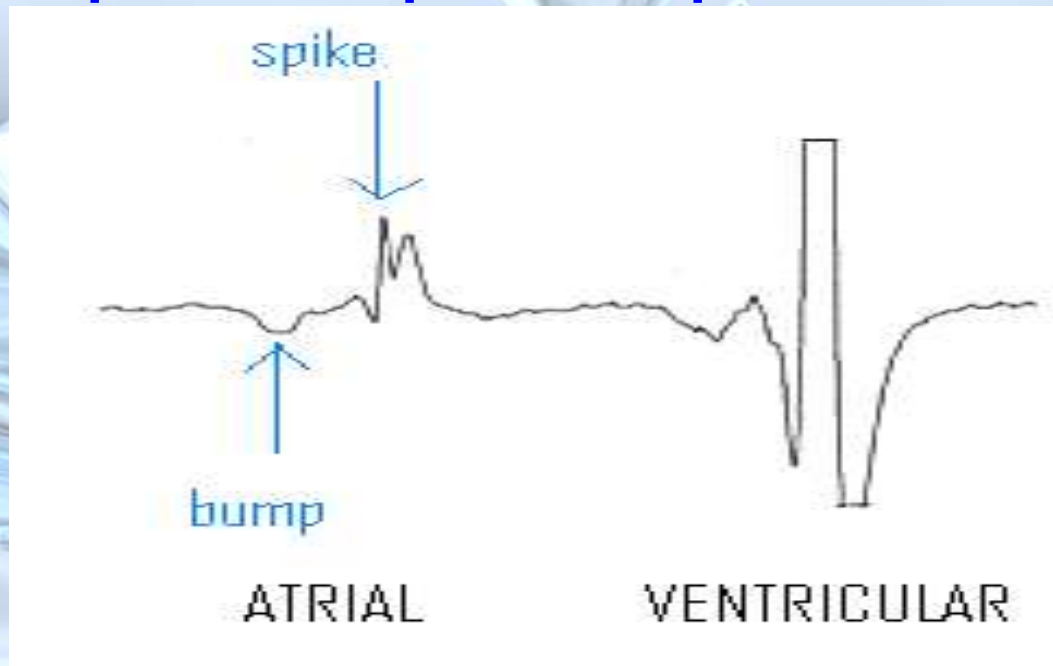
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- ♥ These manoeuvres terminate other tachycardias that involve the AV node such as AV re-entry tachycardia (AVRT).
 - ♥ Patients often develop their own techniques for stopping attacks, such as breath holding, straining or crouching.

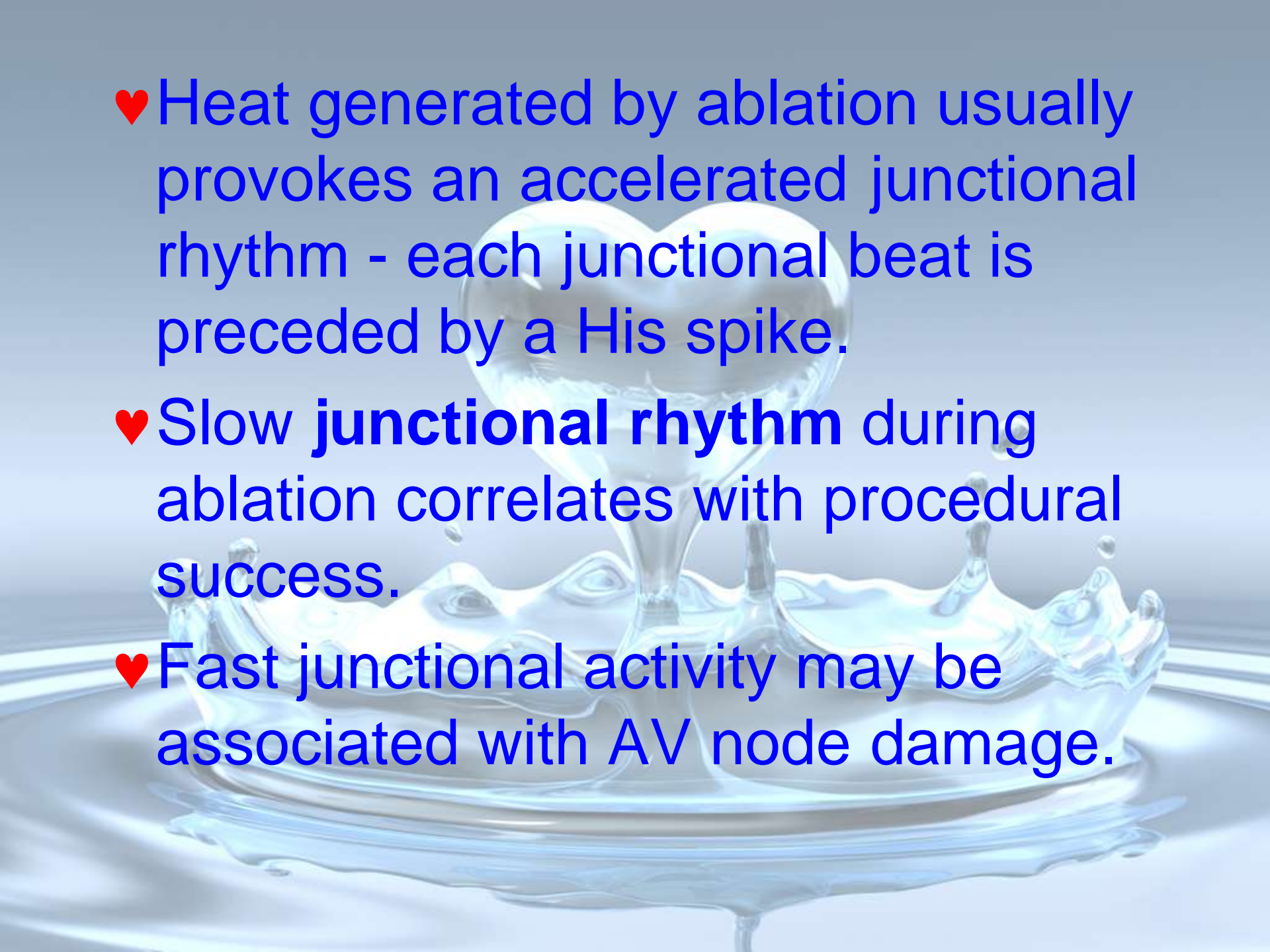
Treatment

- ♥ Modification of the AV node - Slow pathway ablation
- ♥ The slow-pathway is located in the infero-posterior septum, close to the coronary sinus ostium.



- ♥ Ablation may be guided by **slow pathway potentials** also referred to as “bump and spike”.
- ♥ These correlate with sites of successful ablation but it is not certain exactly what the bump and spike represent.

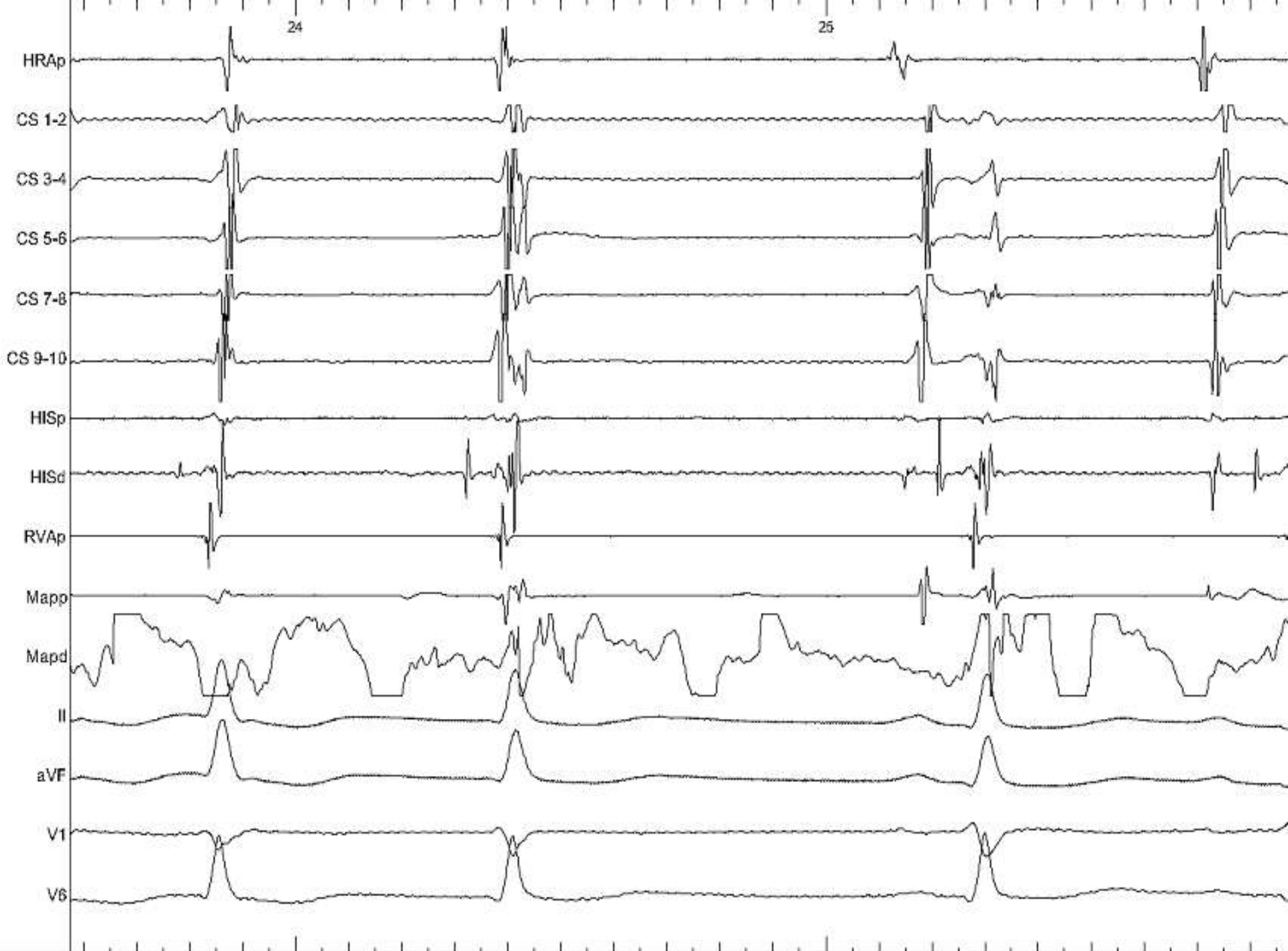


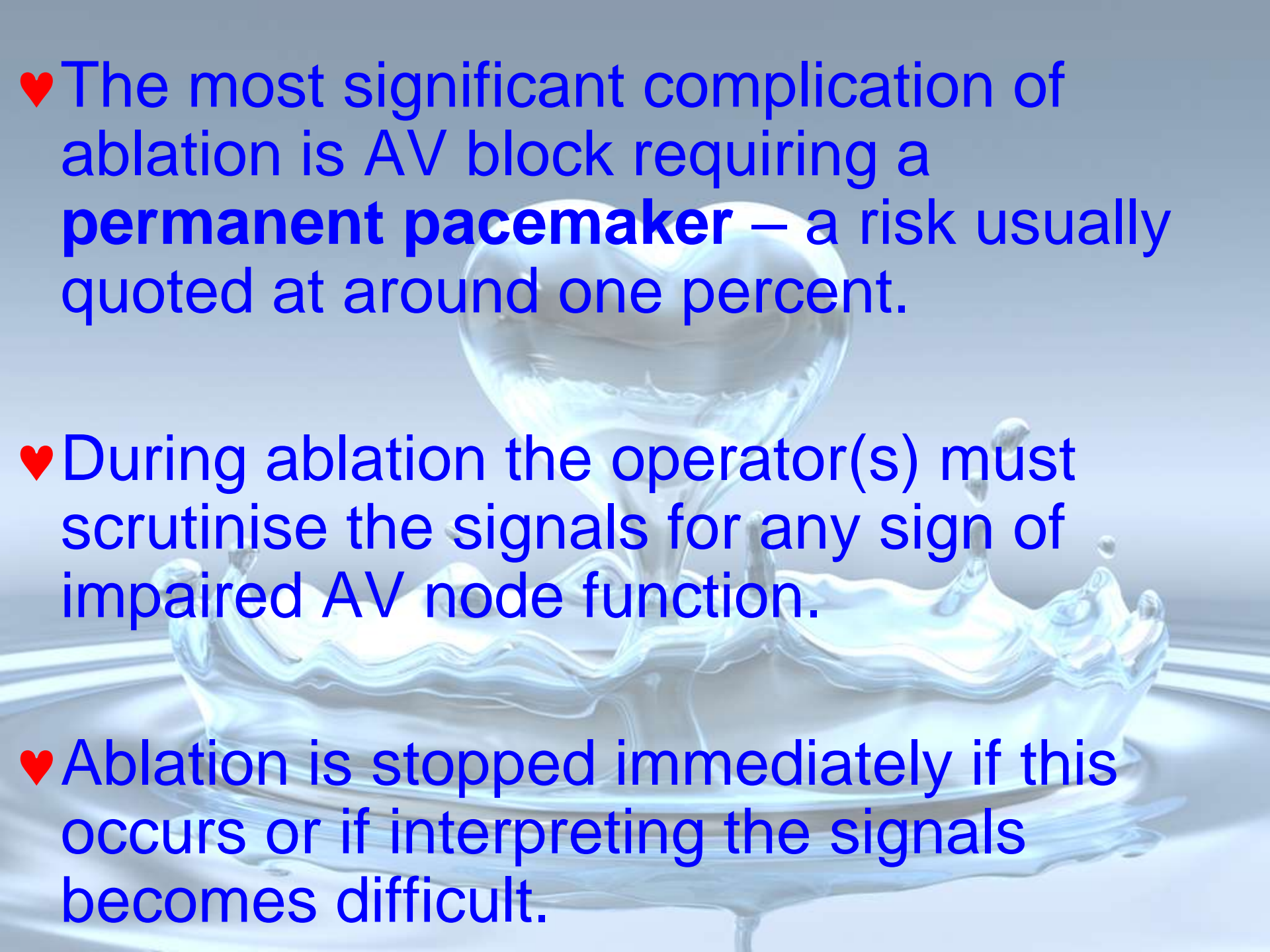


♥ Heat generated by ablation usually provokes an accelerated junctional rhythm - each junctional beat is preceded by a His spike.

♥ Slow **junctional rhythm** during ablation correlates with procedural success.

♥ Fast junctional activity may be associated with AV node damage.



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- ♥ The most significant complication of ablation is AV block requiring a **permanent pacemaker** – a risk usually quoted at around one percent.
 - ♥ During ablation the operator(s) must scrutinise the signals for any sign of impaired AV node function.
 - ♥ Ablation is stopped immediately if this occurs or if interpreting the signals becomes difficult.

