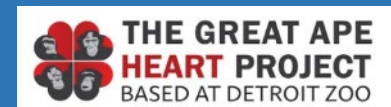




Cardiac structure and examination of the conduction system



Gisela Martinez-Romero
DVM, MS, PhD, DAVCP



Acknowledgments

Thank you for all the photos!

Cummings Veterinary School of Veterinary Medicine-Tufts University

Dr. Emily Brinker- Department of Pathobiology

Dr. Francisco Conrado- Department of Pathobiology

All Anatomic Pathologists

Dr. John Rush- Department of Clinical Sciences

Dr. Emily Karlin- Department of Clinical Sciences

Dr. Lisa Freeman- Department of Clinical Sciences

Great Ape Heart Project

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Dr. Karen Terio- University of Illinois, GAHP Lead Pathology Advisor

Dr. Marieta Dindo Danforth- GAHP director

Dr. Francisco Carvallo- Virginia-Maryland College of Veterinary Medicine

Dr. Francisco Uzal- UC Davis School of Veterinary Medicine

Facultad de Medicina Veterinaria y Zootecnia-UNAM Mexico

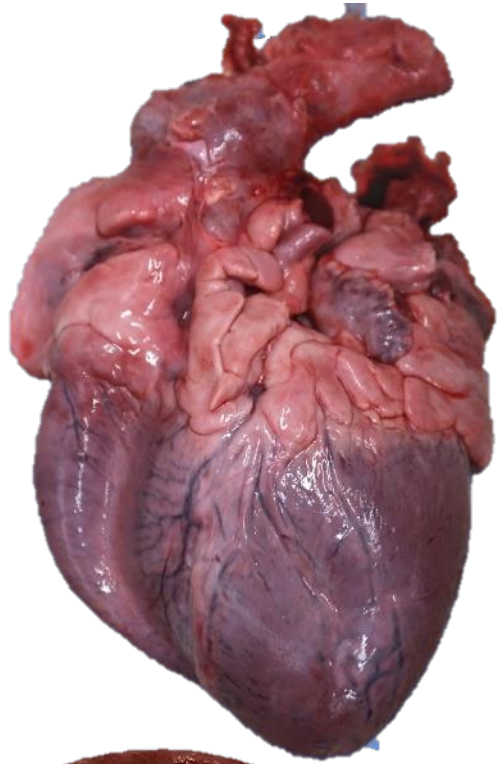
Dr. Feliz Sanchez Godoy- Departamento de Aves

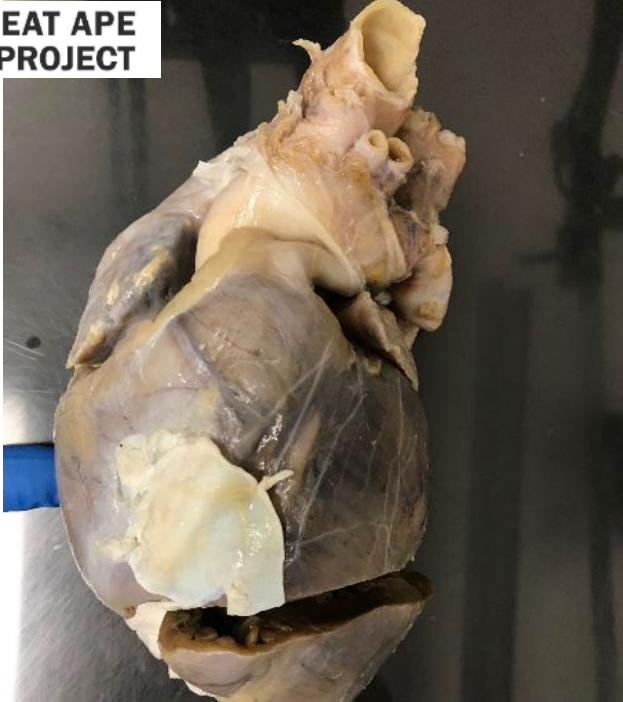
Dr. Elizabeth Morales Salinas- Departamento de Patologia

Dr. Gerardo Salas Garrido- Departamento de Patologia



OFFICIAL
HEARTS





CARDIAC EXAMINATION

- In situ
- Pericardium
- Anatomy of great arteries
- Transect the cranial vena cava 2 cm above the point where the crista of the right atrial appendage meets the cranial vena cava
- Transect the aorta above the arch (if possible)
- Weight (kg, g)



OFFICIAL
CARDIAC EXAMINATION



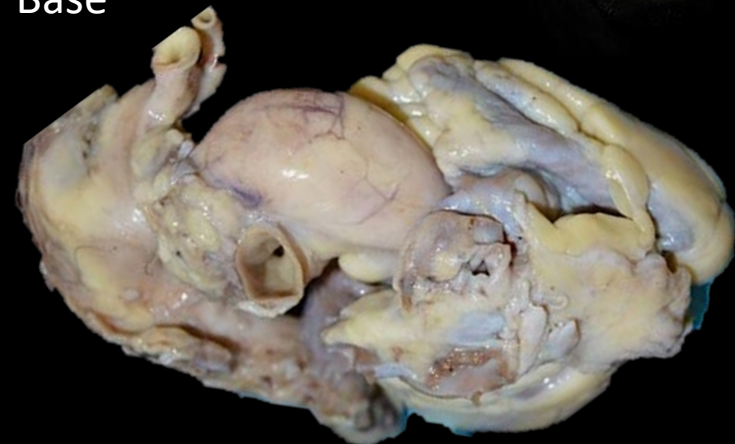
Anterior



Right



Base



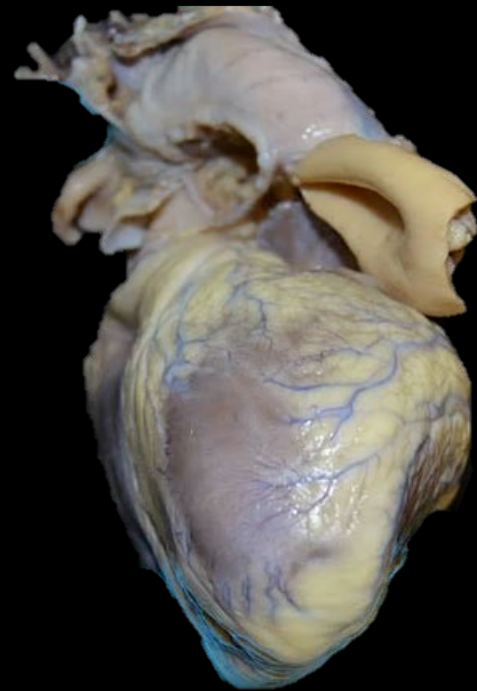
Posterior

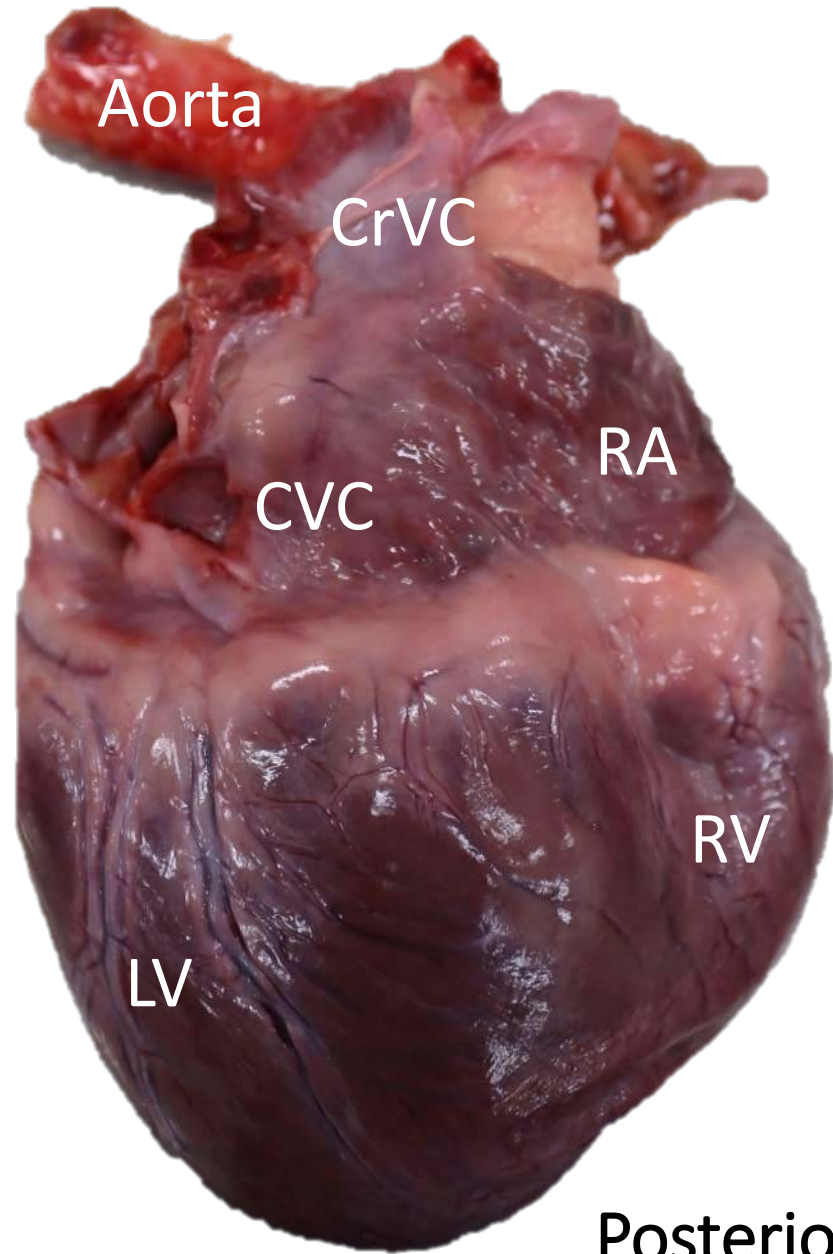


Left

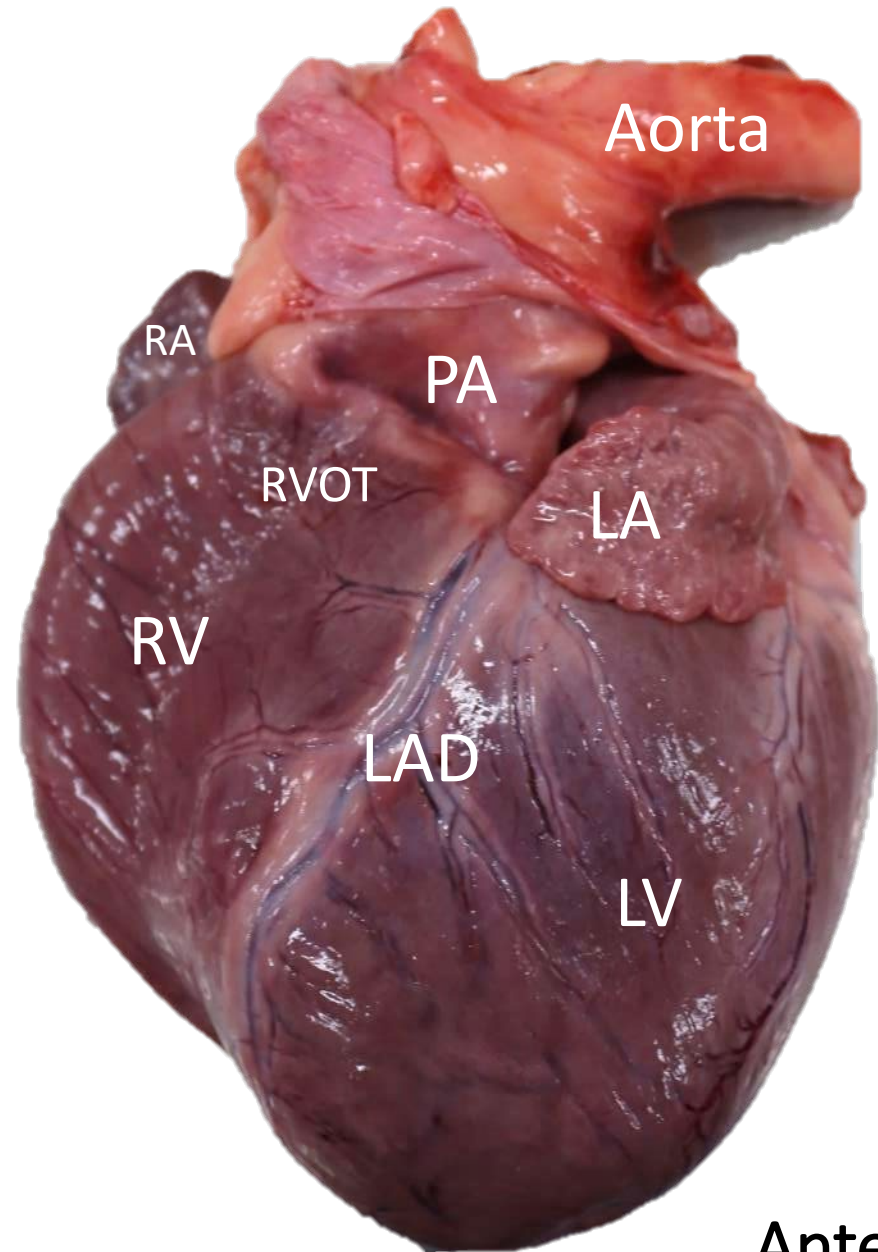


Apex





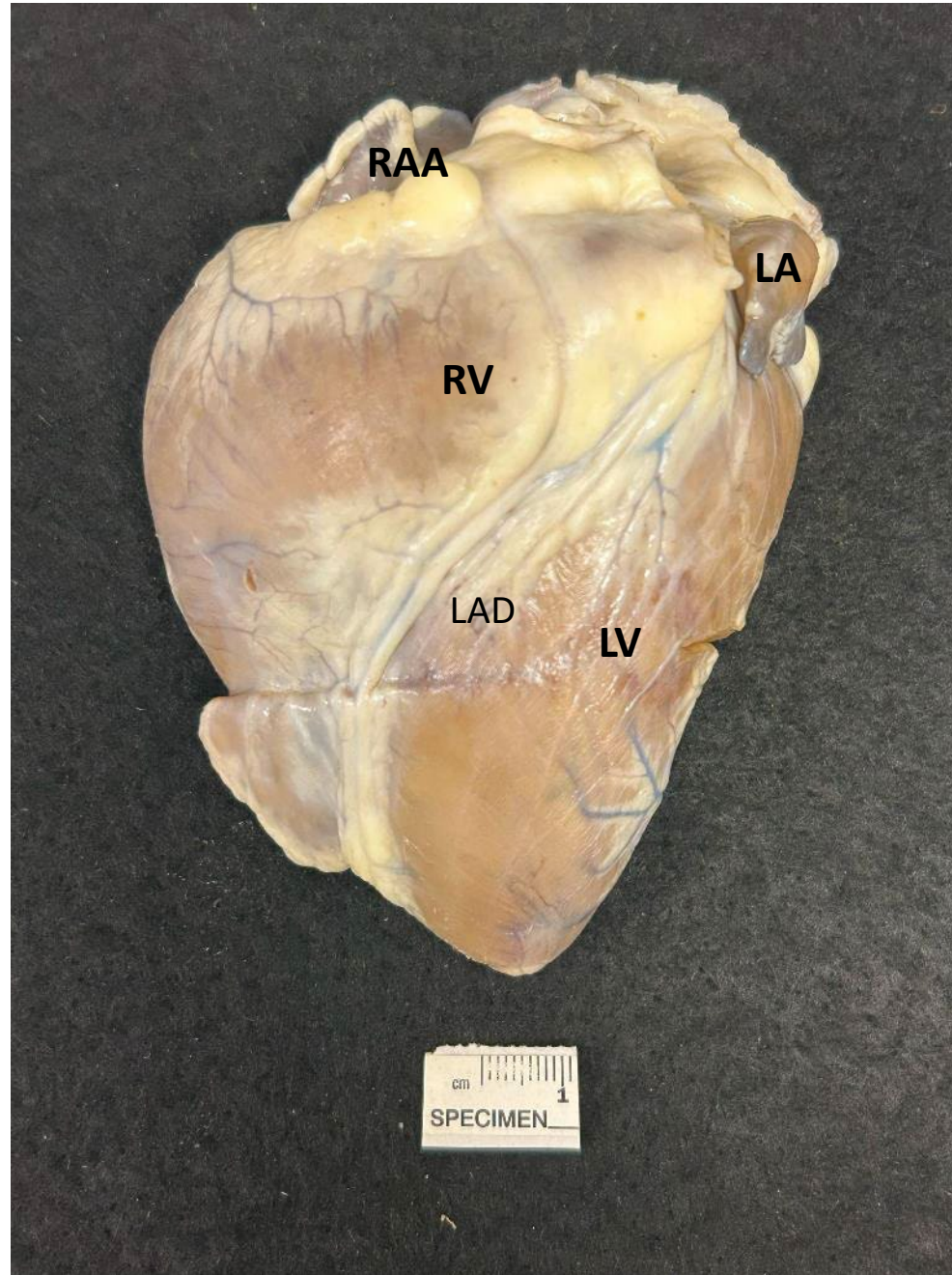
Posterior



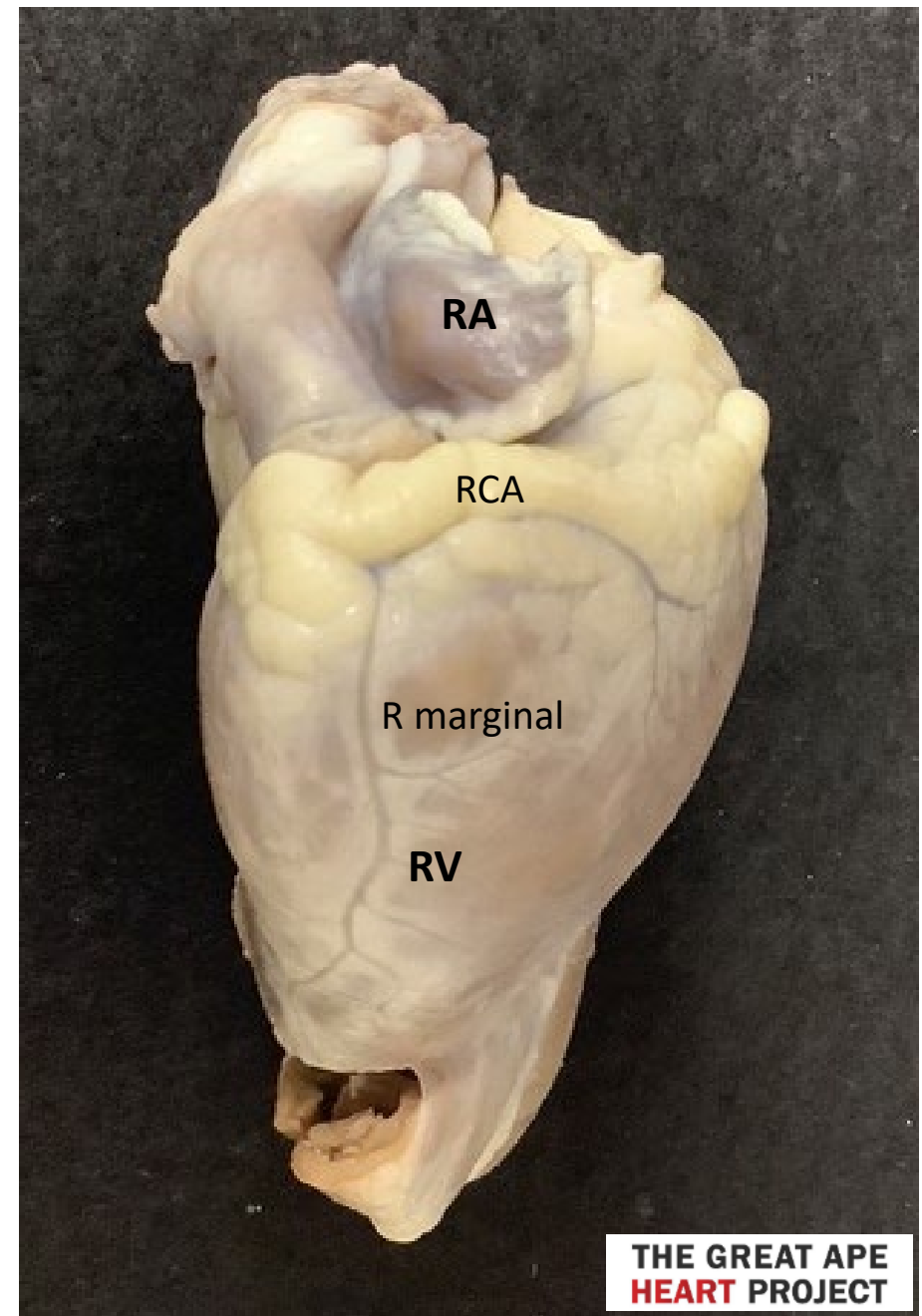
Anterior

Anterior

OFFICIAL

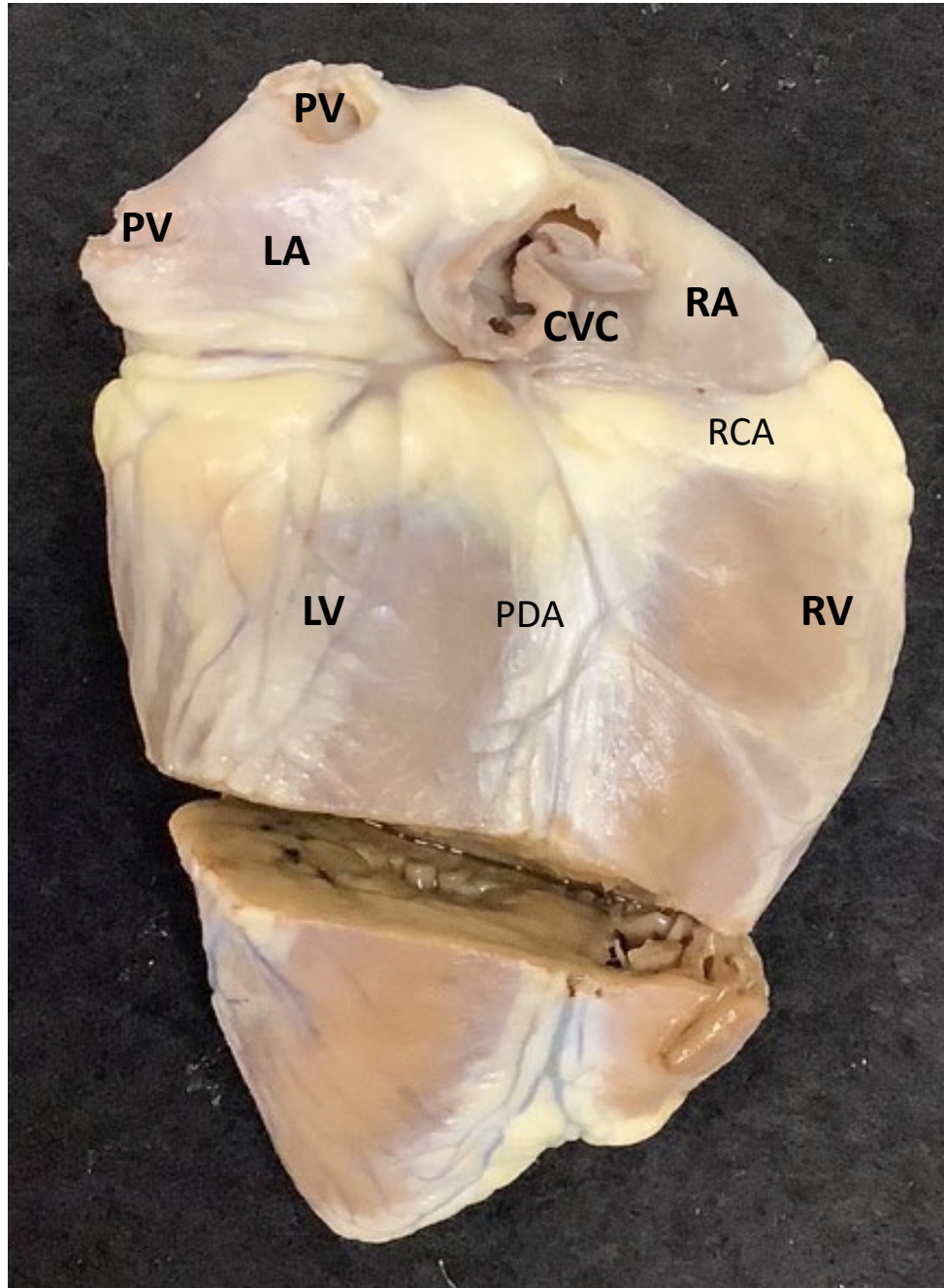


Right ventricle



OFFICIAL

Posterior



FFICIAL

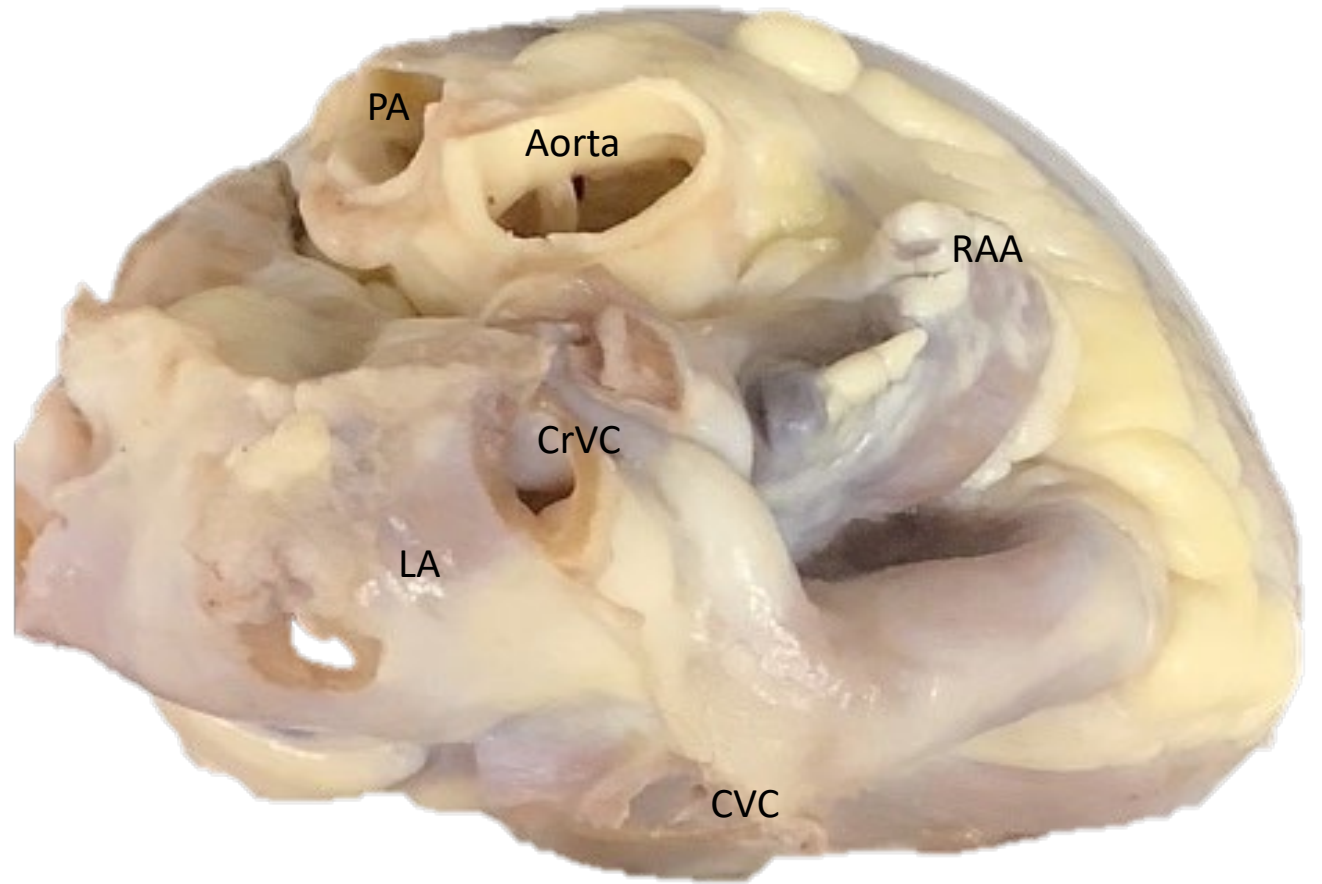
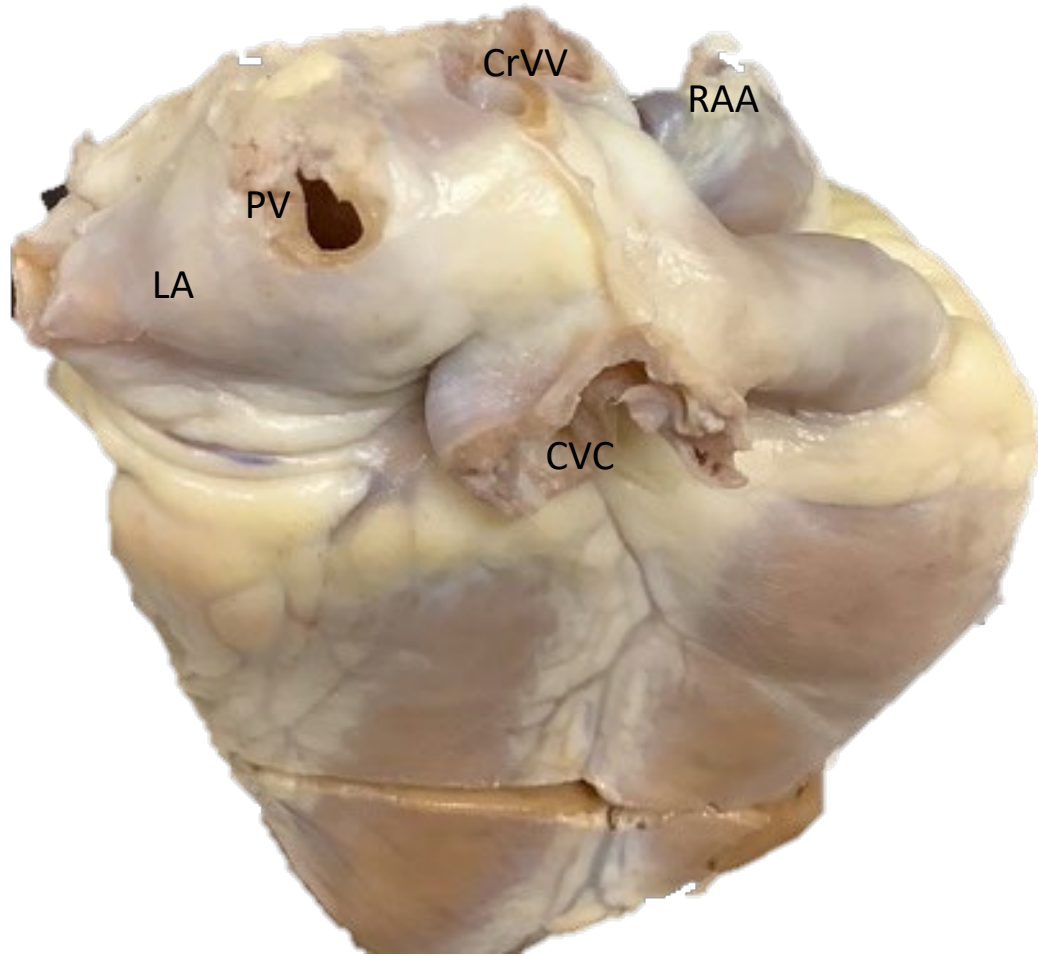
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Left

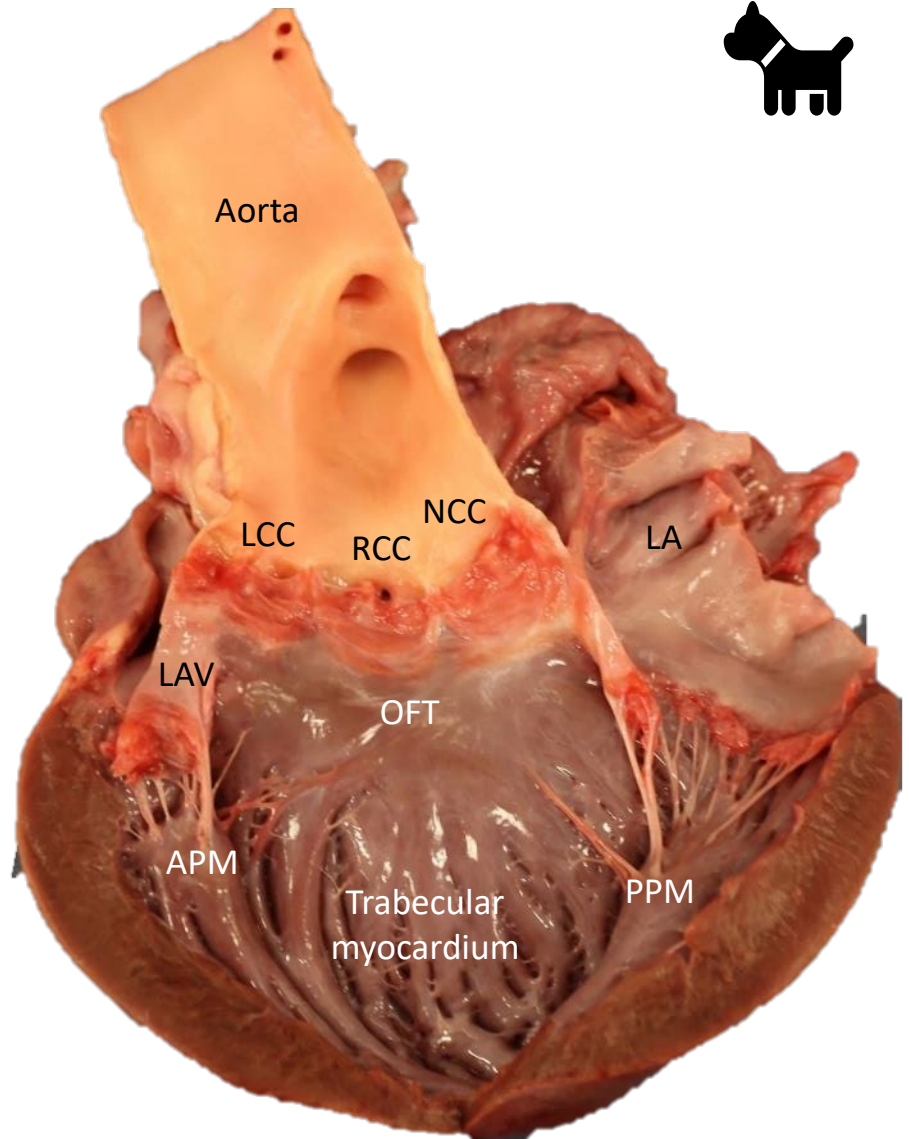
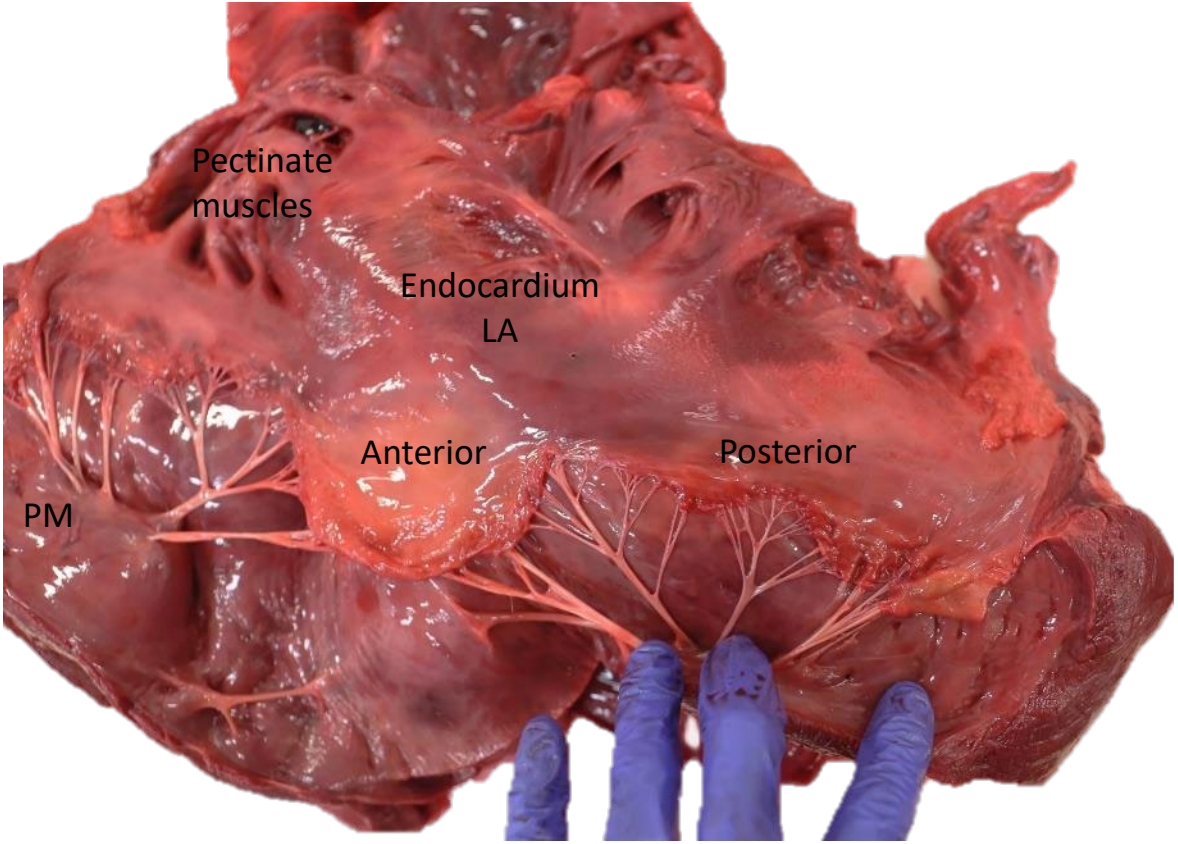
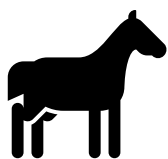


THE GREAT APE
HEART PROJECT

Base



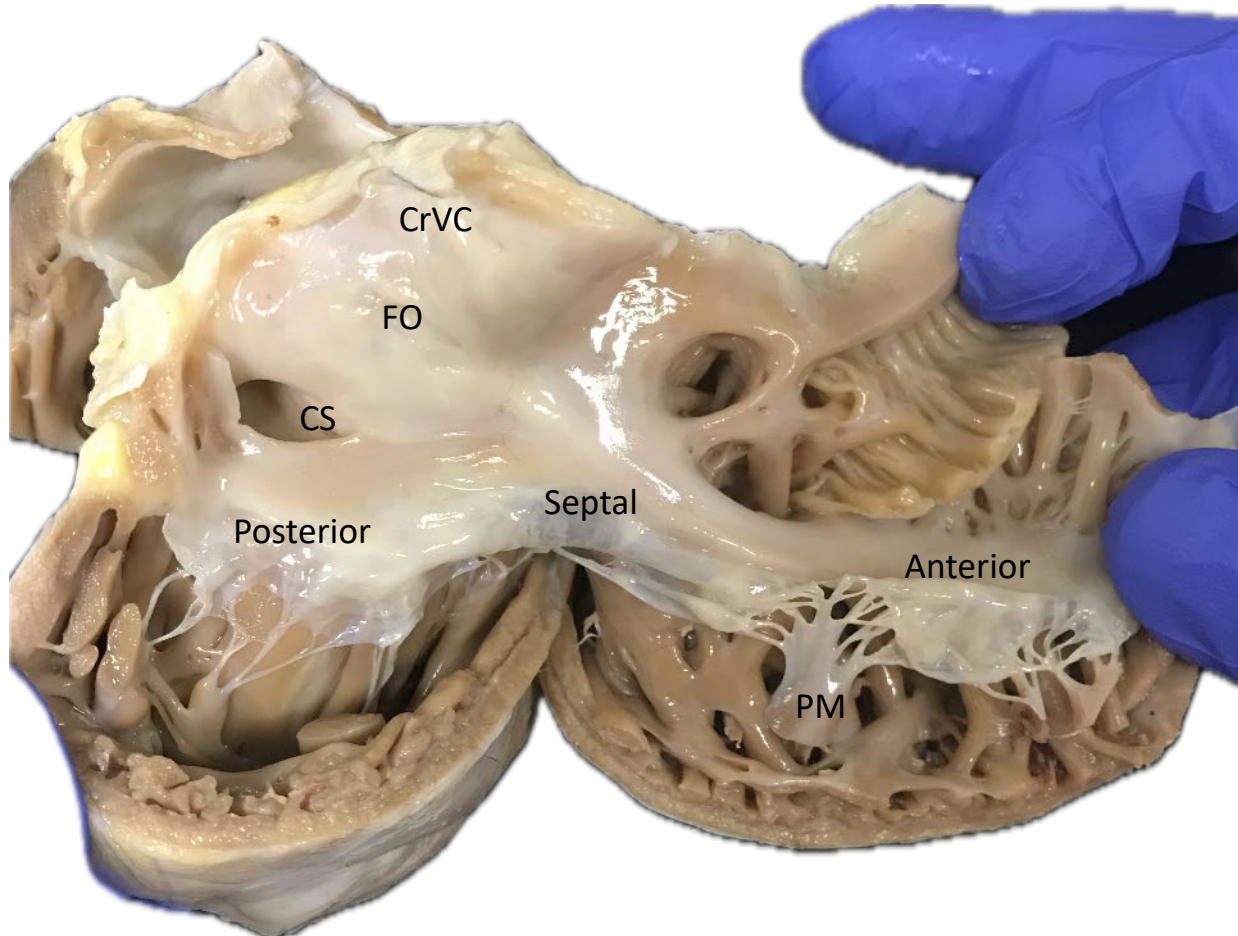
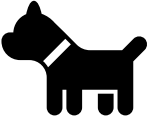
Left side



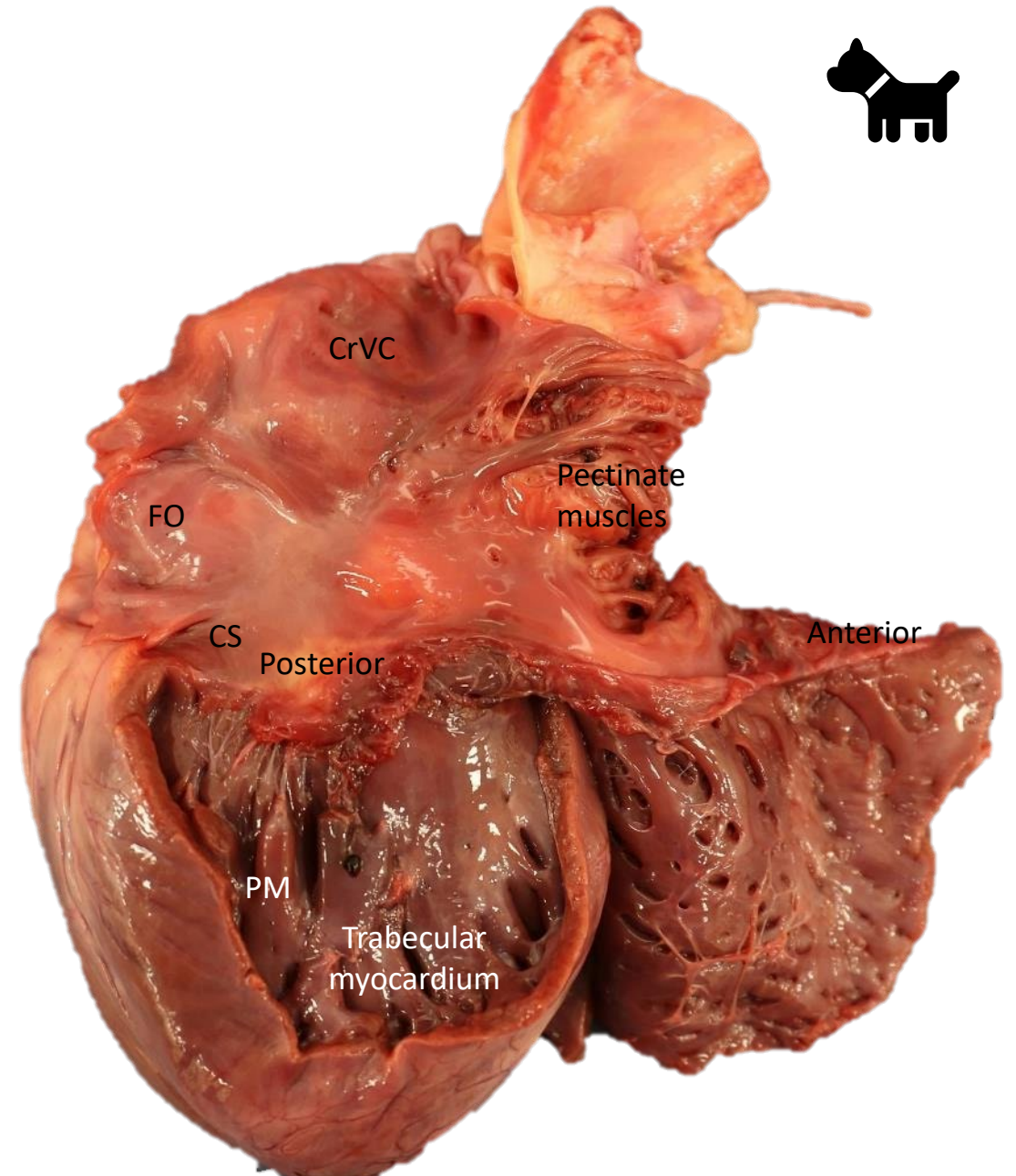


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Right side

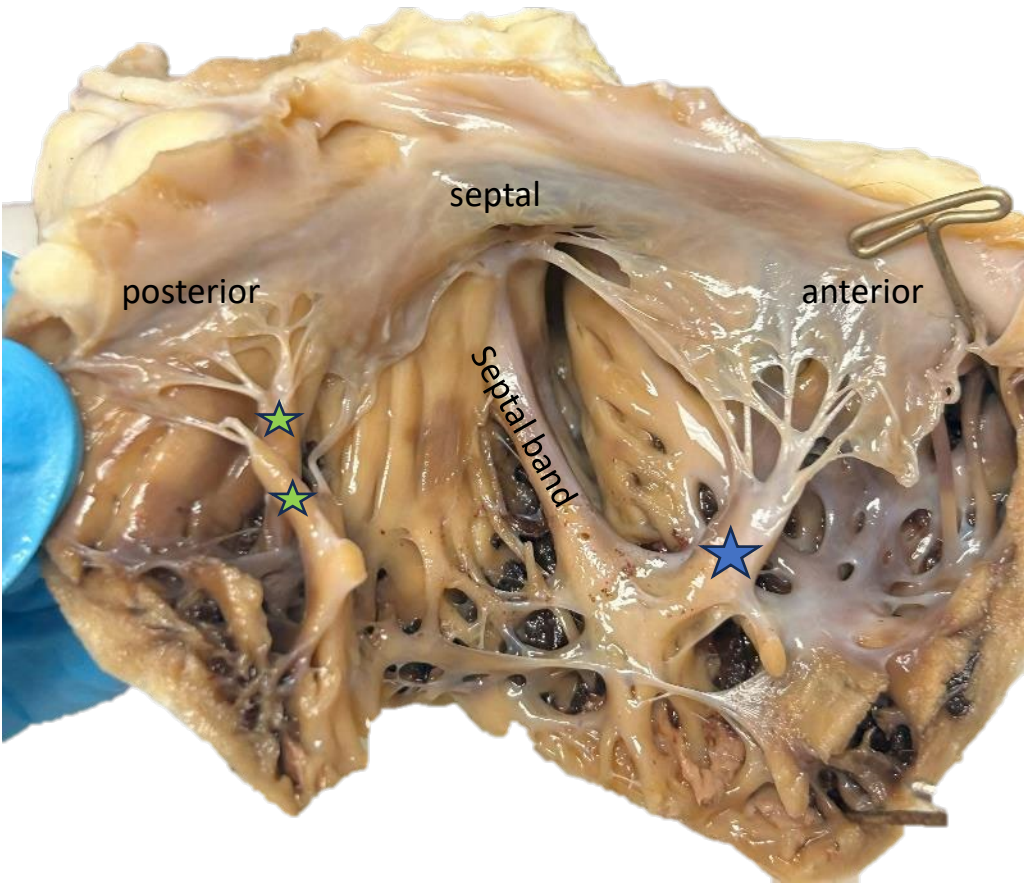


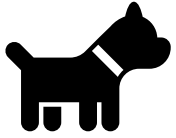
THE GREAT APE
HEART PROJECT



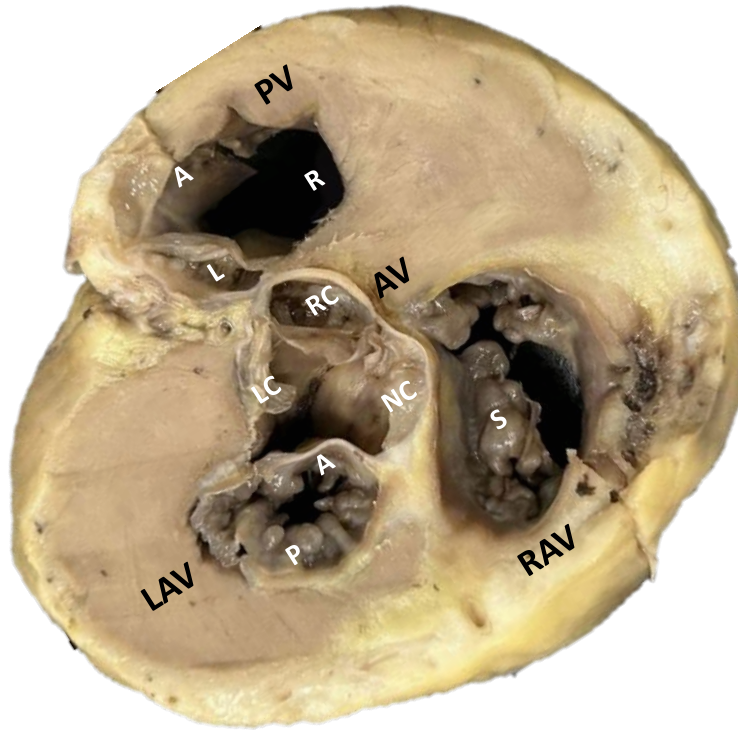
OFFICIAL

Right AV valve

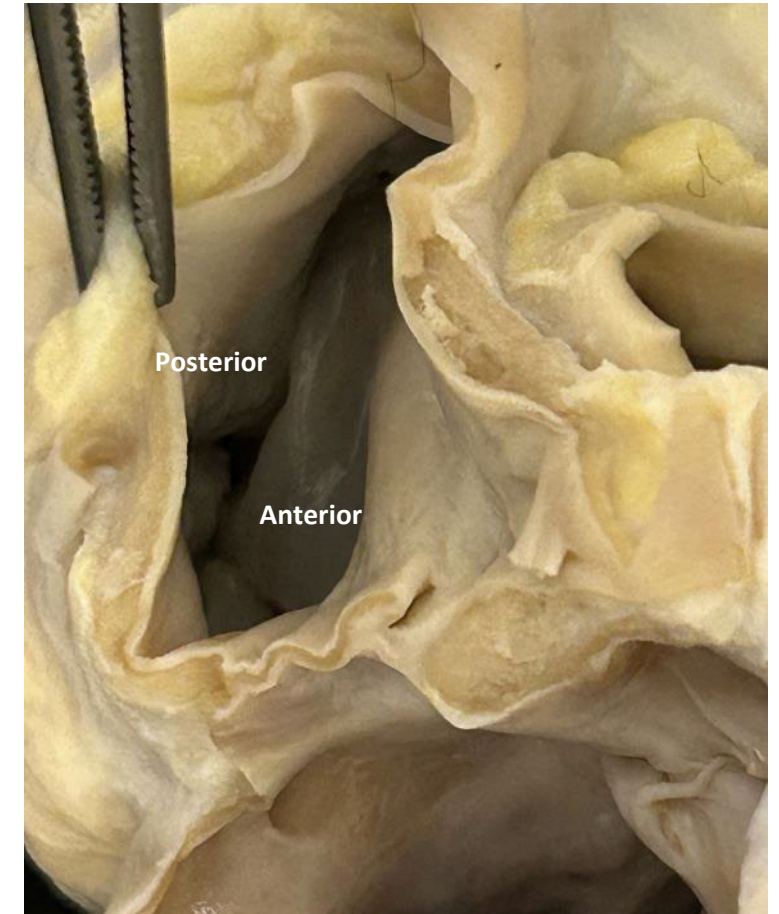
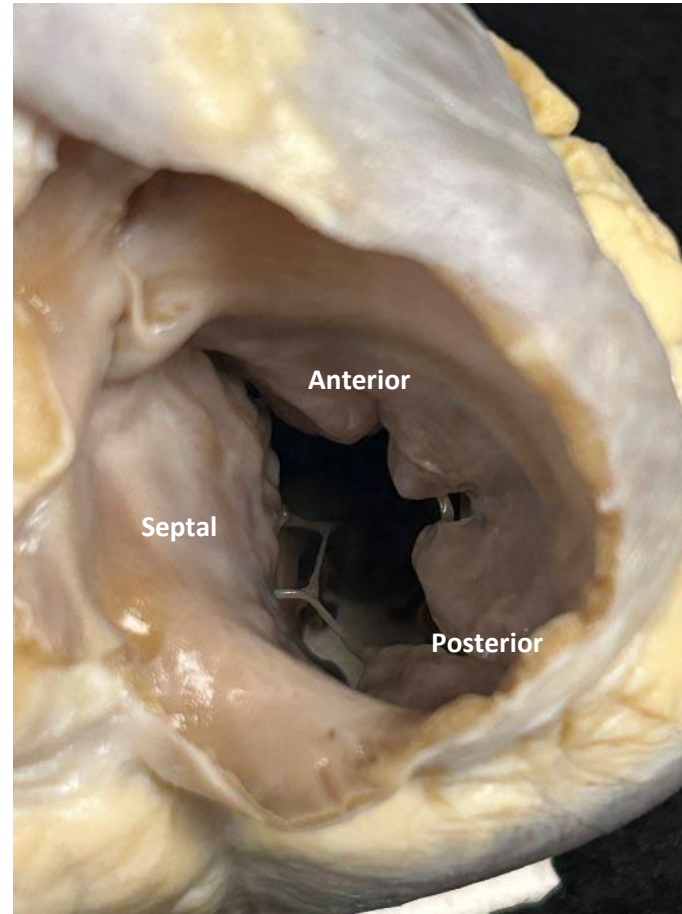




Right AV valve

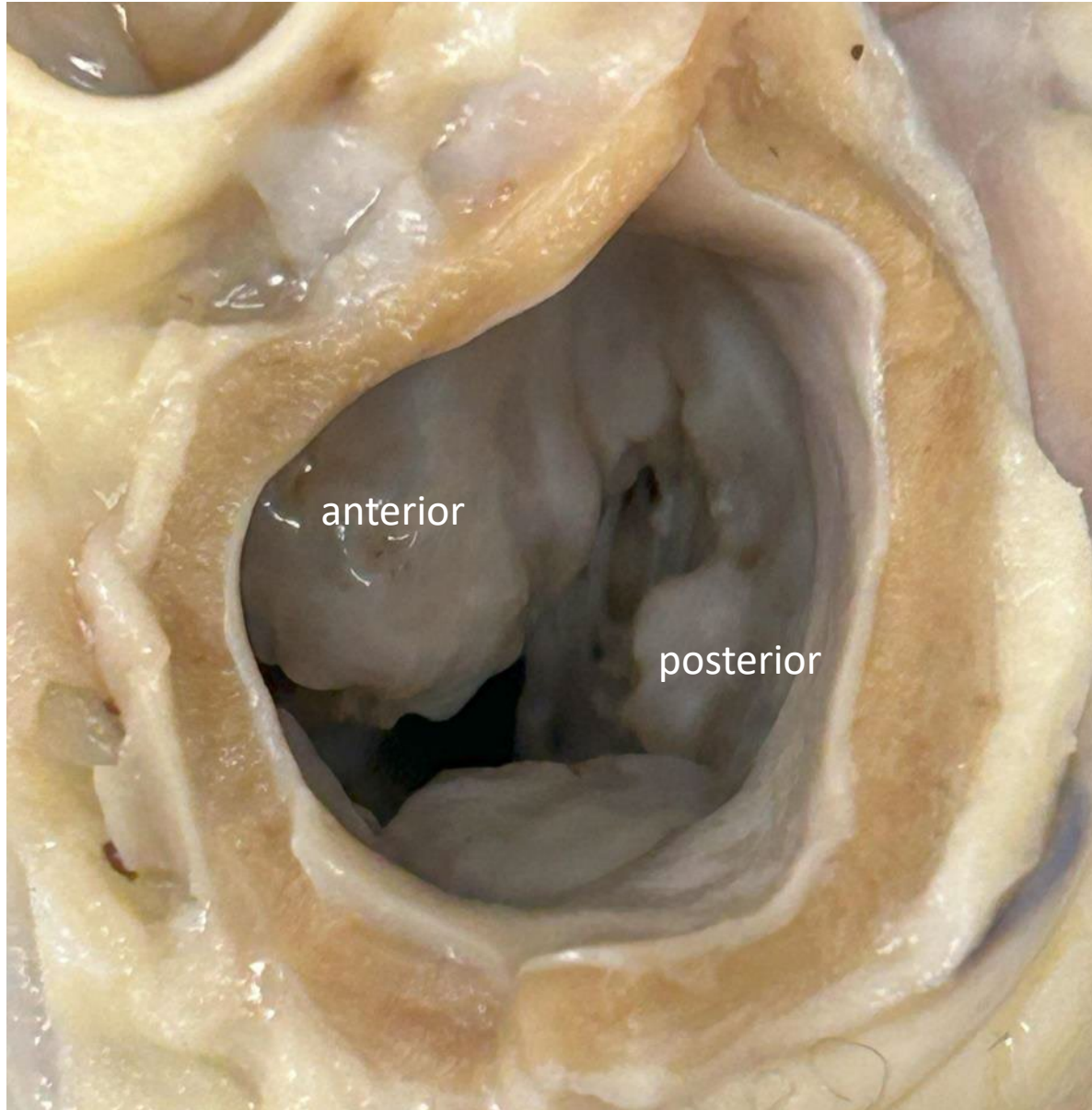


Left AV valve

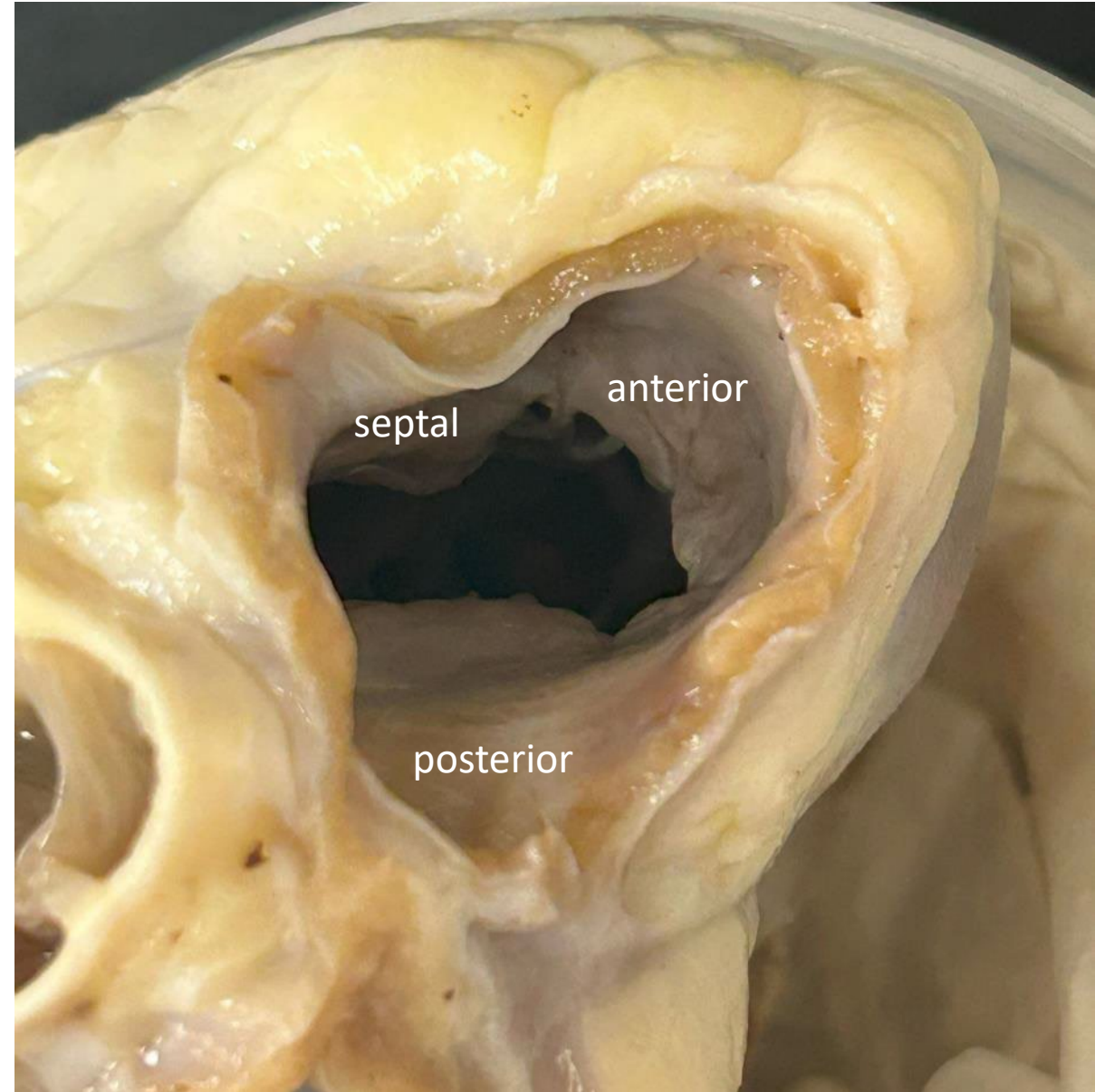


Left AV valve

OFFICIAL

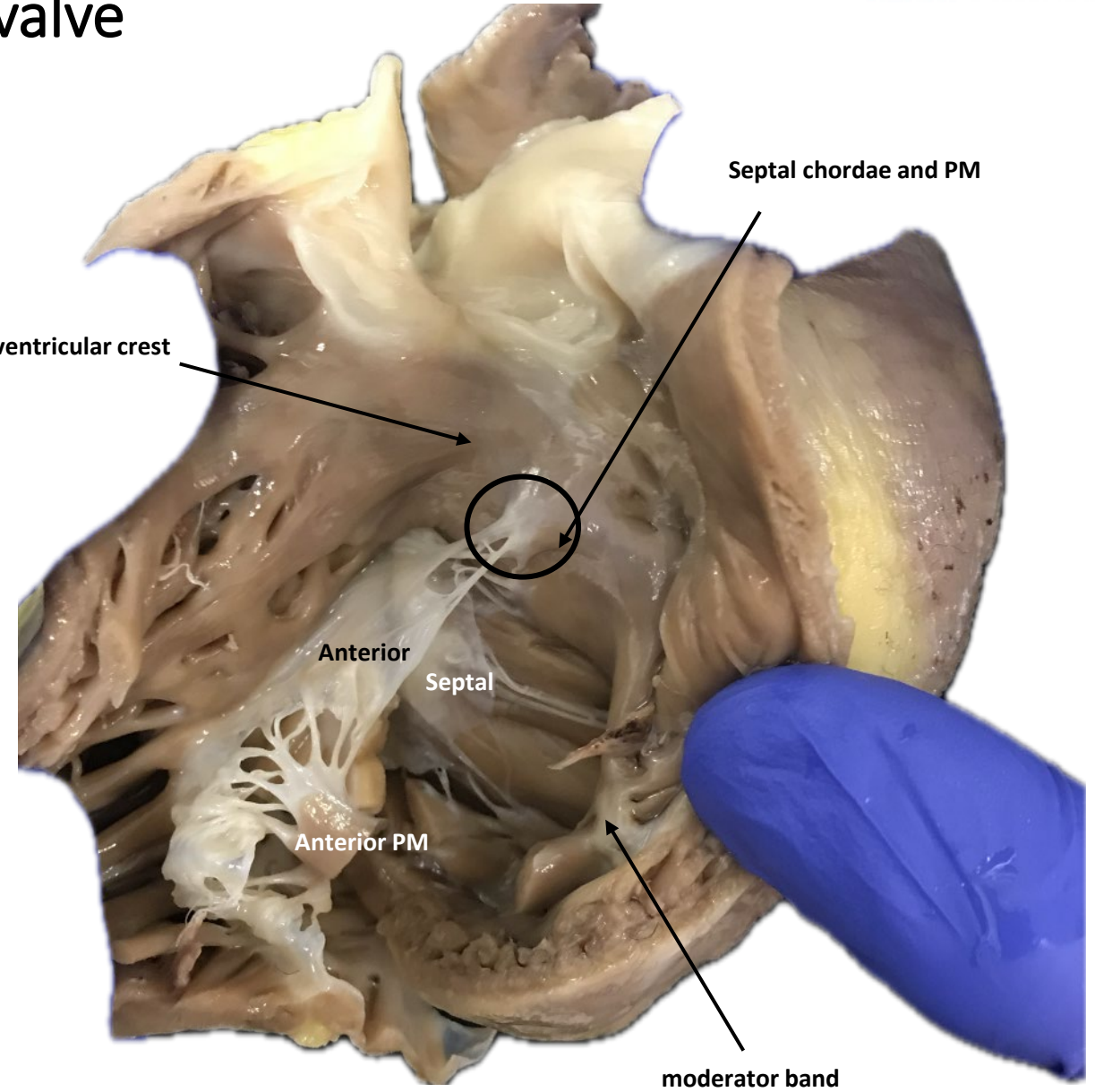
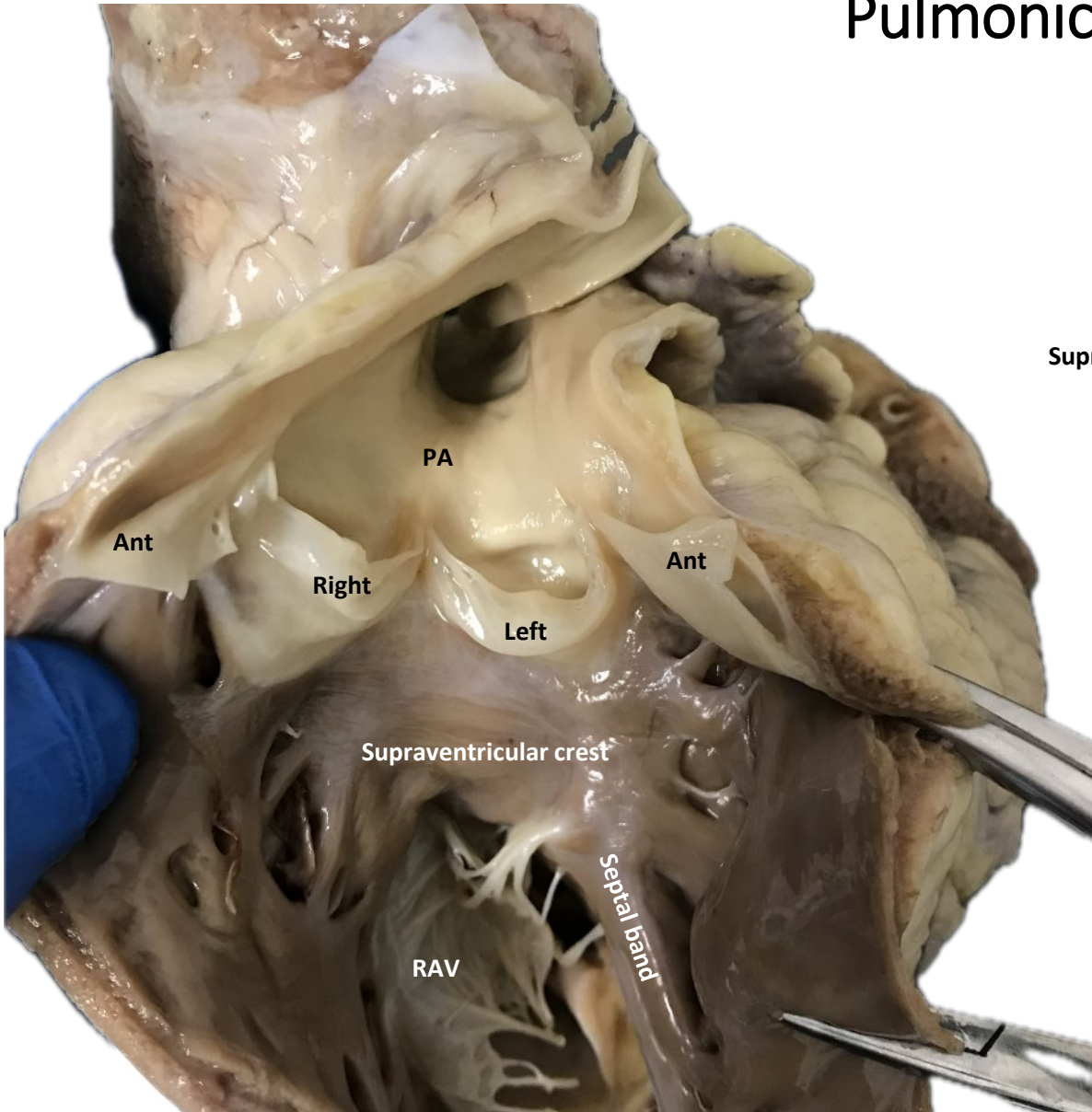


Right AV valve



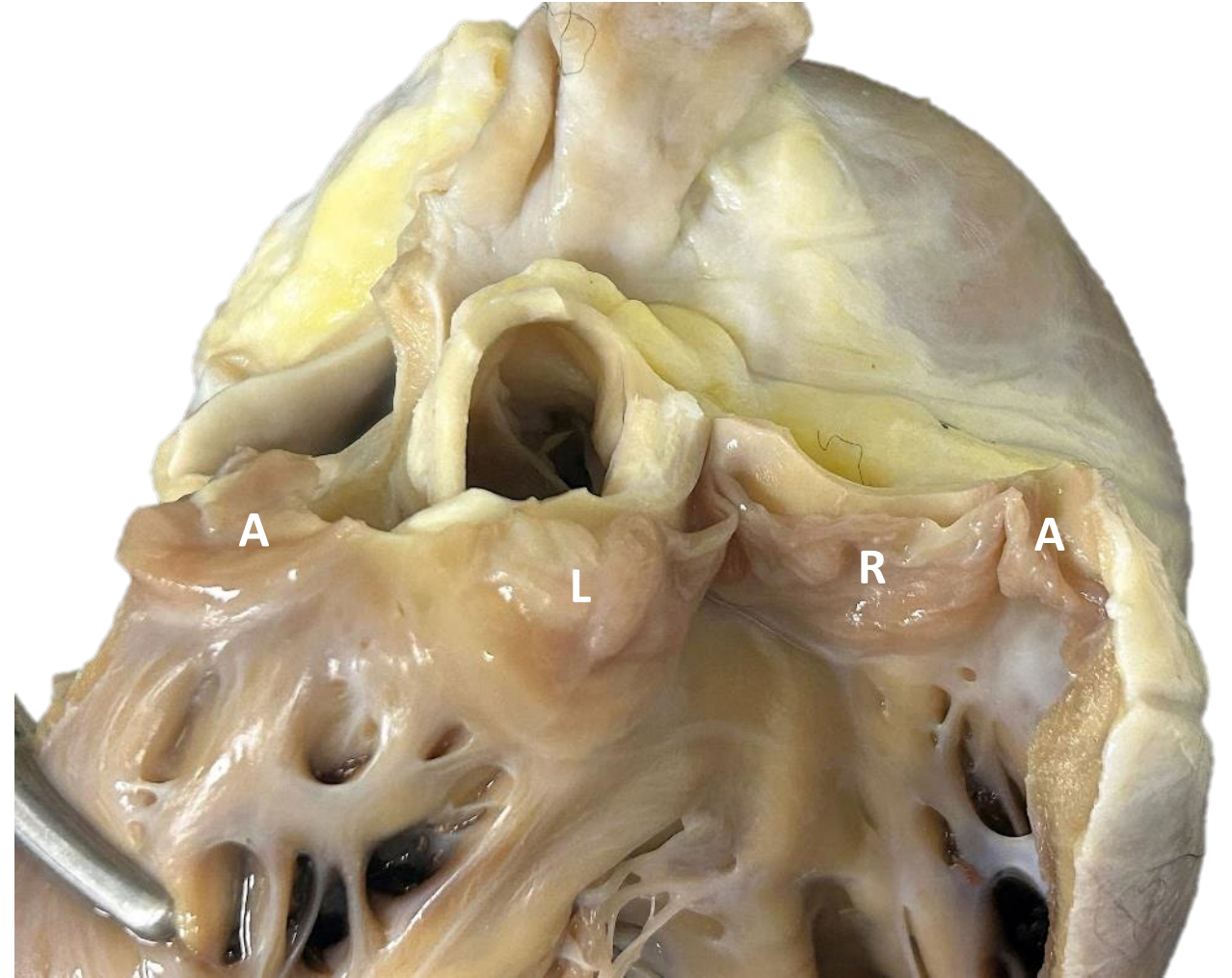
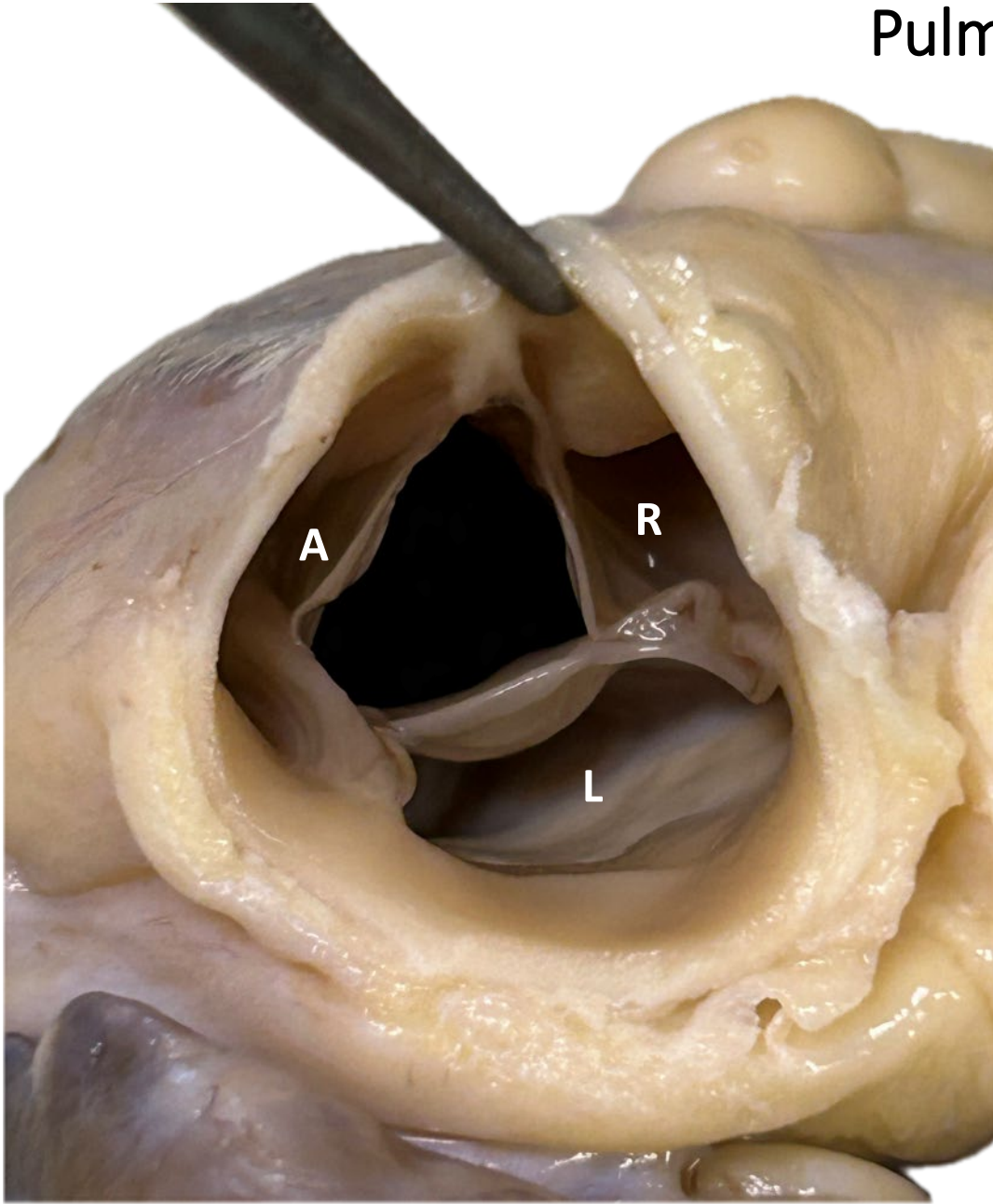
OFFICIAL

Pulmonic valve

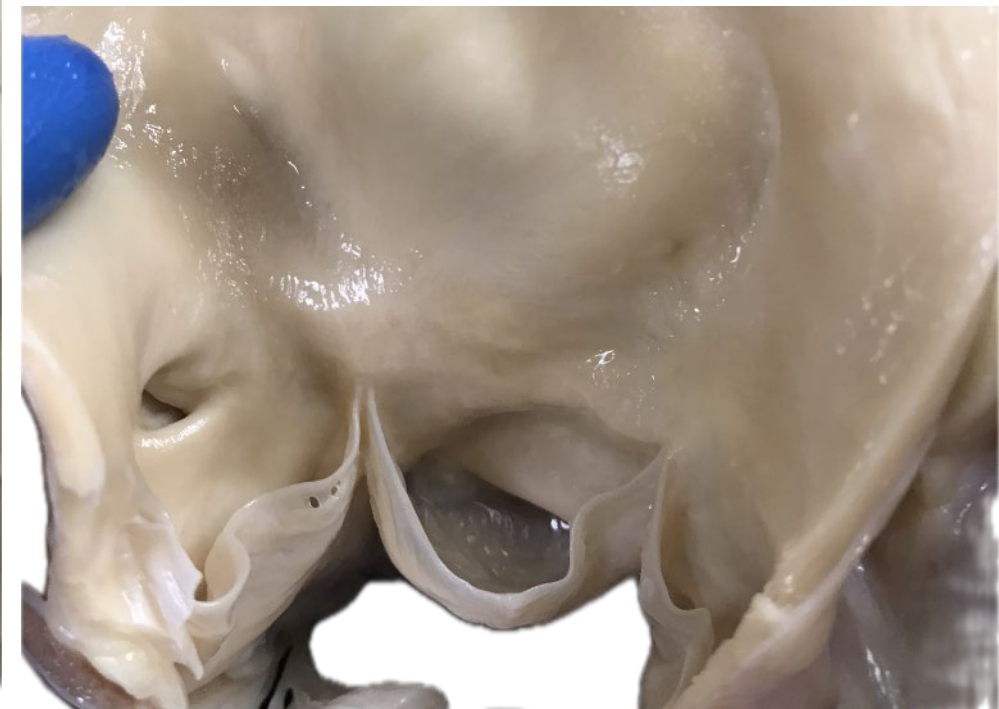
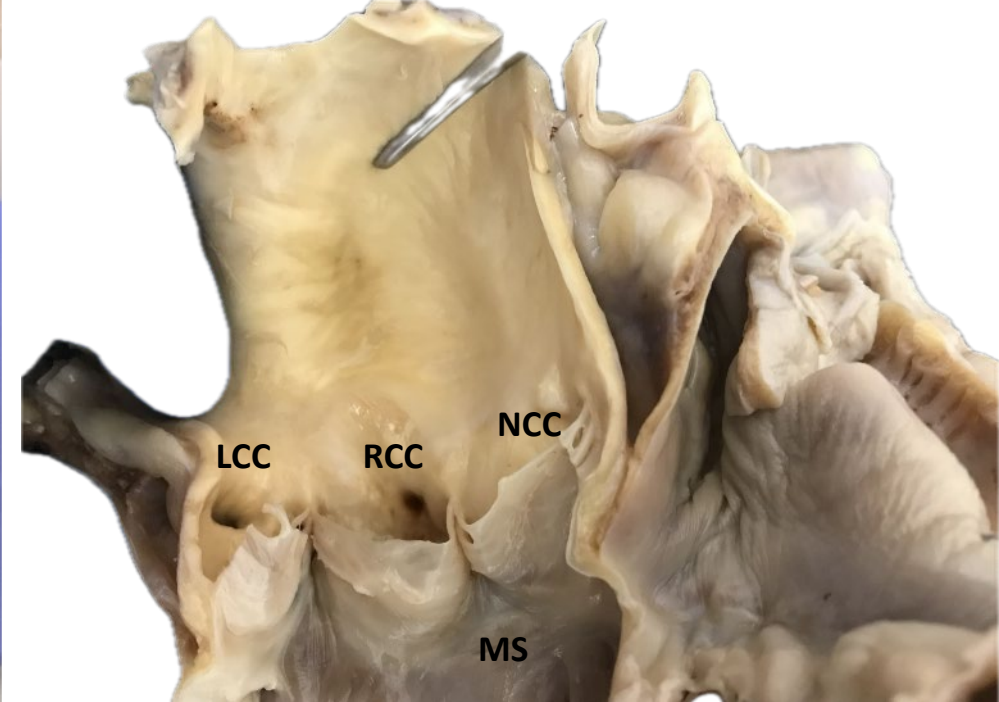
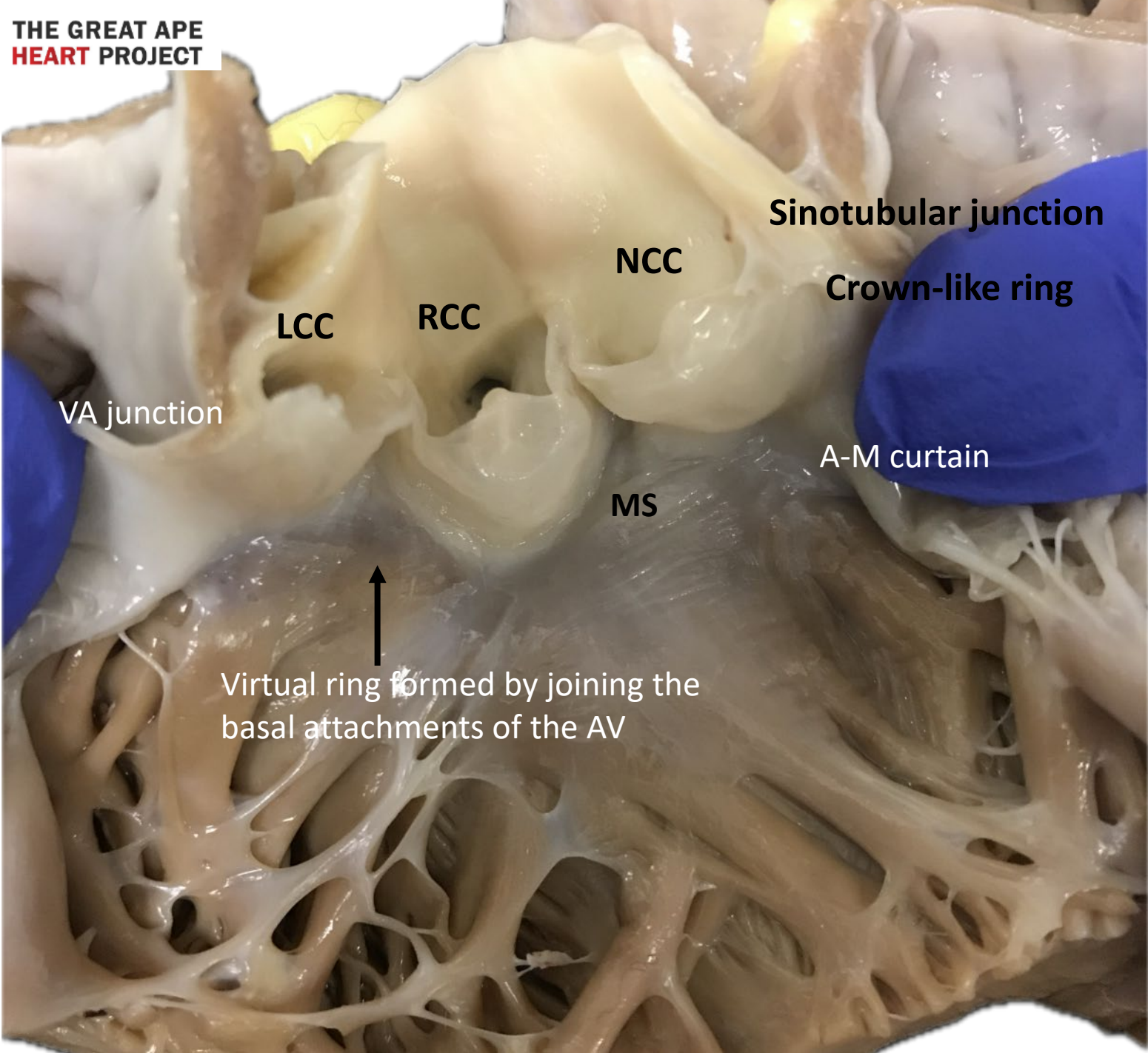


OFFICIAL
Pulmonic valve

THE GREAT APE
HEART PROJECT

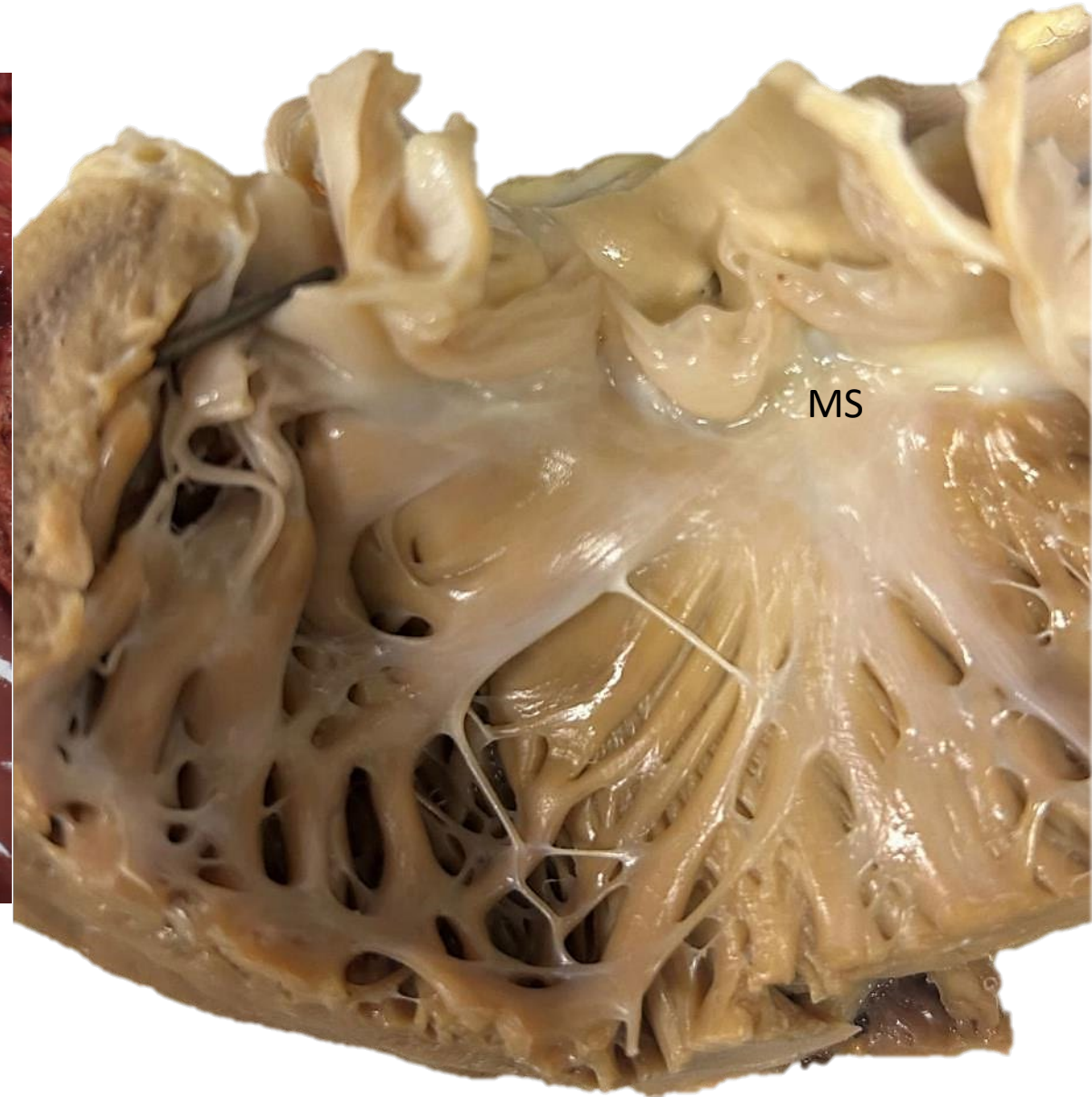
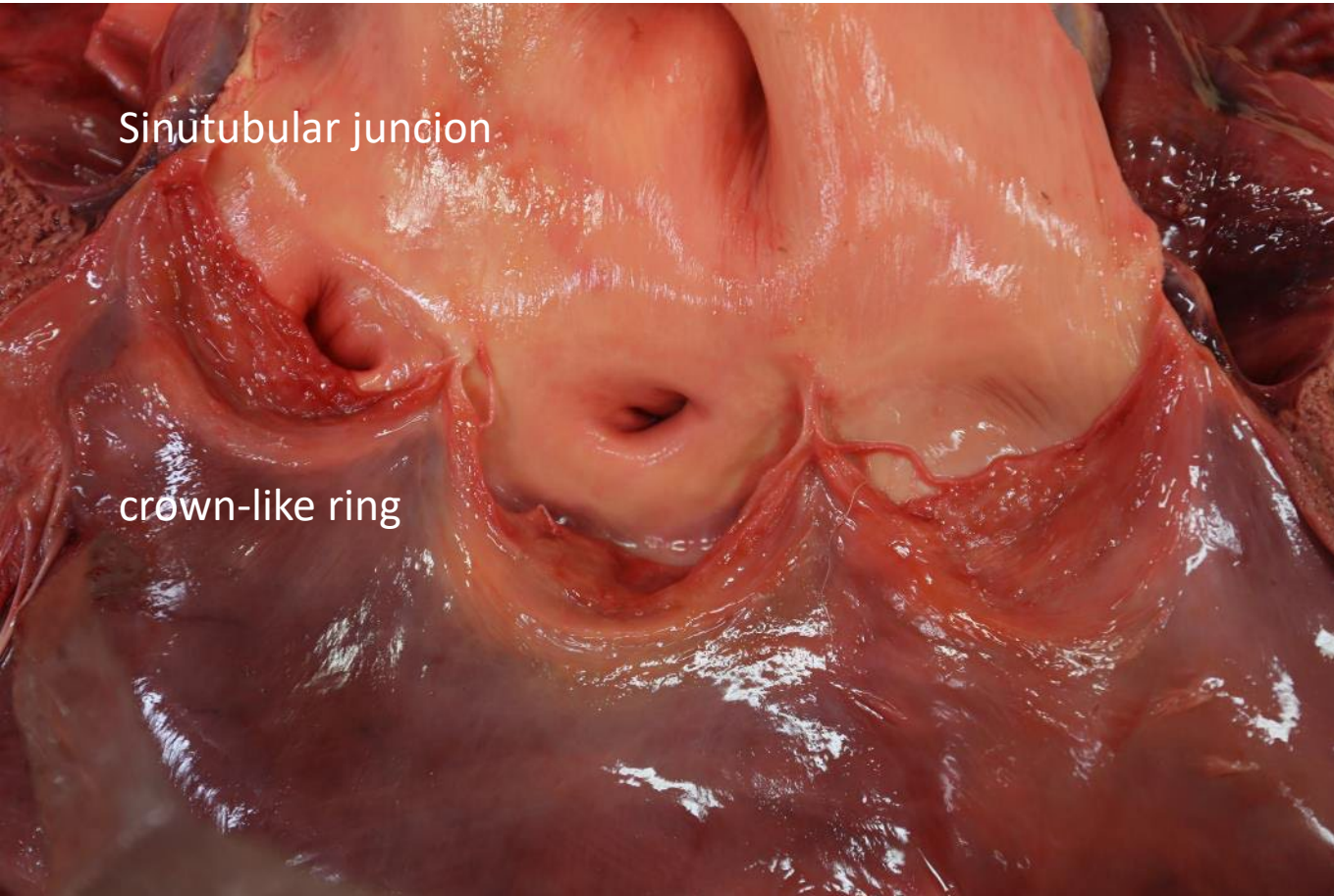


OFFICIAL



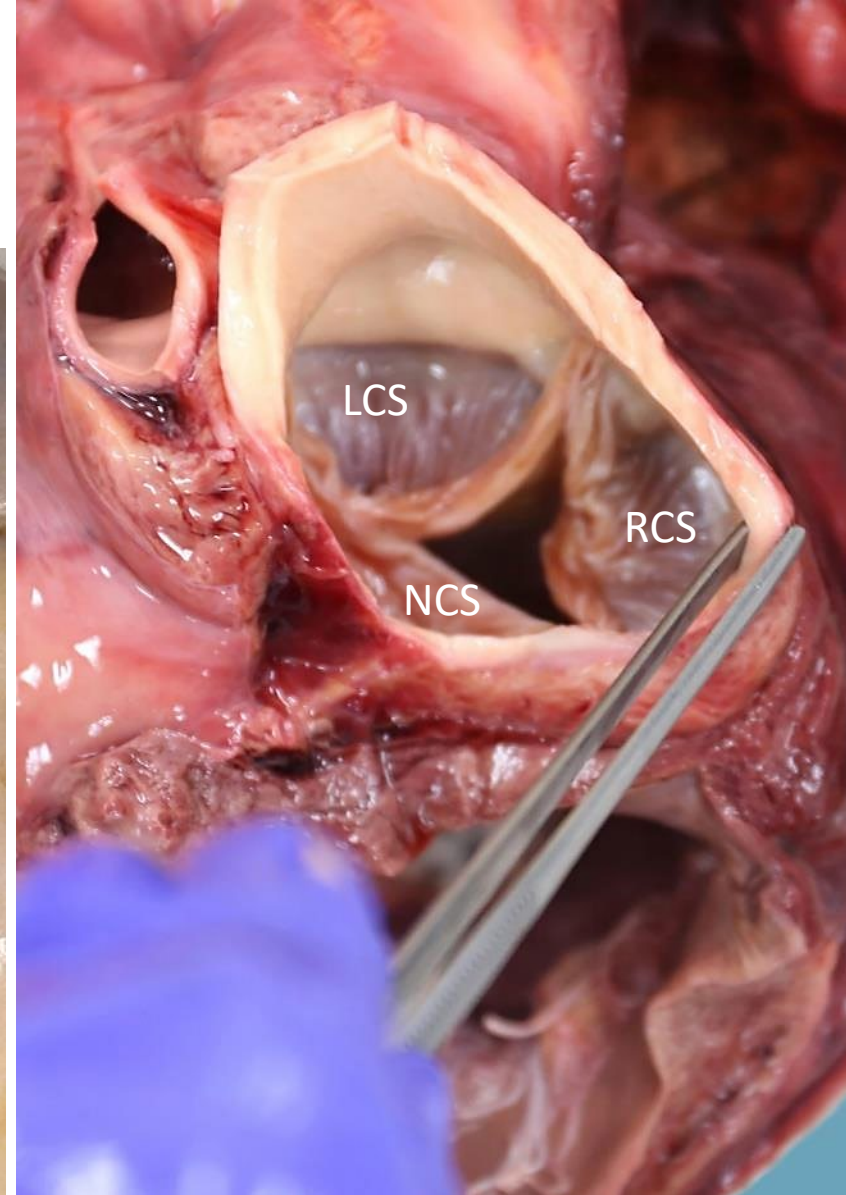
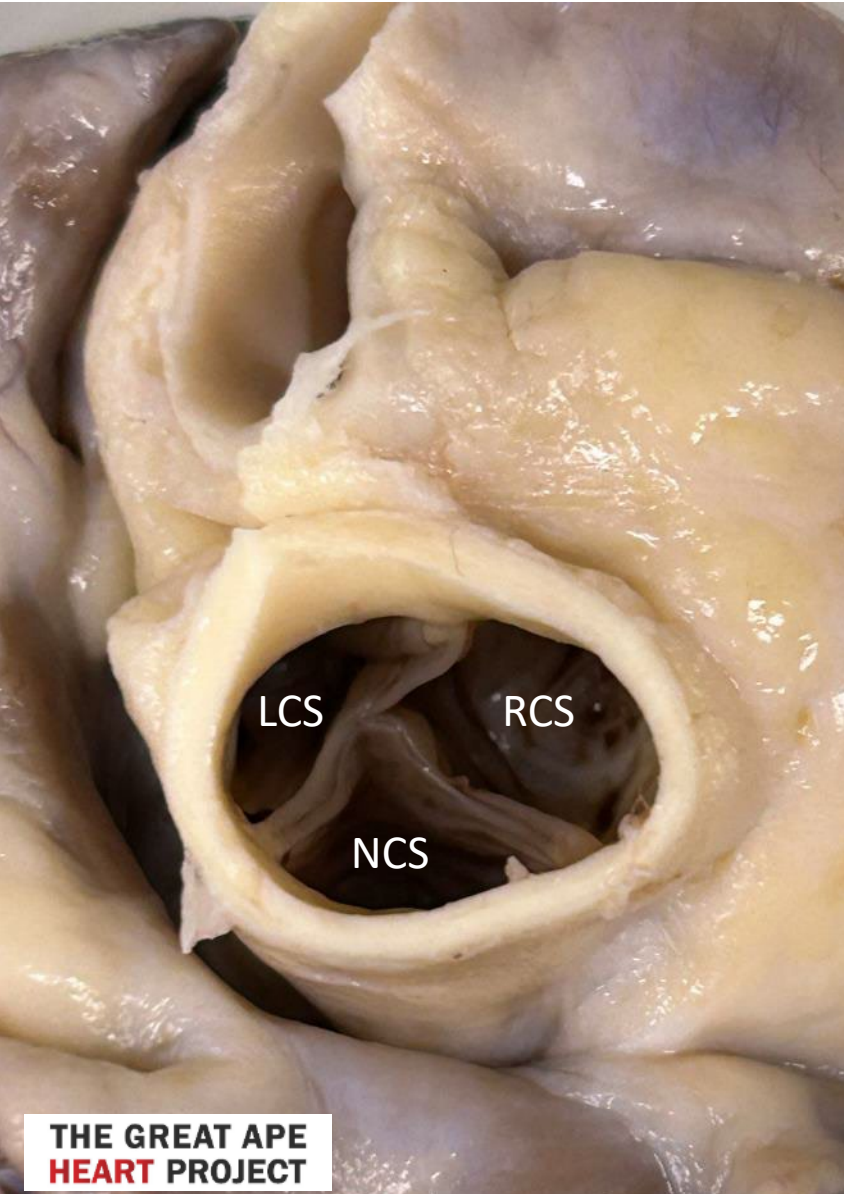
OFFICIAL
Aortic valve

THE GREAT APE
HEART PROJECT

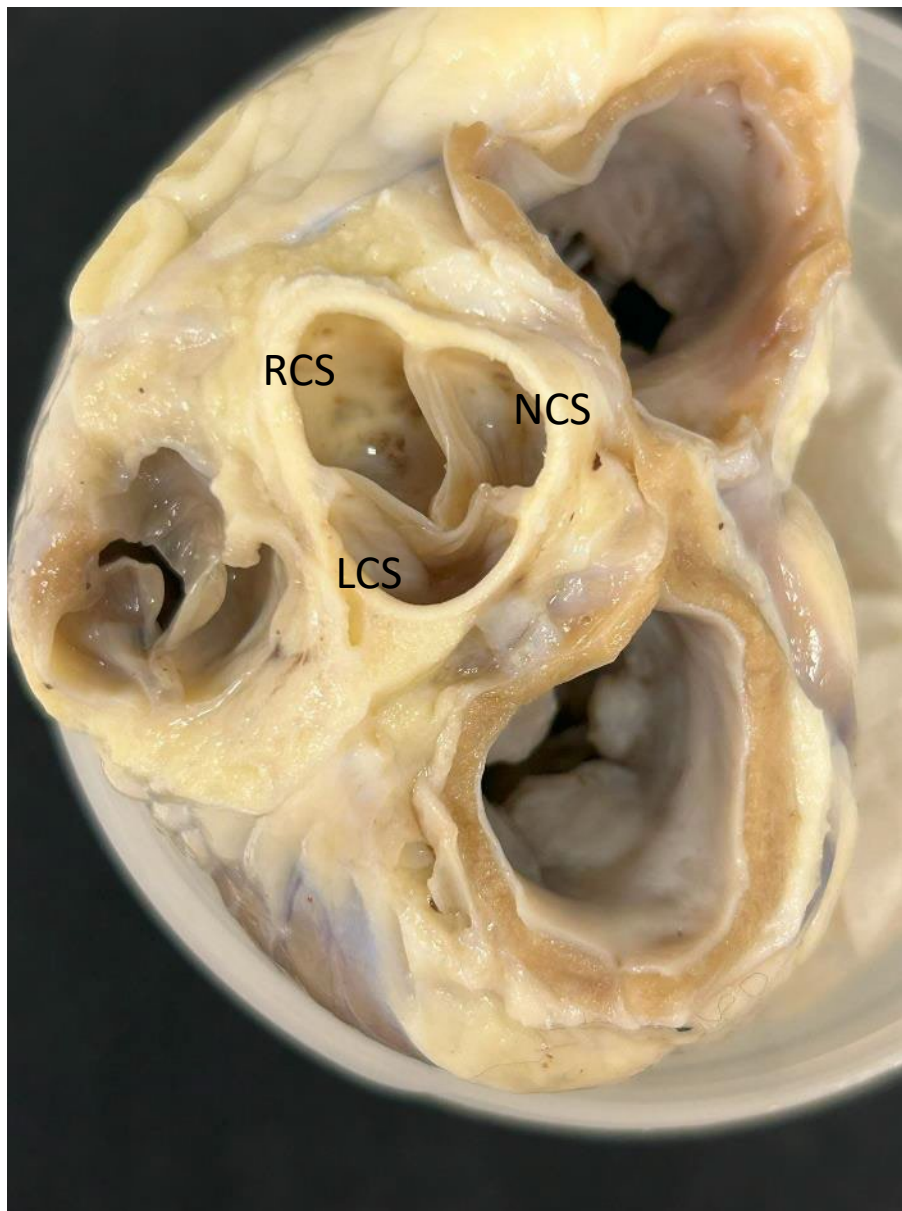


OFFICIAL

Aortic valve

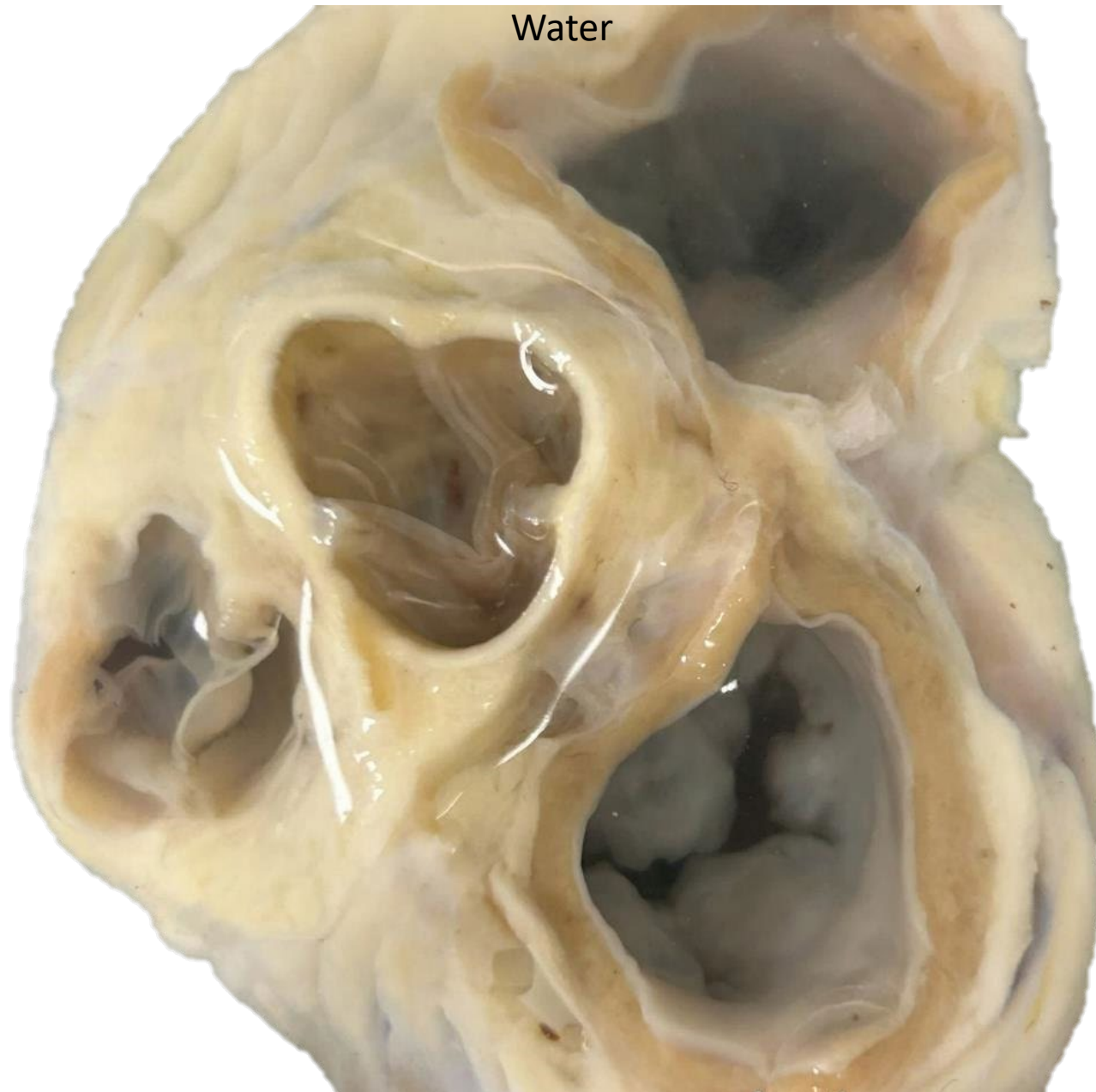


No water



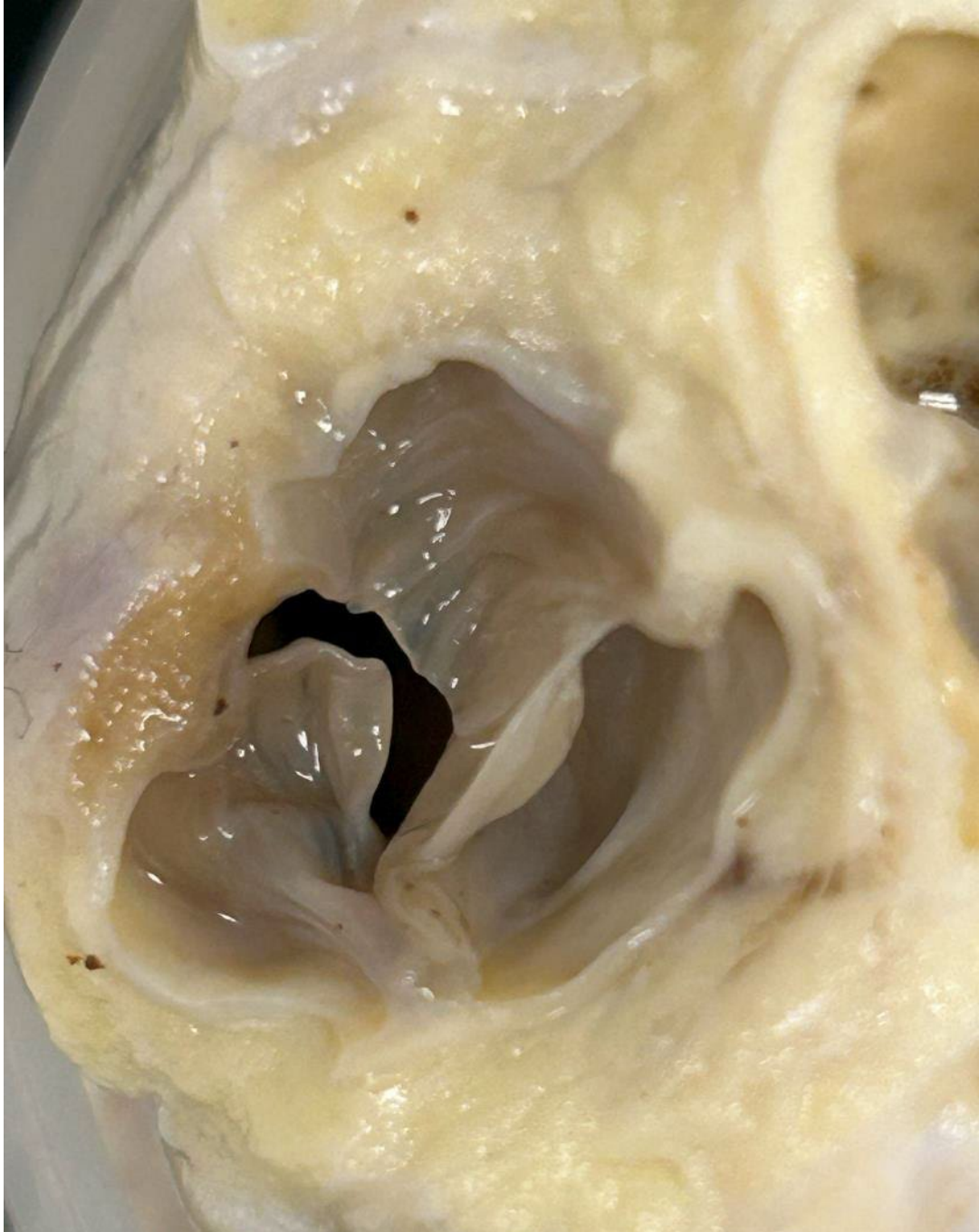
OFFICIAL

Water



OFFICIAL

OFFICIAL



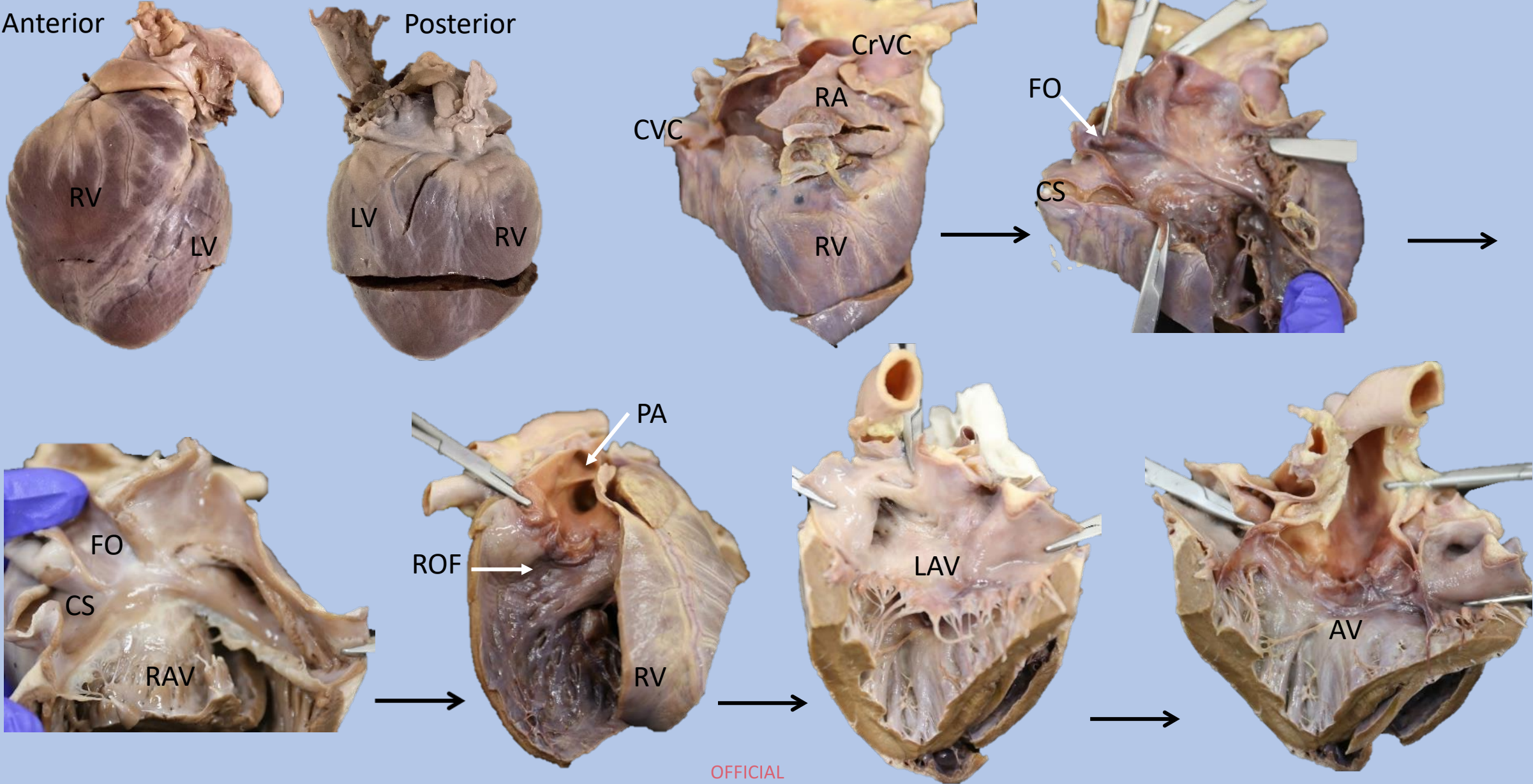


Aortic-mitral curtain

Dissection techniques

OFFICIAL

Blood flow (inflow-outflow)

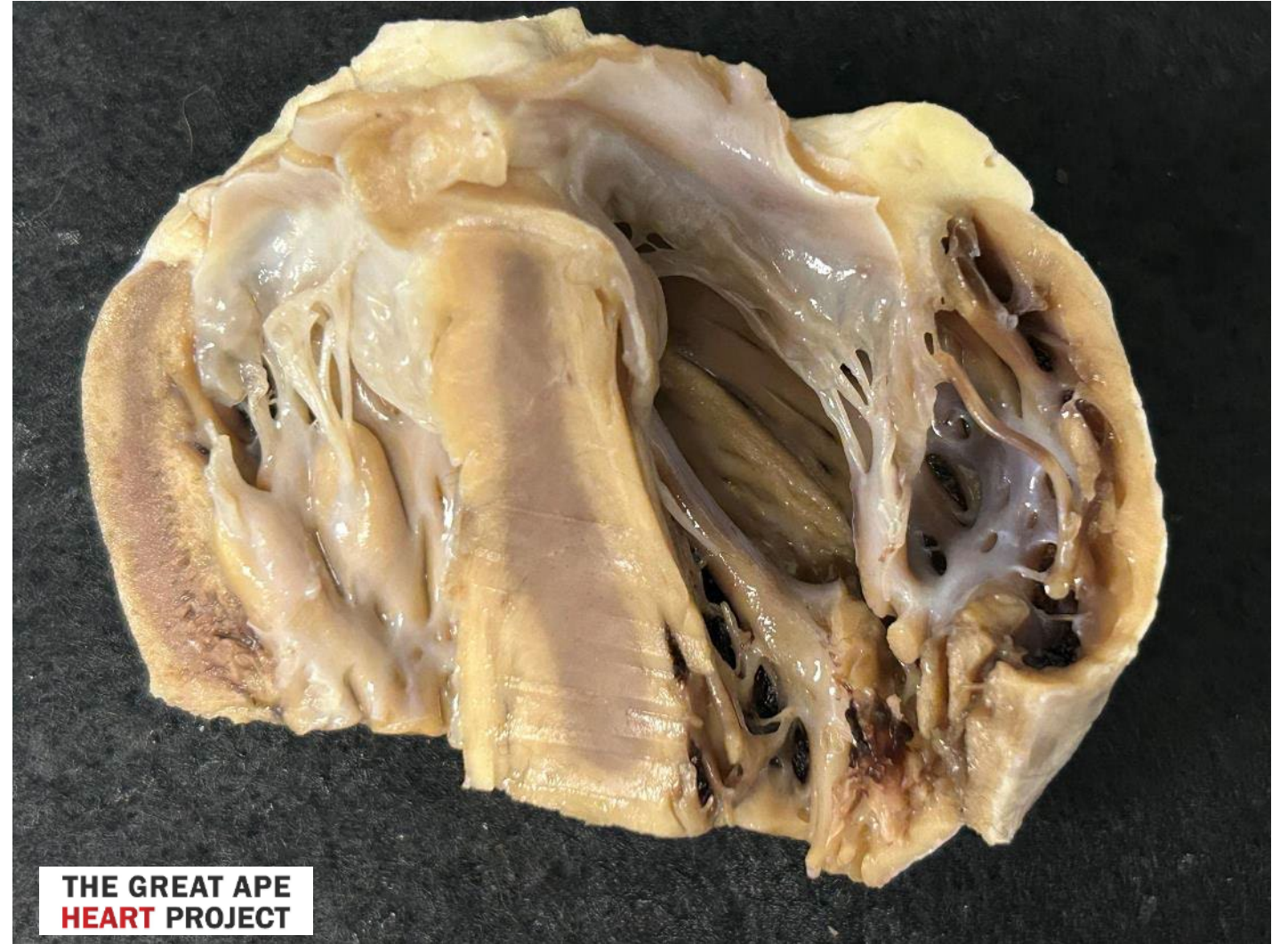


Dissection techniques



OFFICIAL

Four-chamber cut of the heart

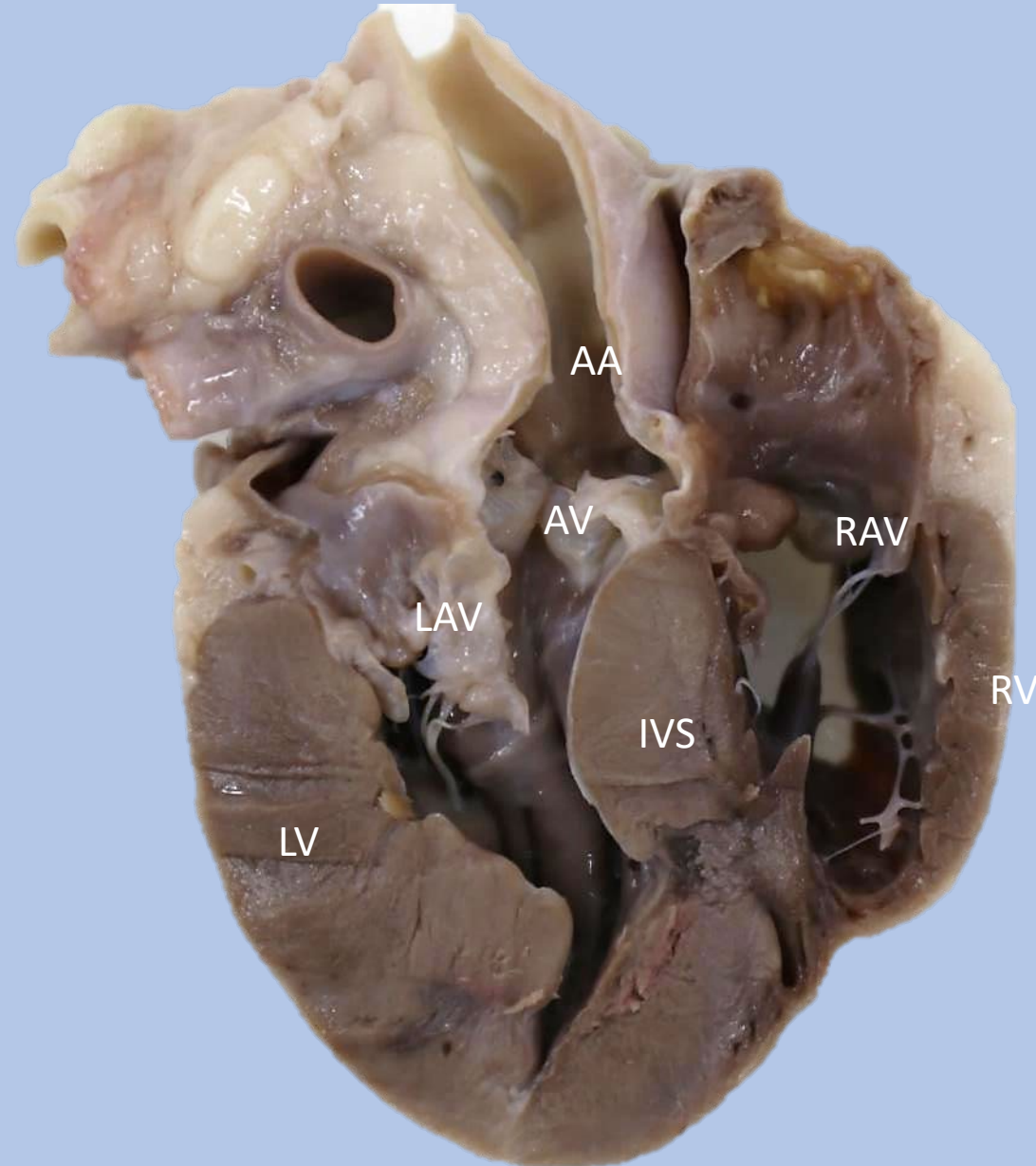


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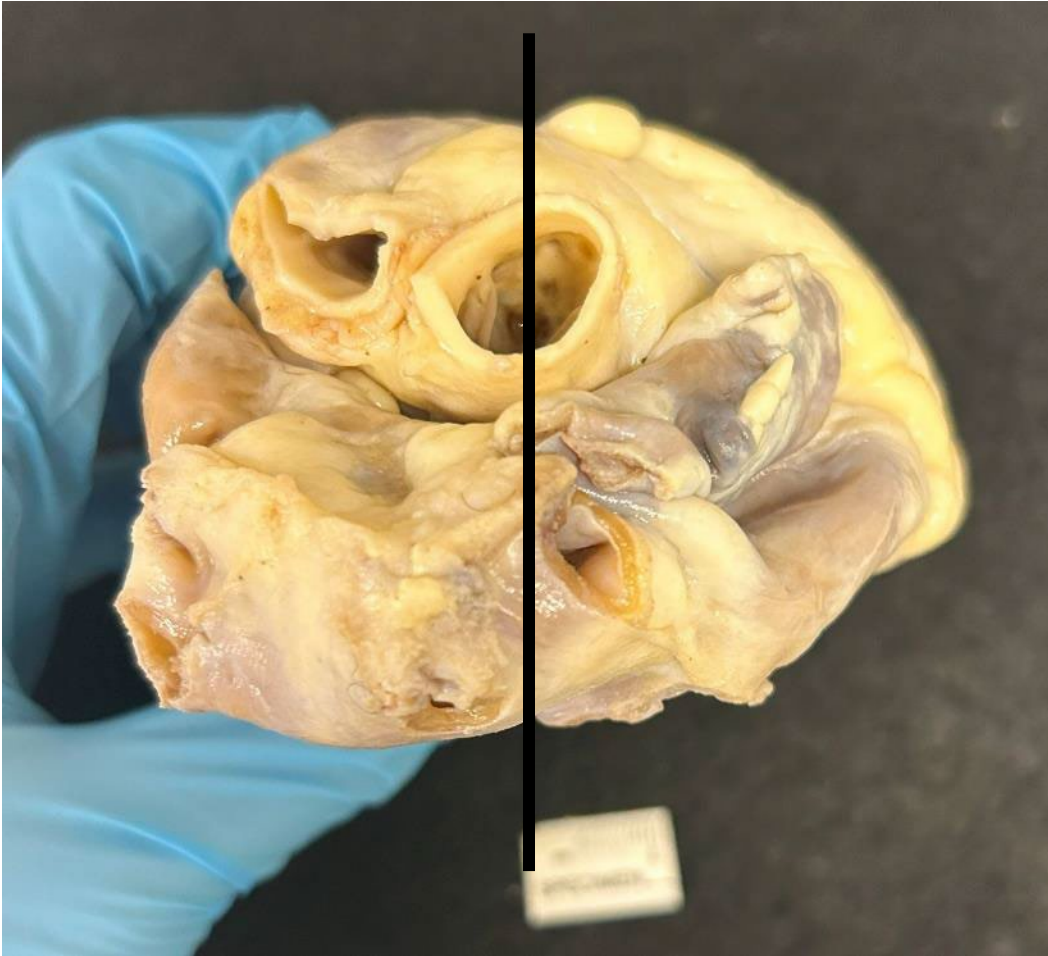
Dissection techniques

OFFICIAL

Four chamber method

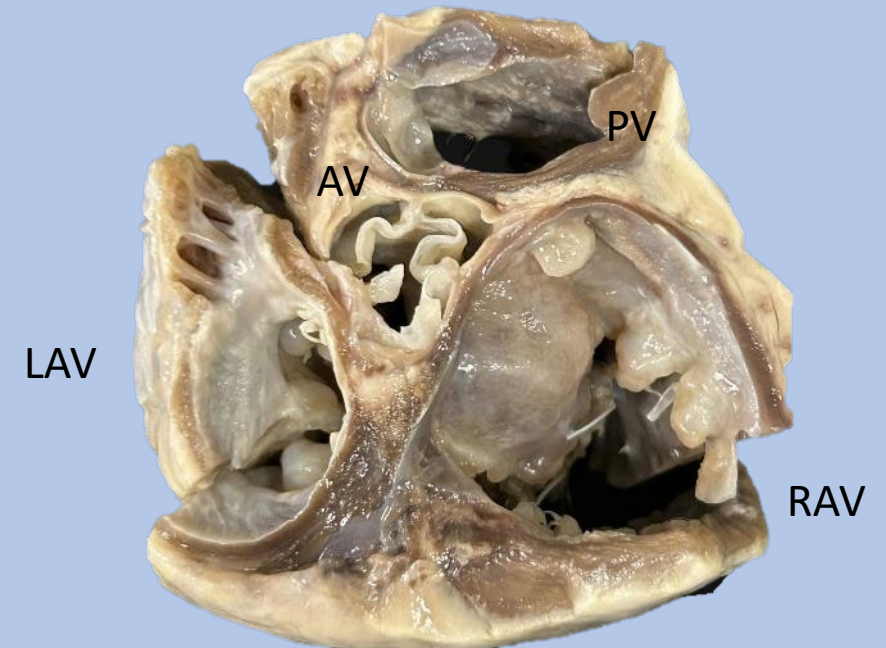
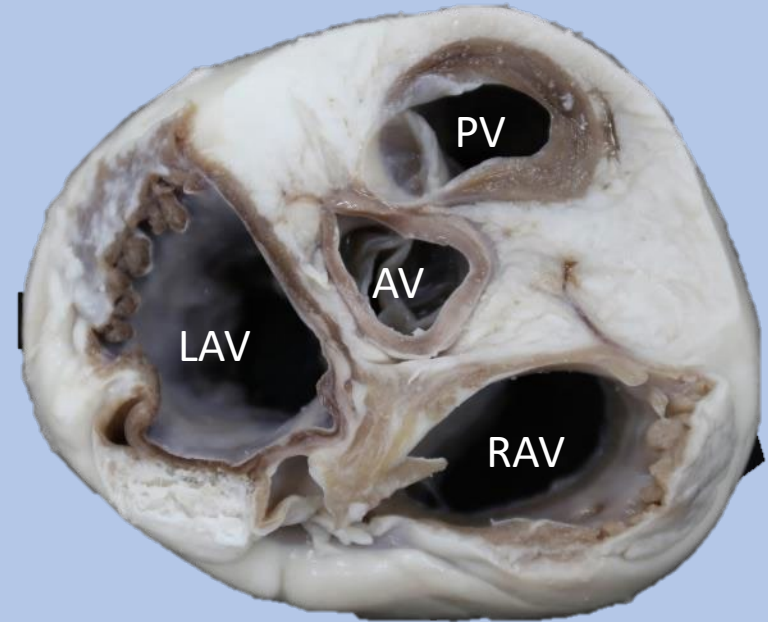
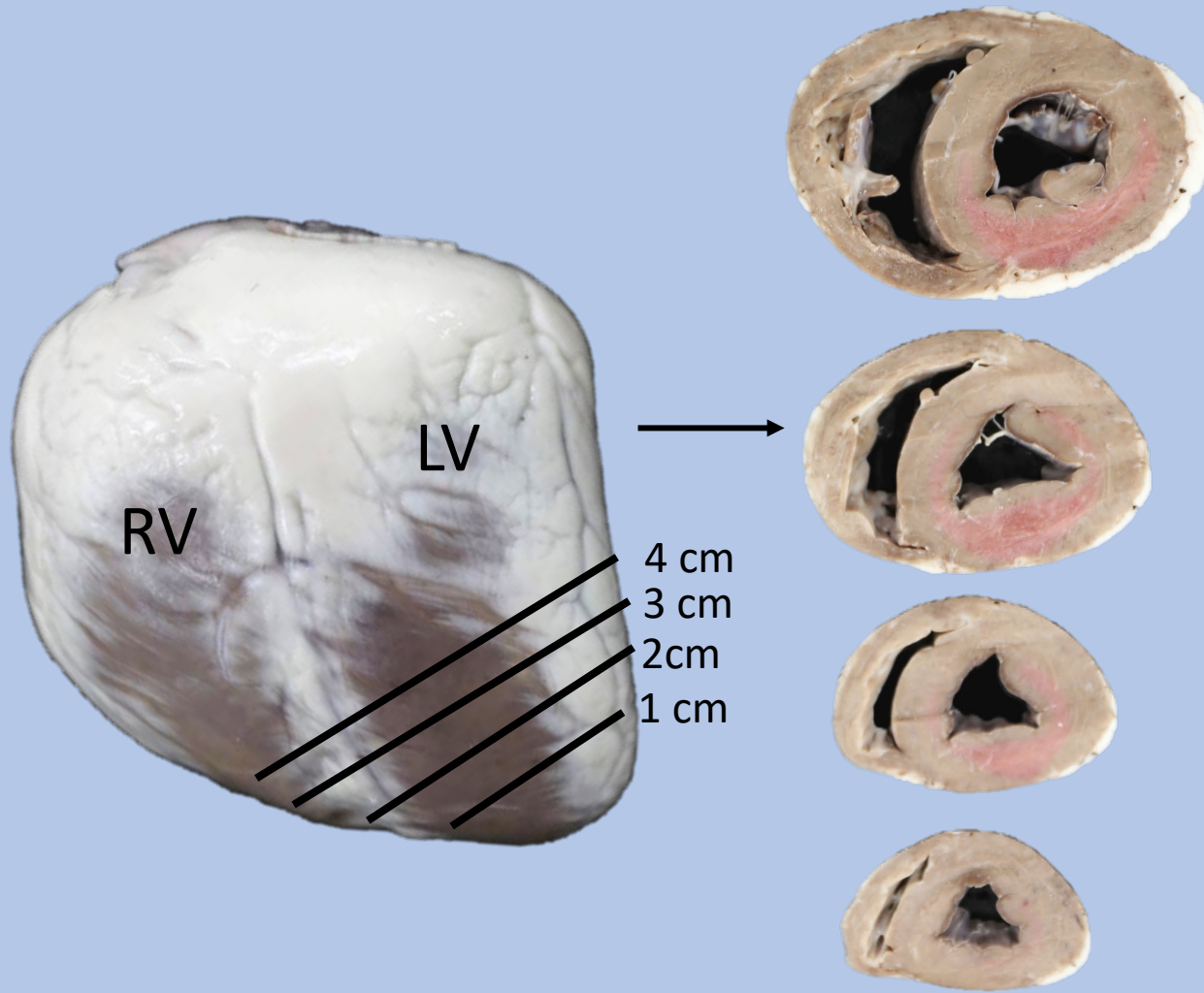


Dissection techniques



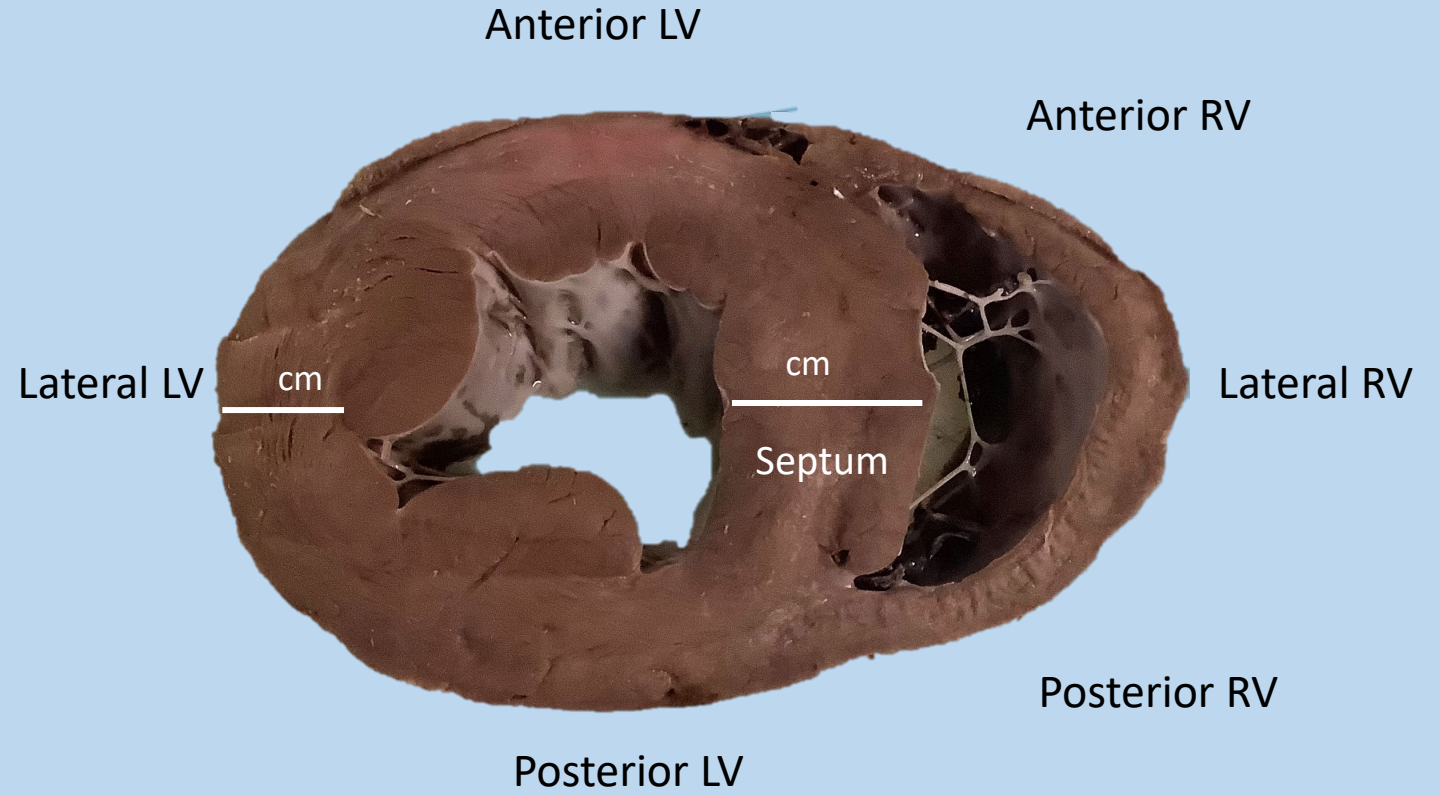
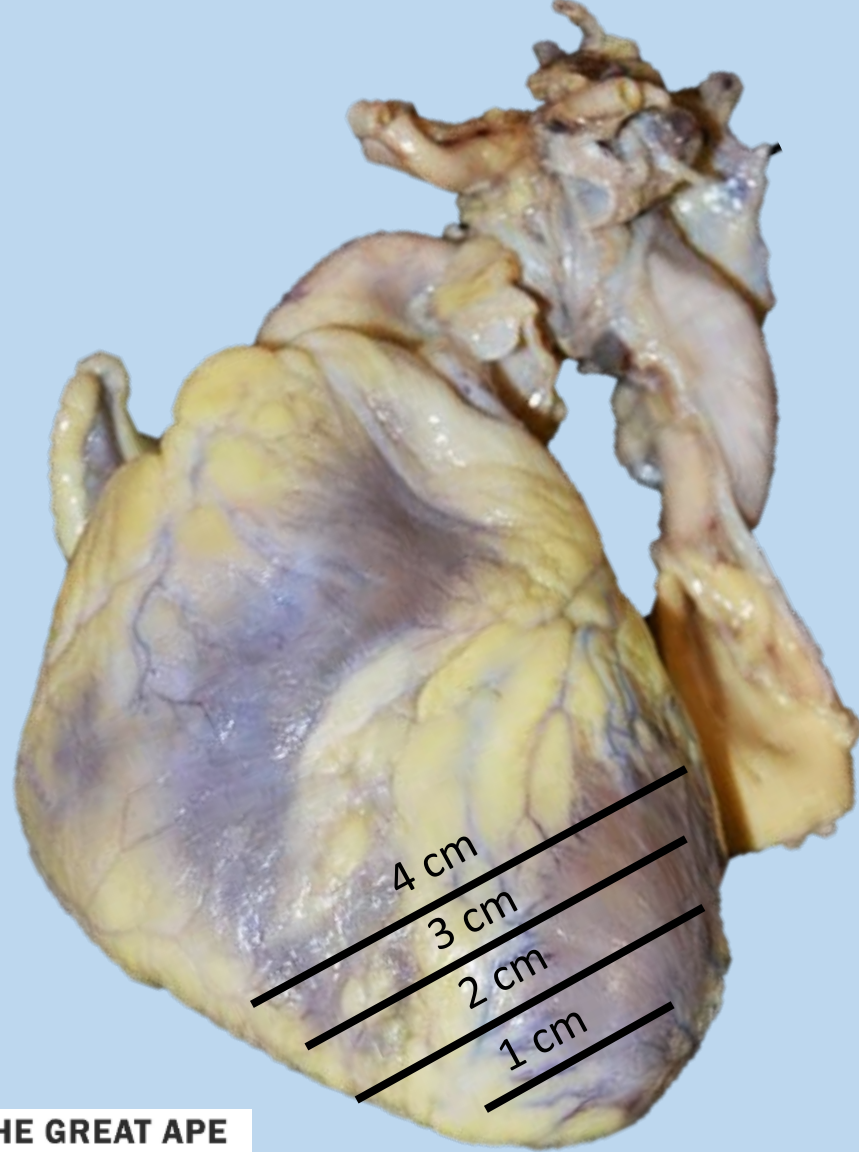
Long-axis cut of the heart



*Base of the heart method**Short axis method*

OFFICIAL

HEART SAMPLING



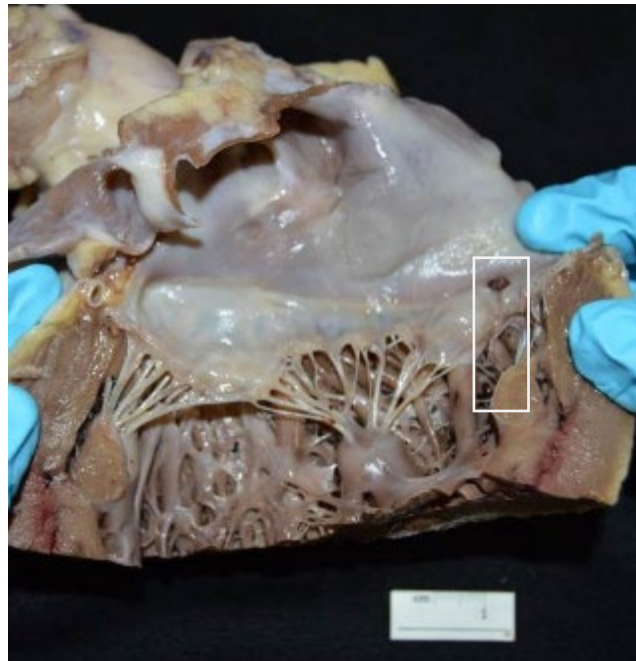
THE GREAT APE
HEART PROJECT

OFFICIAL

RA-RV-AV valve



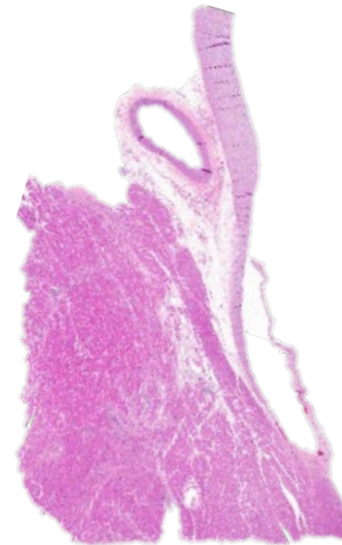
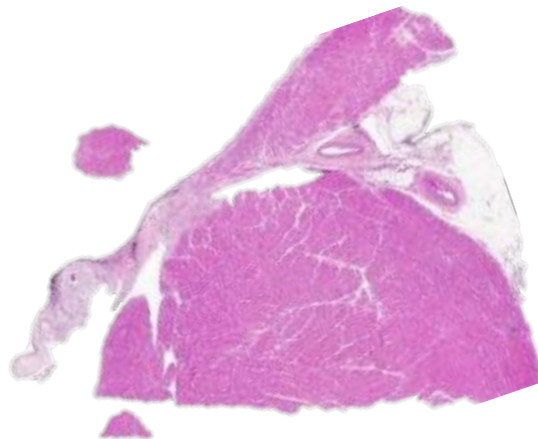
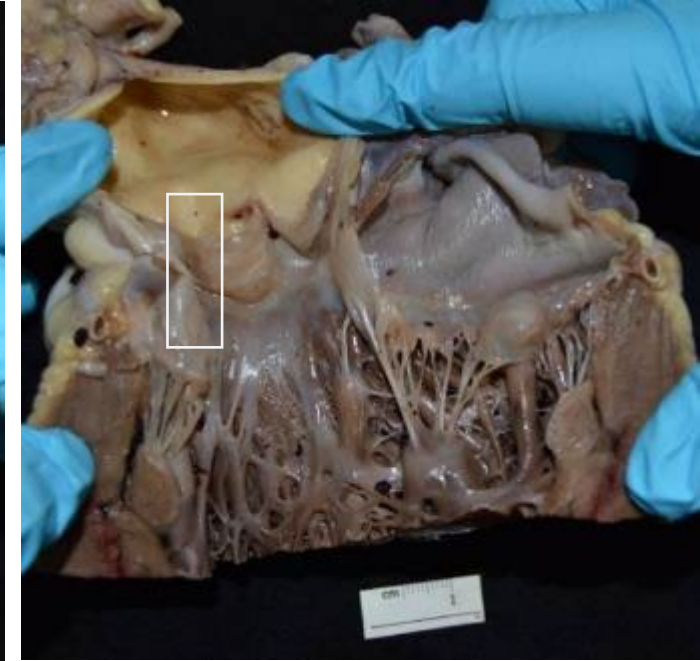
LA-LV-AV valve



Pulmonic valve



Aortic valve



HISTOLOGIC RECONSTRUCTION OF A TRANSVERSE SECTION



**Anterior RV
Lateral RV
Posterior RV**

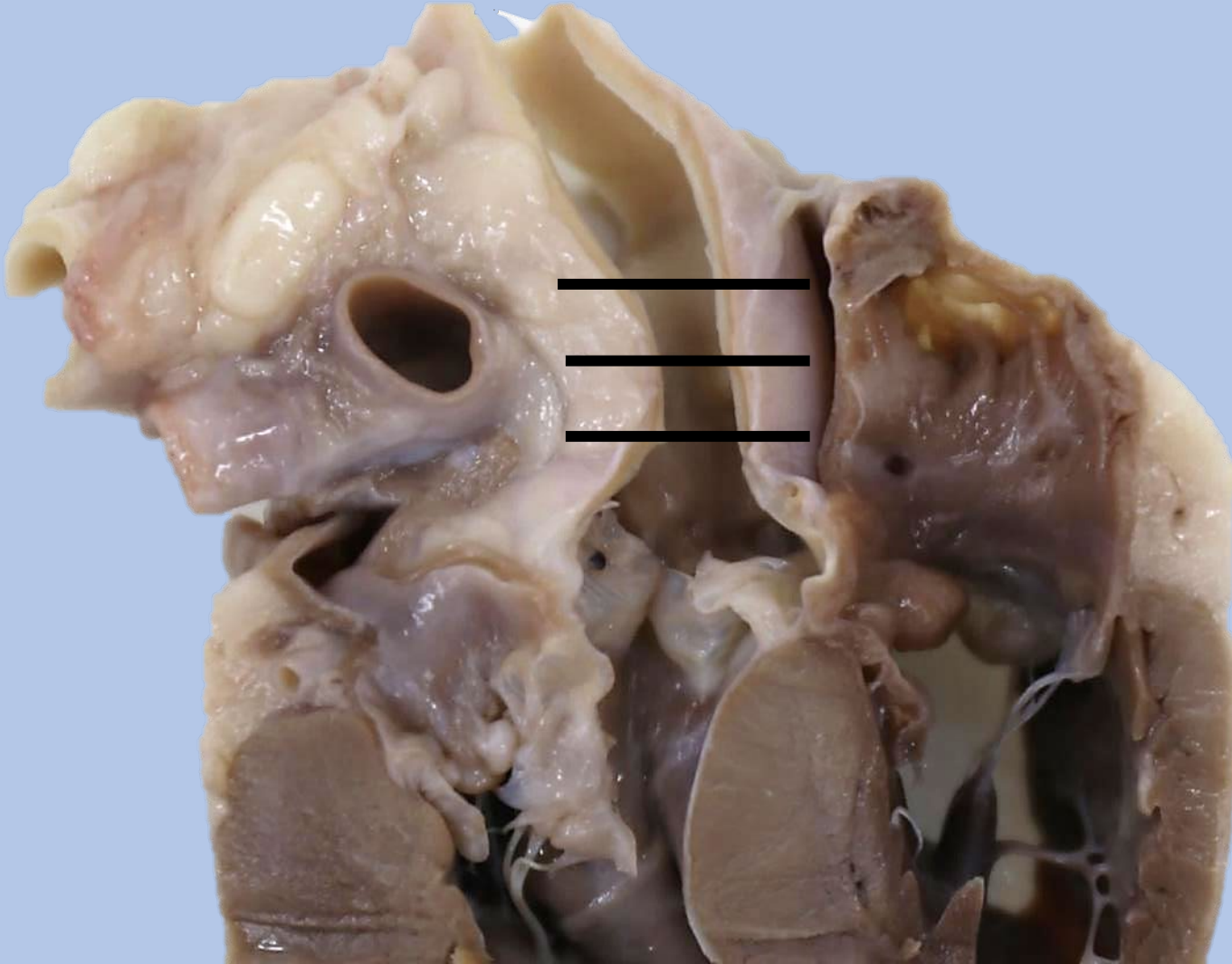
**Anterior LV
Lateral LV
Posterior LV
Anterolateral LV
Posterolateral LV**

**Anterior septum
Mid-septum
Posterior septum**

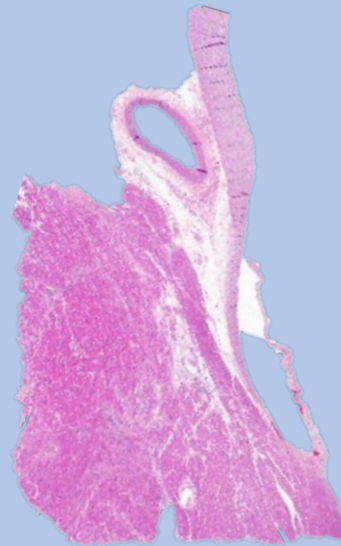
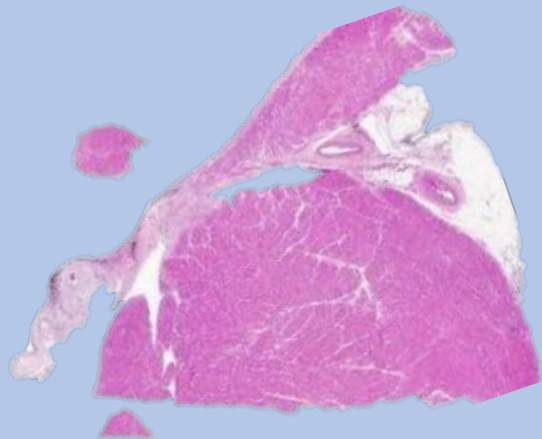
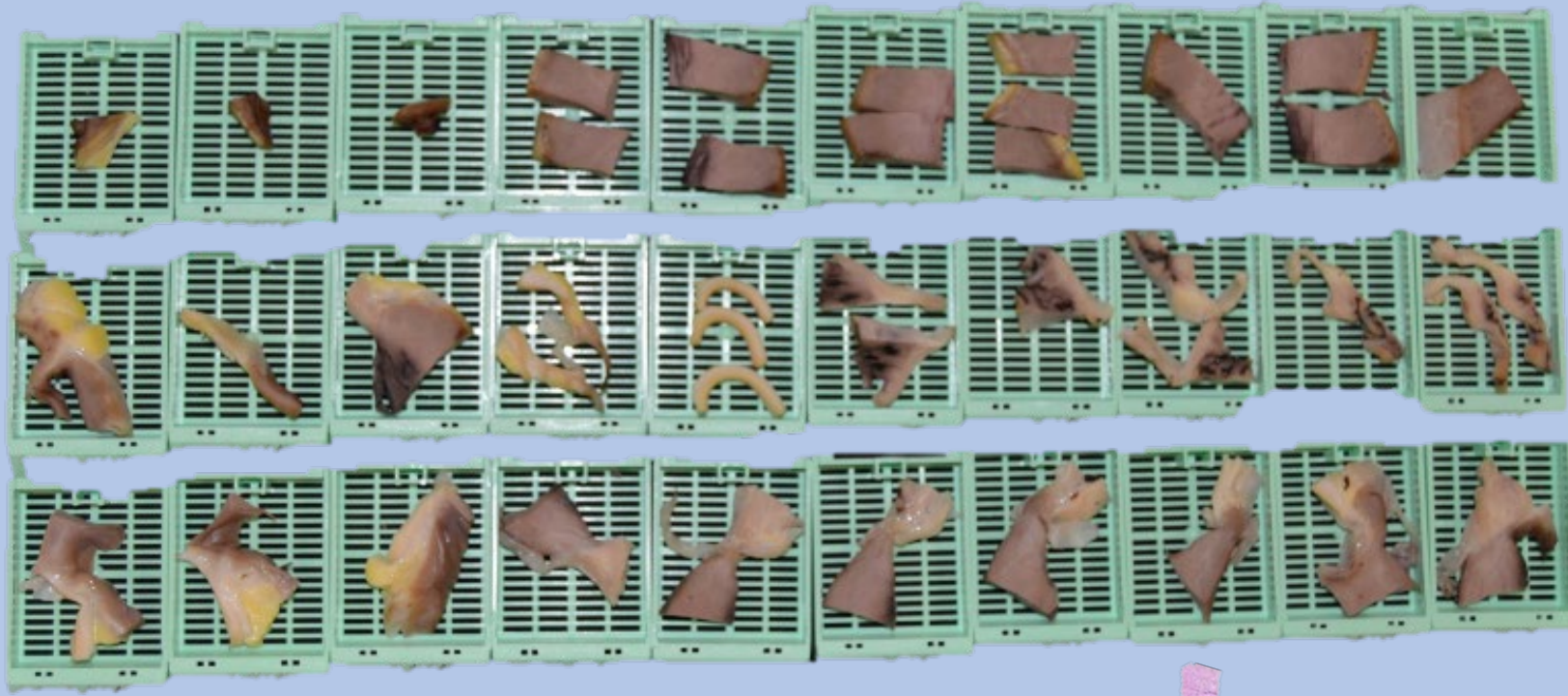
**Papillary muscles
Lesions**

OFFICIAL AORTA SAMPLING

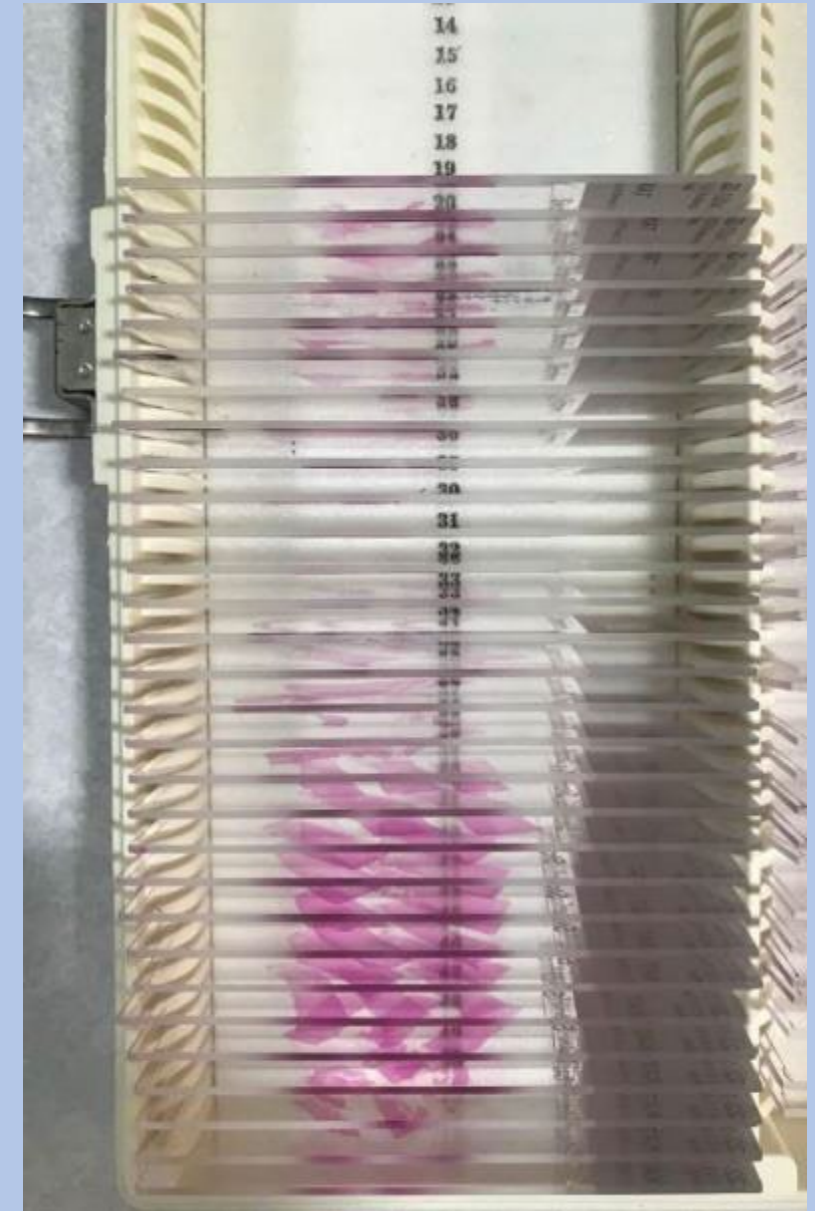
Cross sections of ascending aorta-arch/lesions



OFFICIAL



OFFICIAL

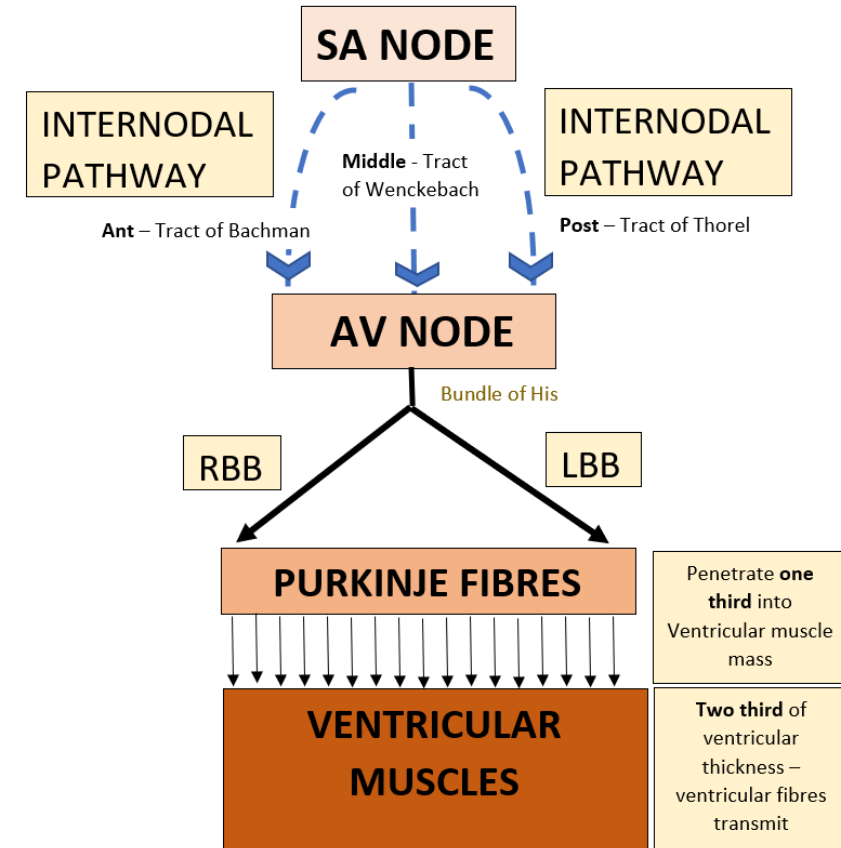
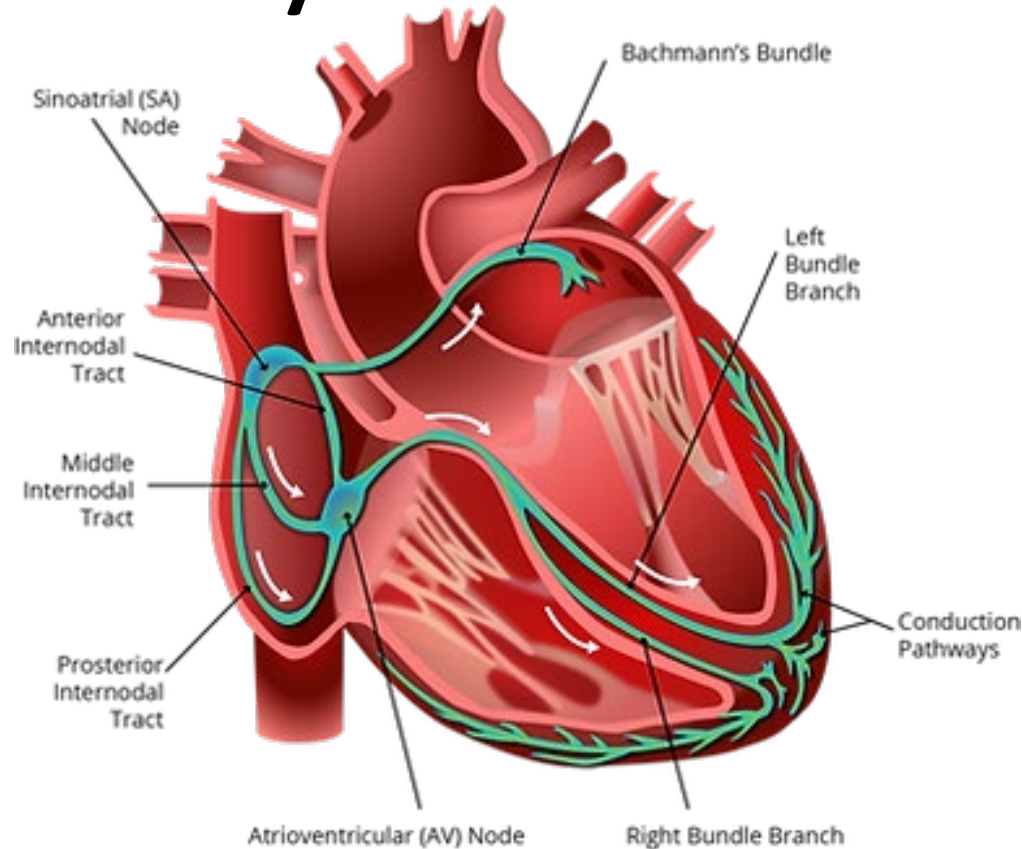


**THE GREAT APE
HEART PROJECT**

Conduction system

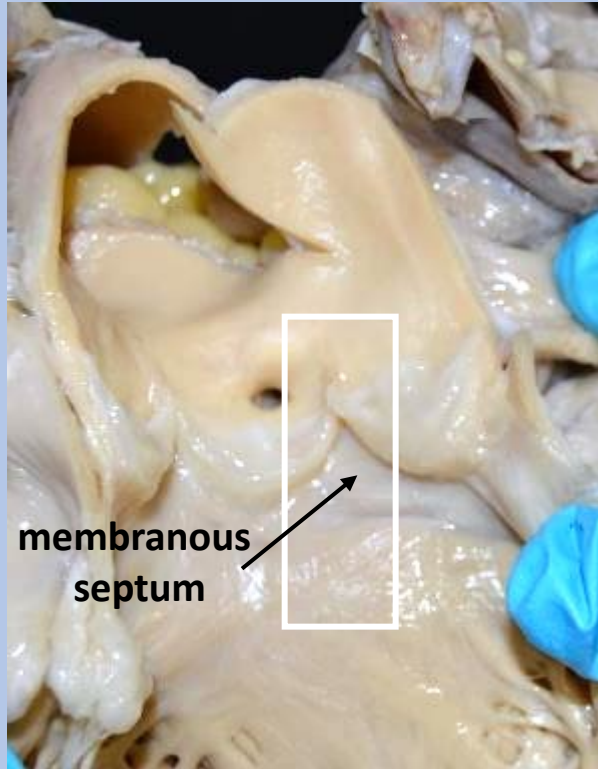
OFFICIAL

The conduction system of the heart initiates and coordinates the electric signal that causes the rhythmic and synchronized contractions of the atria and ventricles.

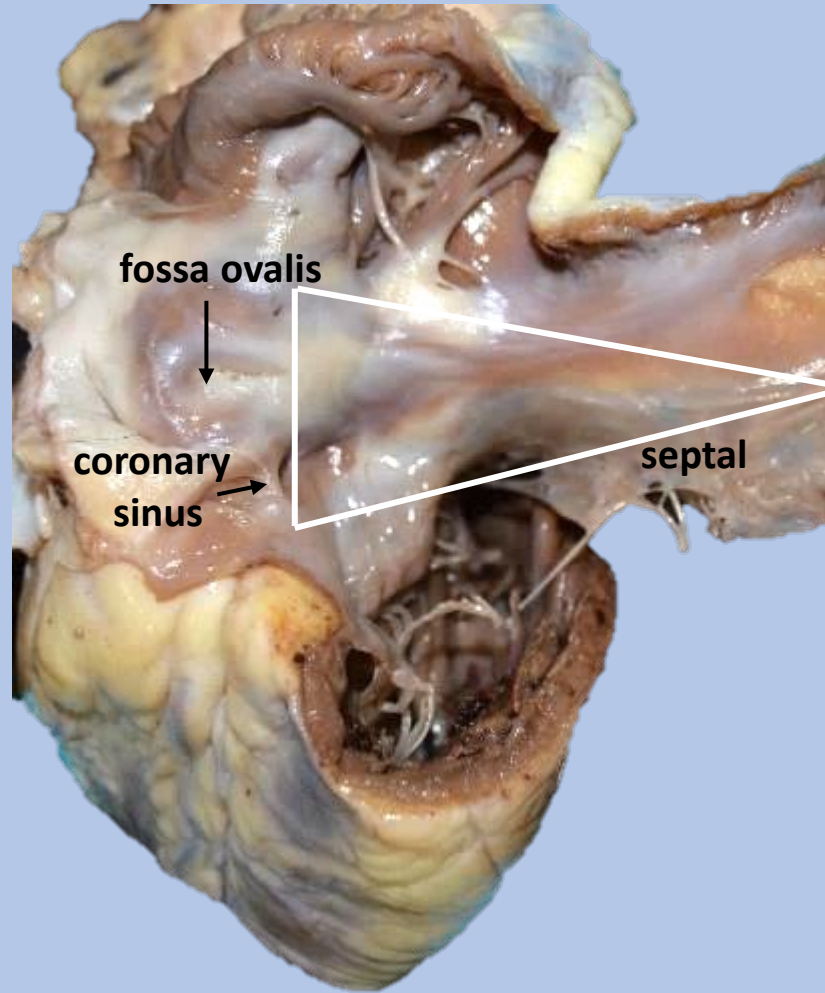


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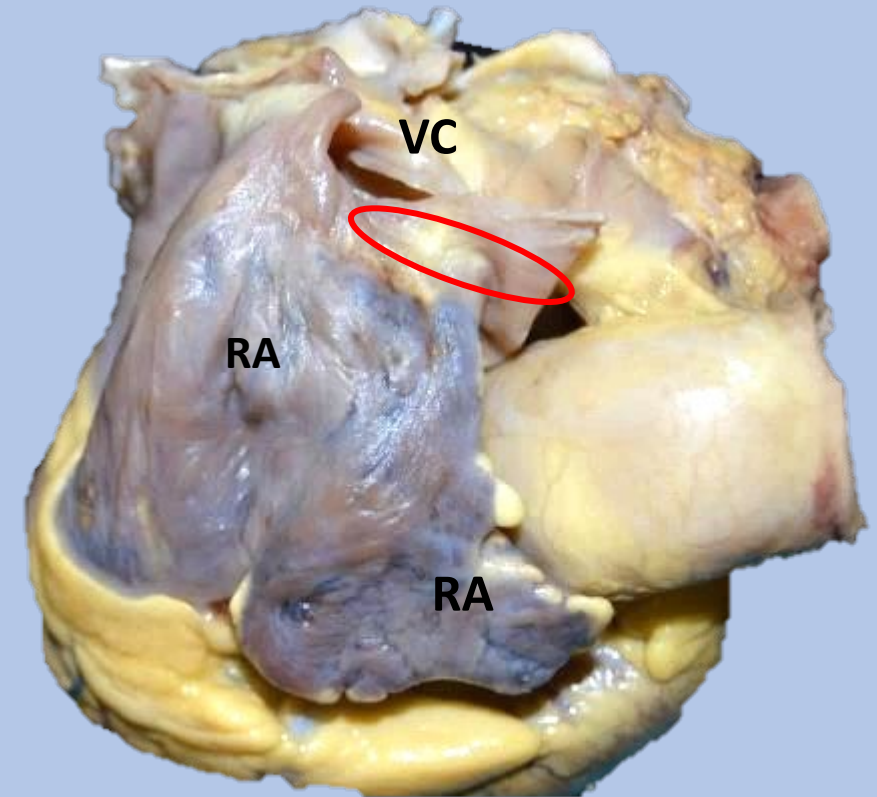
CONDUCTION SYSTEM



Atrioventricular node
Left bundle branch



Atrioventricular node

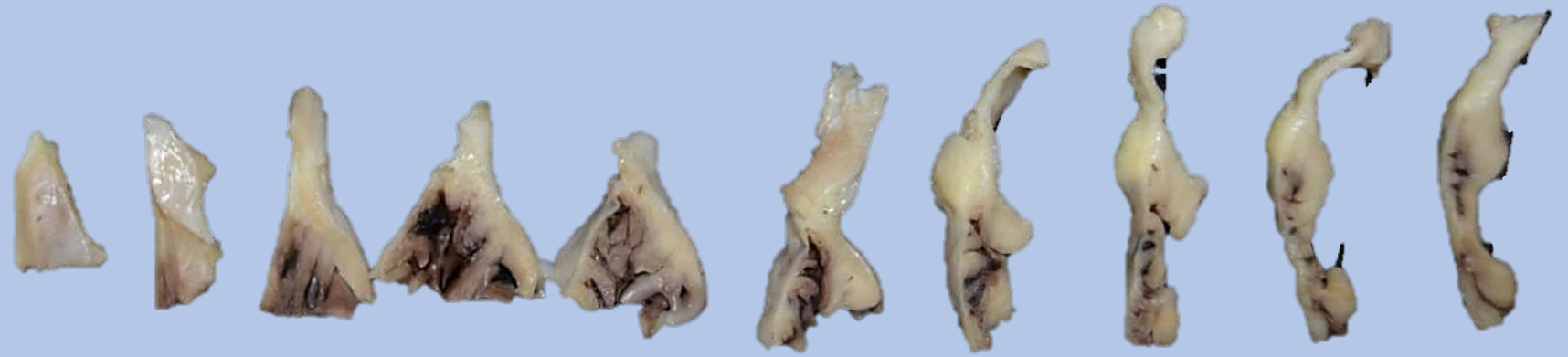
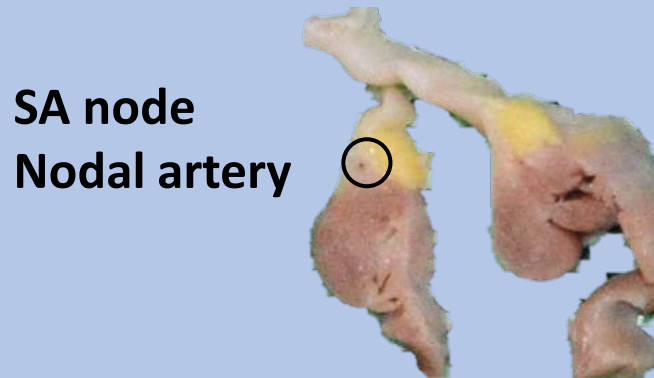


Sinoatrial node

SINOATRIAL NODE

Cranial vena cava

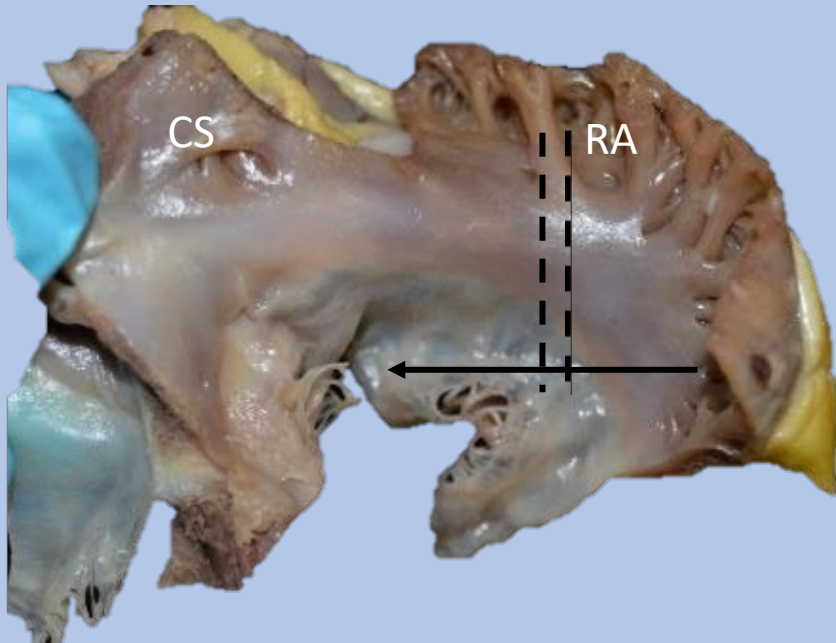
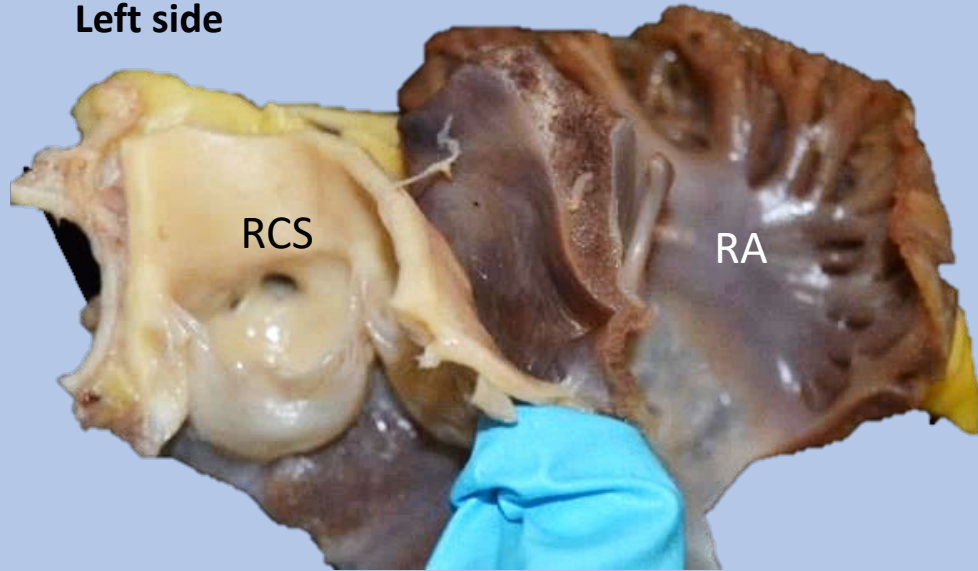
RA



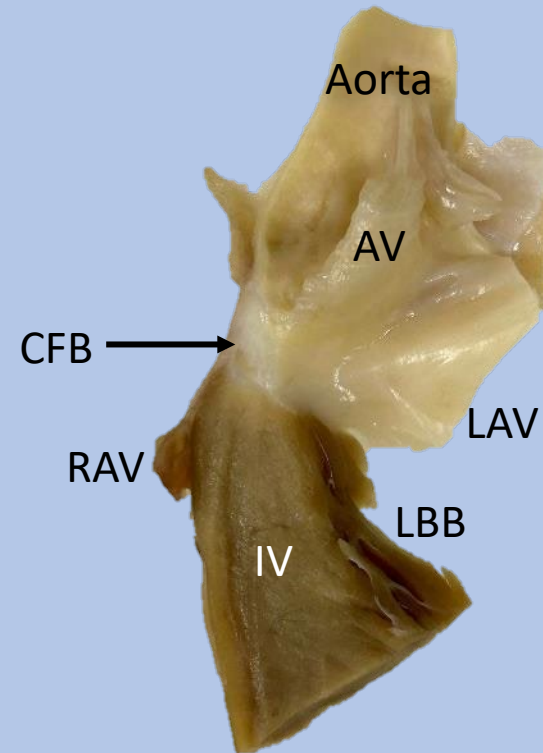
OFFICIAL

OFFICIAL ATRIOVENTRICULAR NODE

Left side

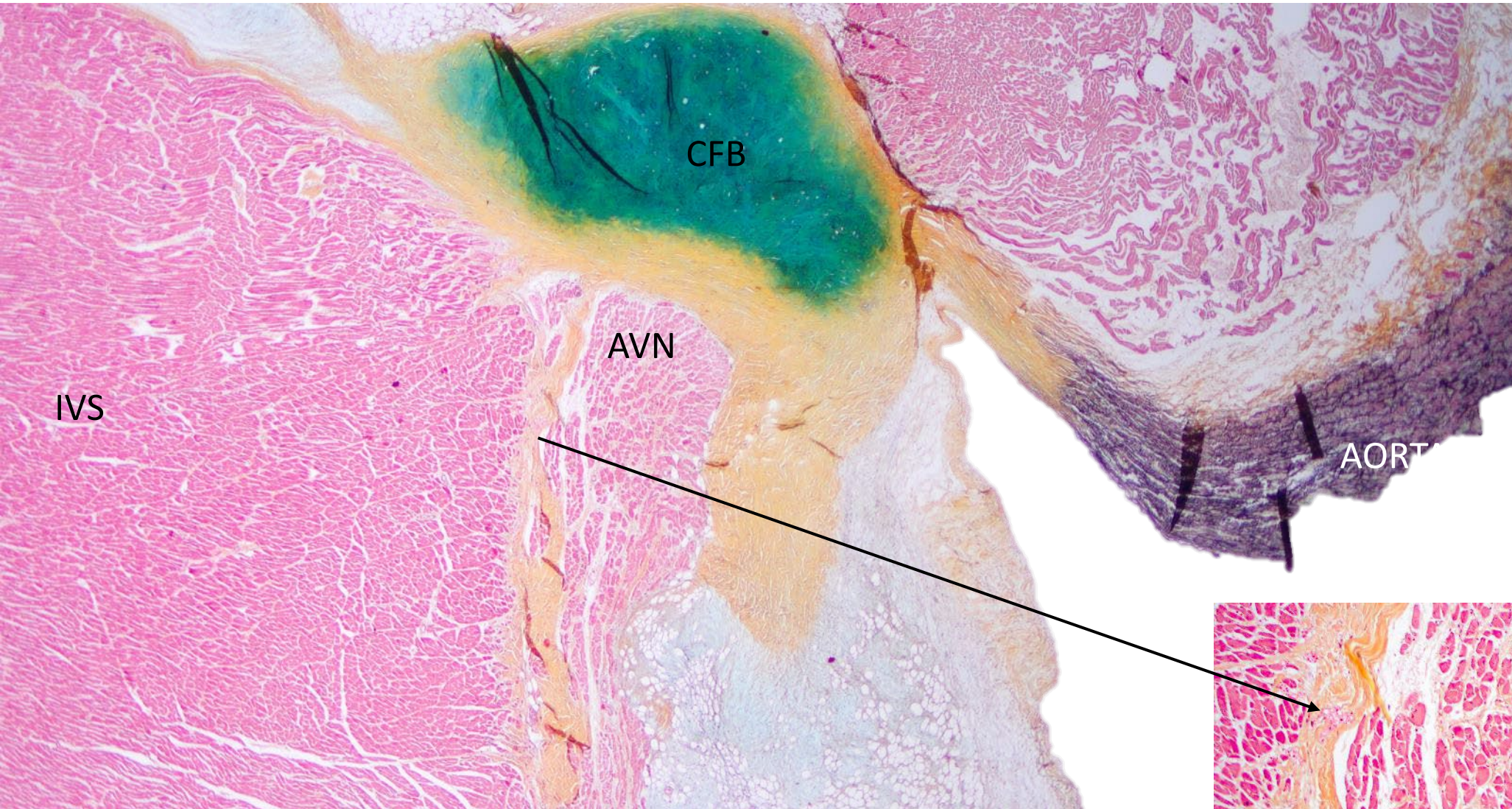
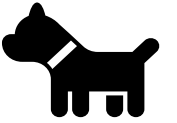


Right side

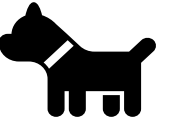


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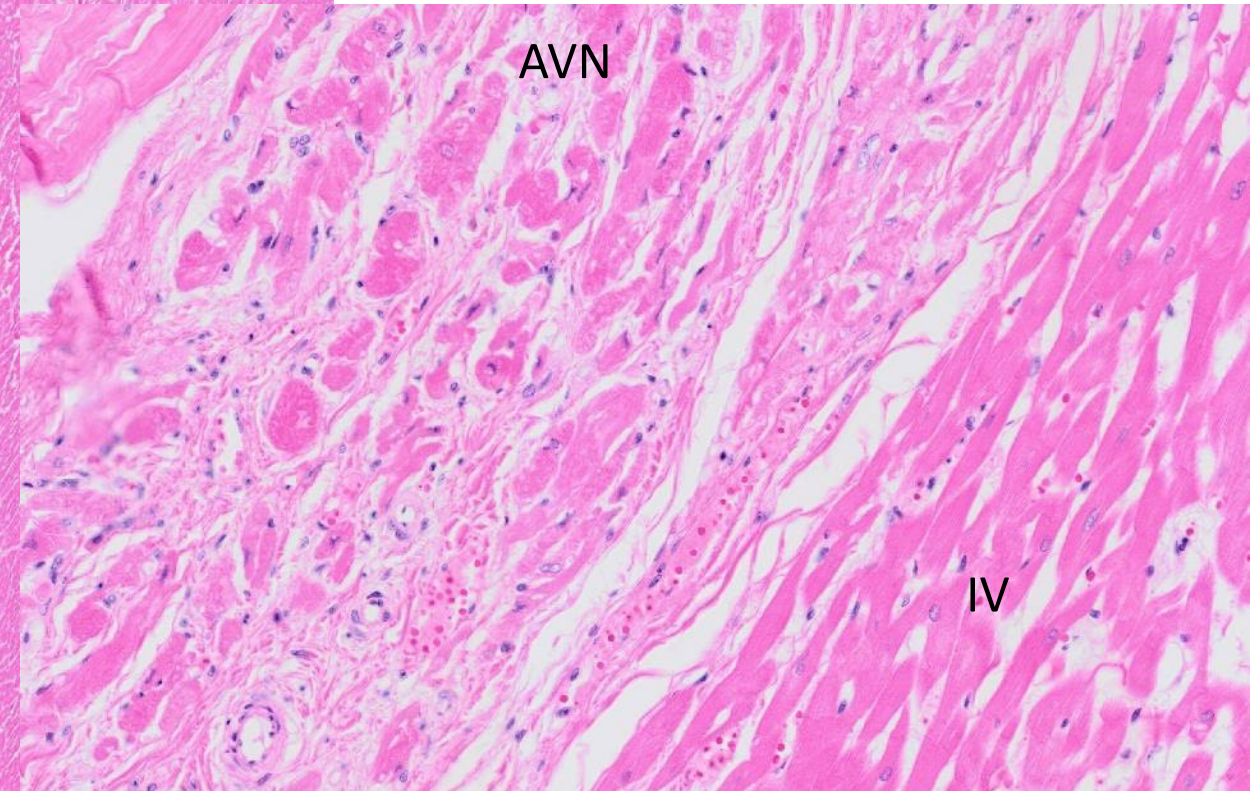
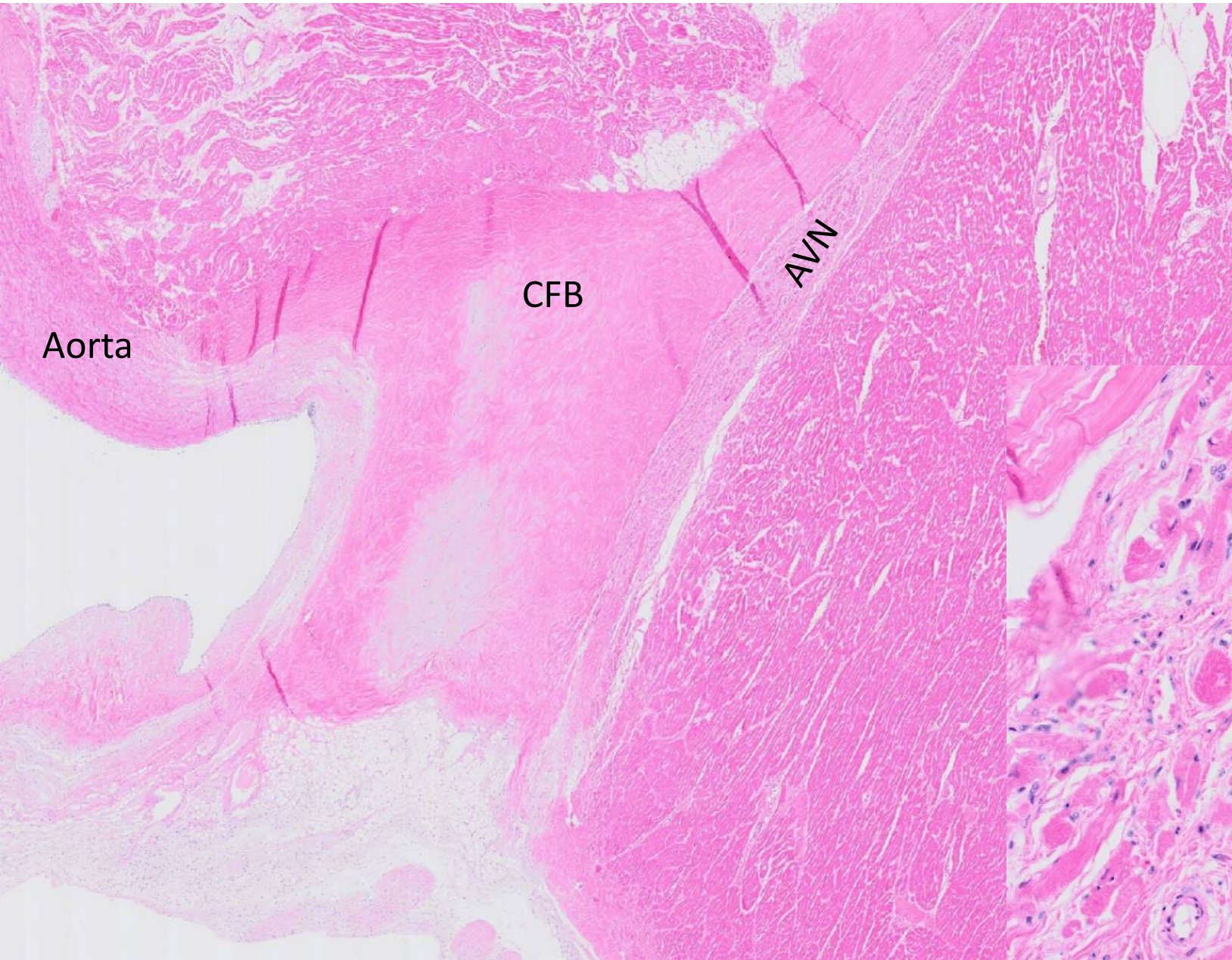
Atrioventricular node



Pentachrome stain



Atrioventricular node





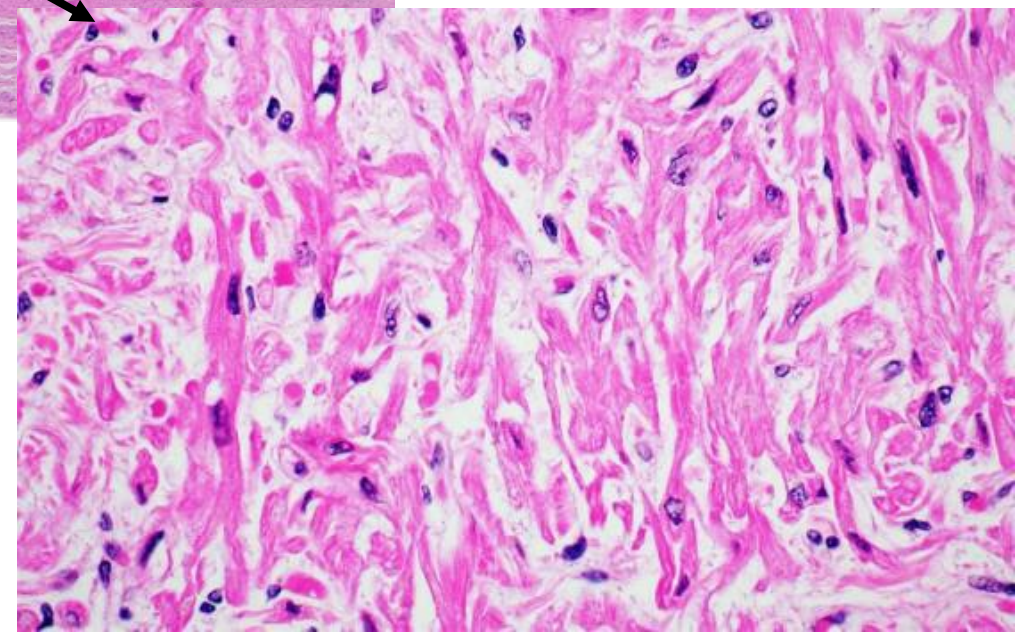
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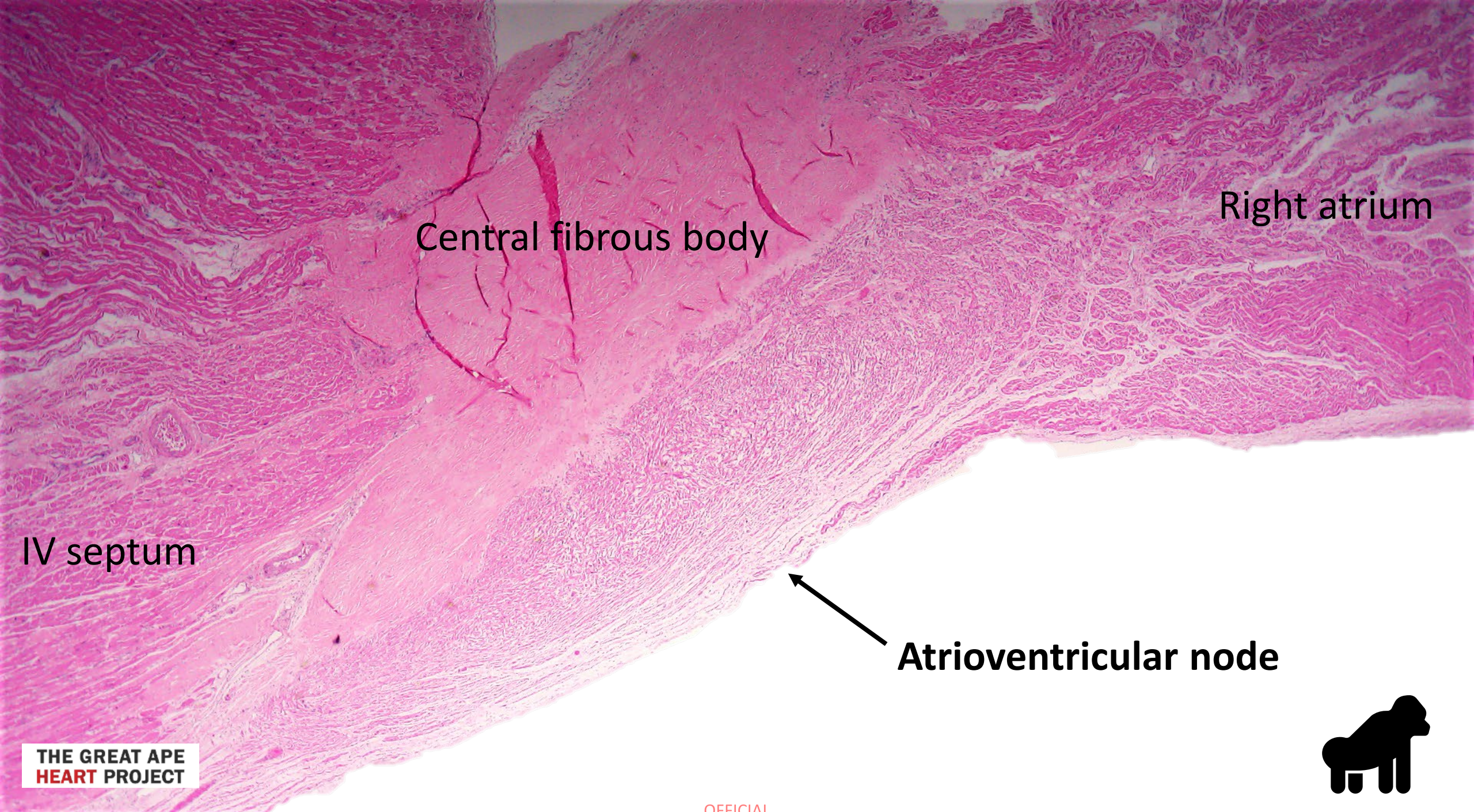
IVS

CFB

Atrioventricular node

OFFICIAL



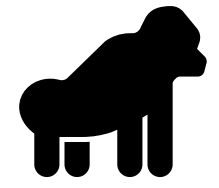


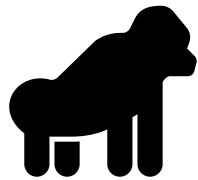
Right atrium

Central fibrous body

IV septum

Atrioventricular node

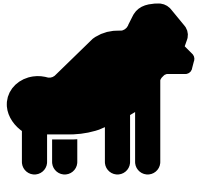




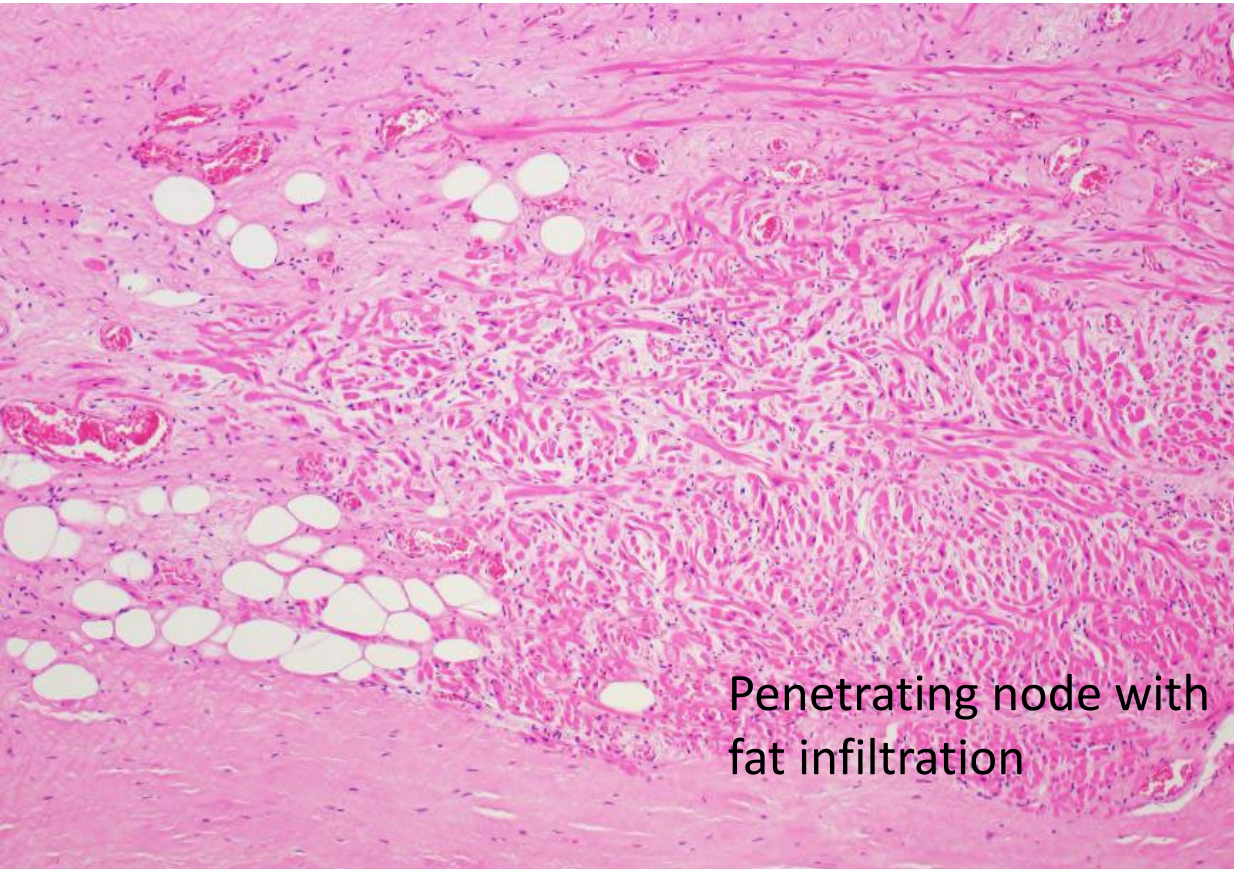
Central fibrous body

Nodal artery

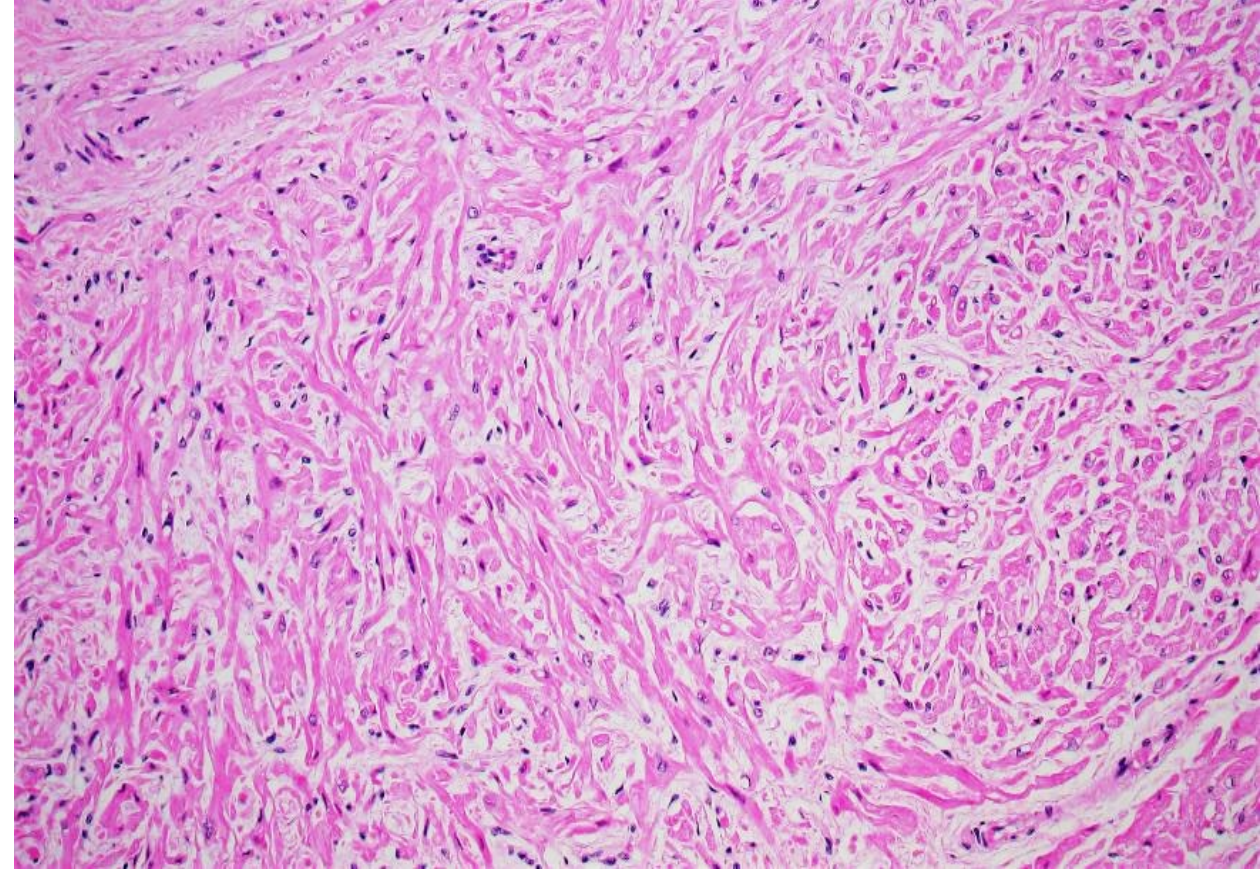


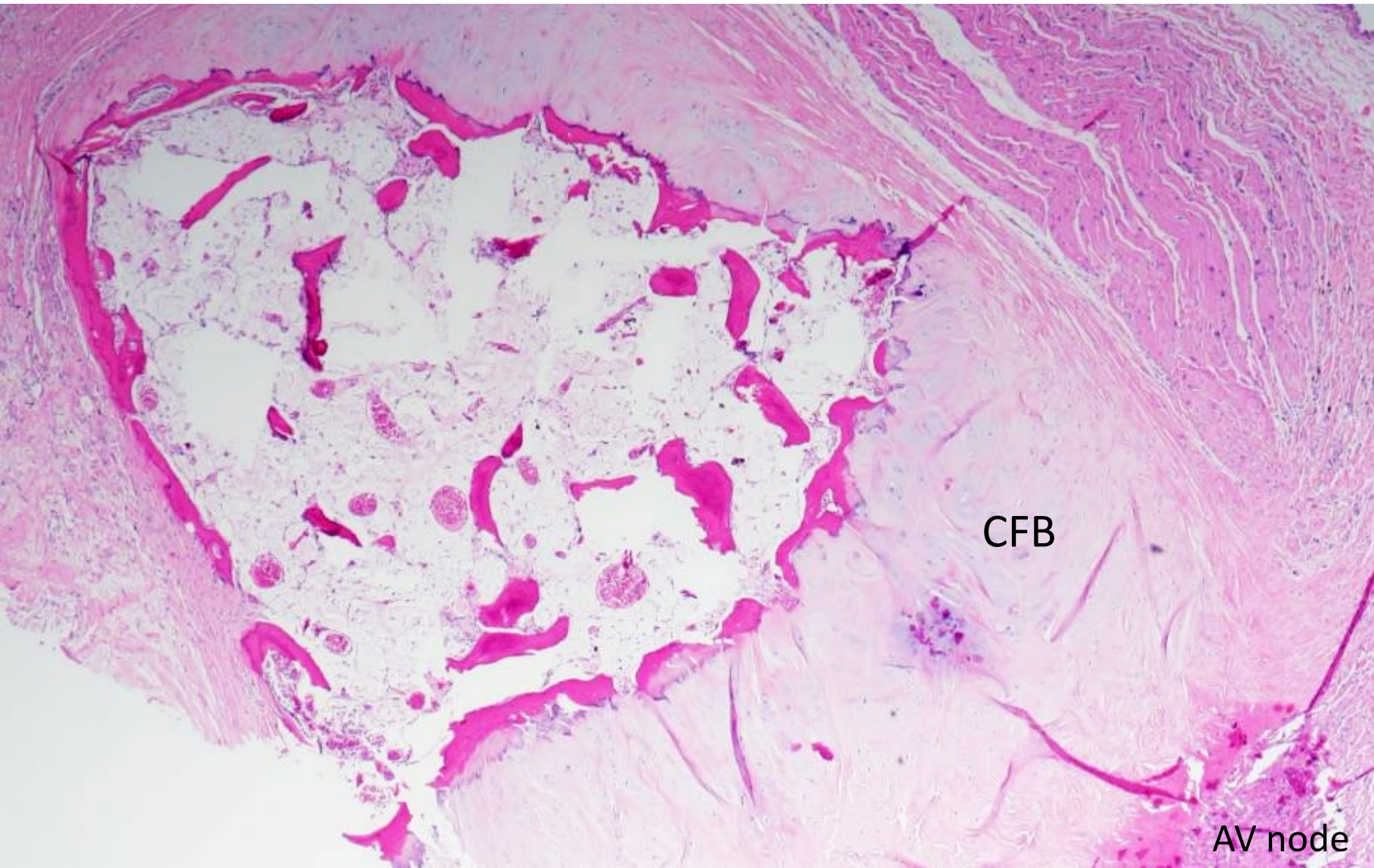


Atrioventricular node



Penetrating node with
fat infiltration





Central fibrous body

- Cartilaginous metaplasia
- Osseous metaplasia
- Mineralization

Chimpanzees

Gorillas

Dogs

Cats

Horses

Lions

etc.....



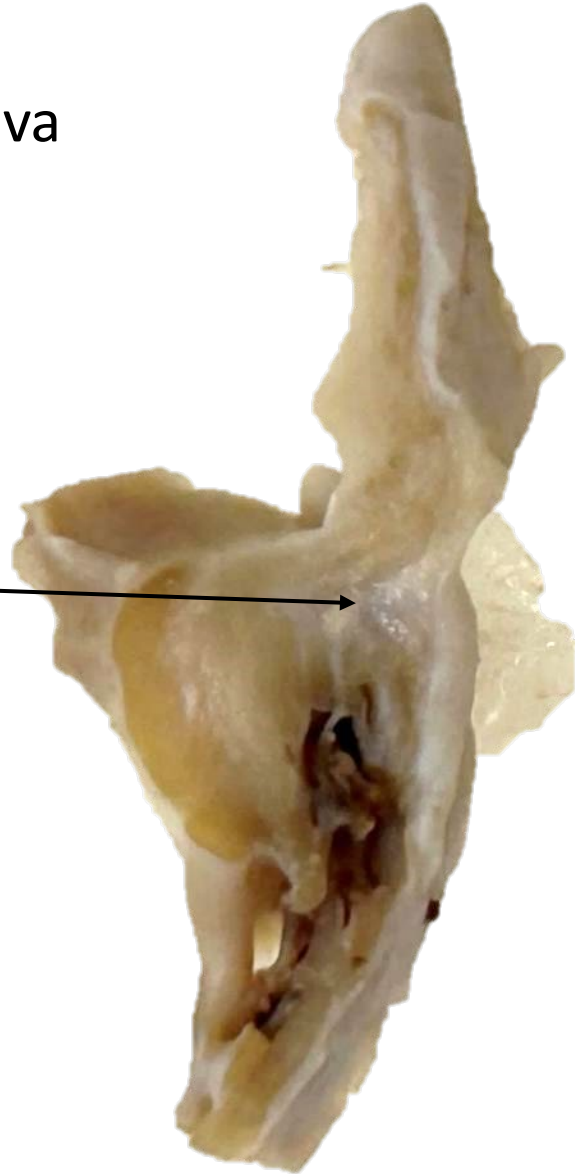
CFB with cartilaginous metaplasia

Sinoatrial node

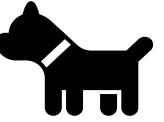
Cranial vena cava

SA node

Right atrium

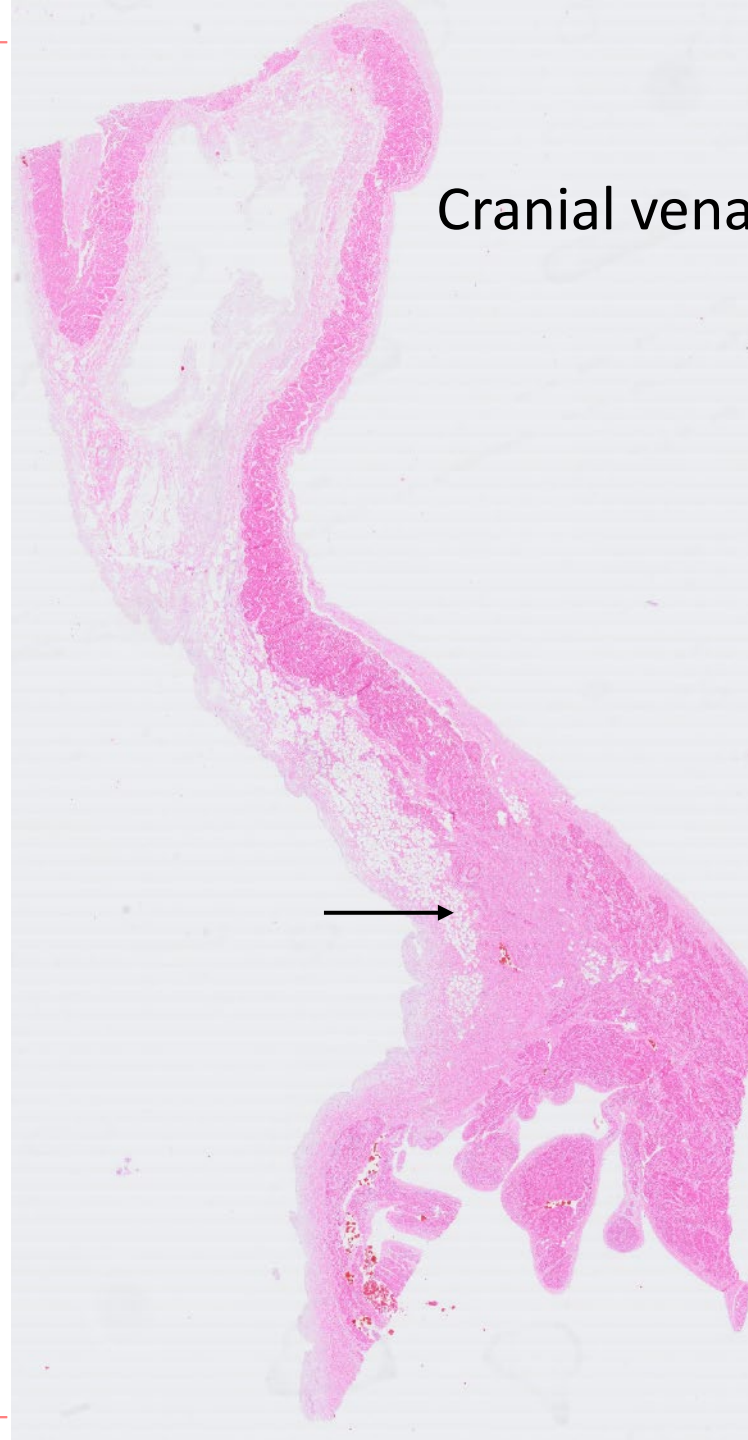


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Cranial vena cava

Right atrium



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Sinoatrial node

Nodal artery →

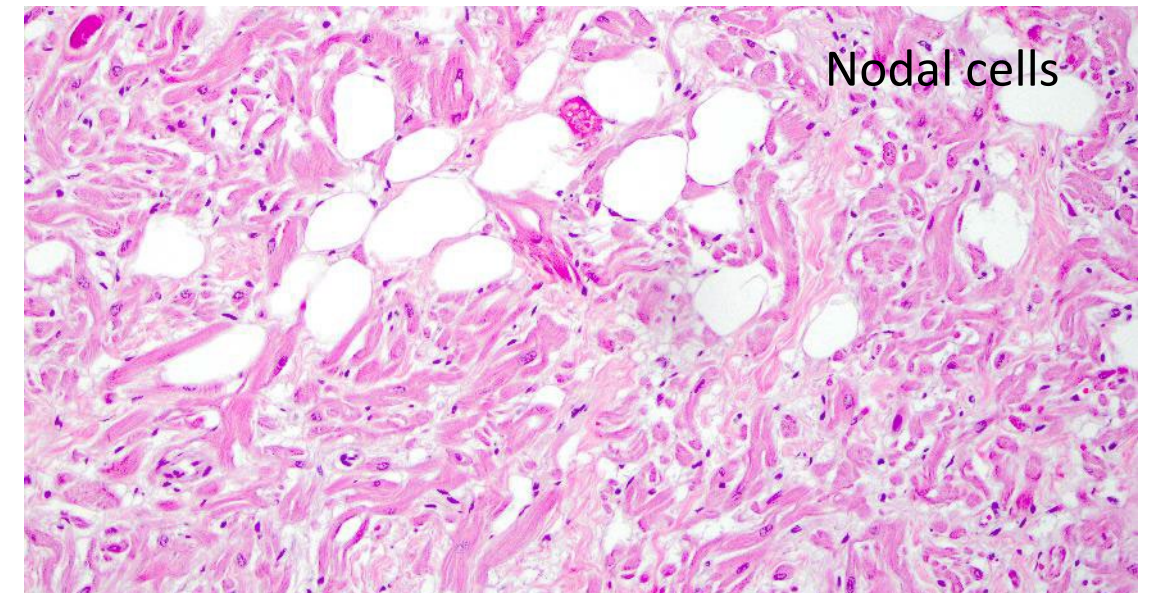
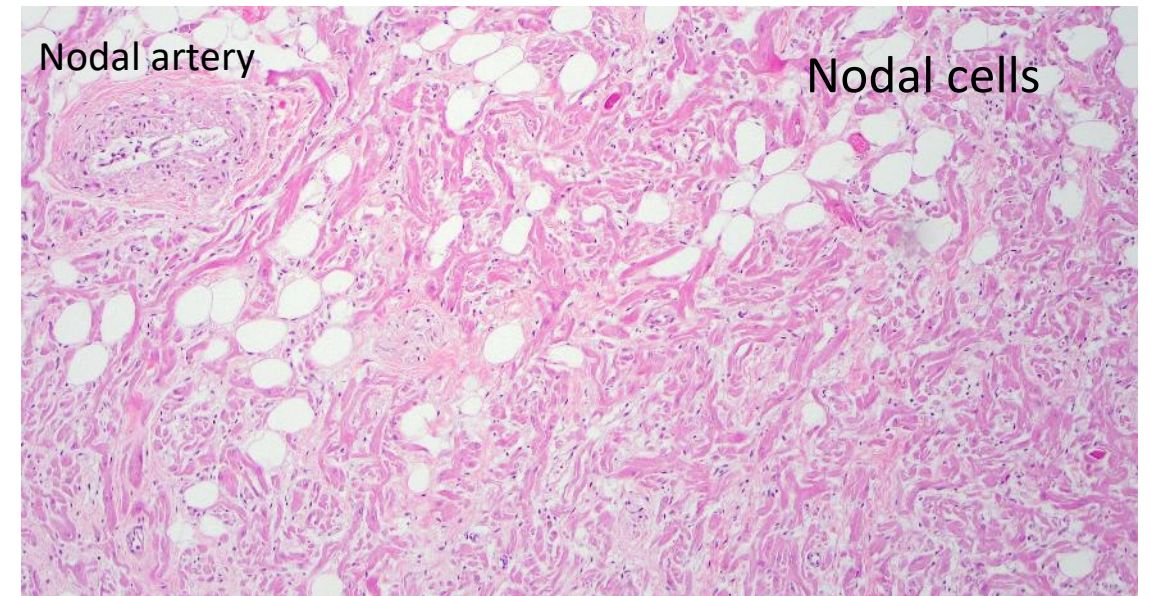
Subepicaridal region

Nodal cells

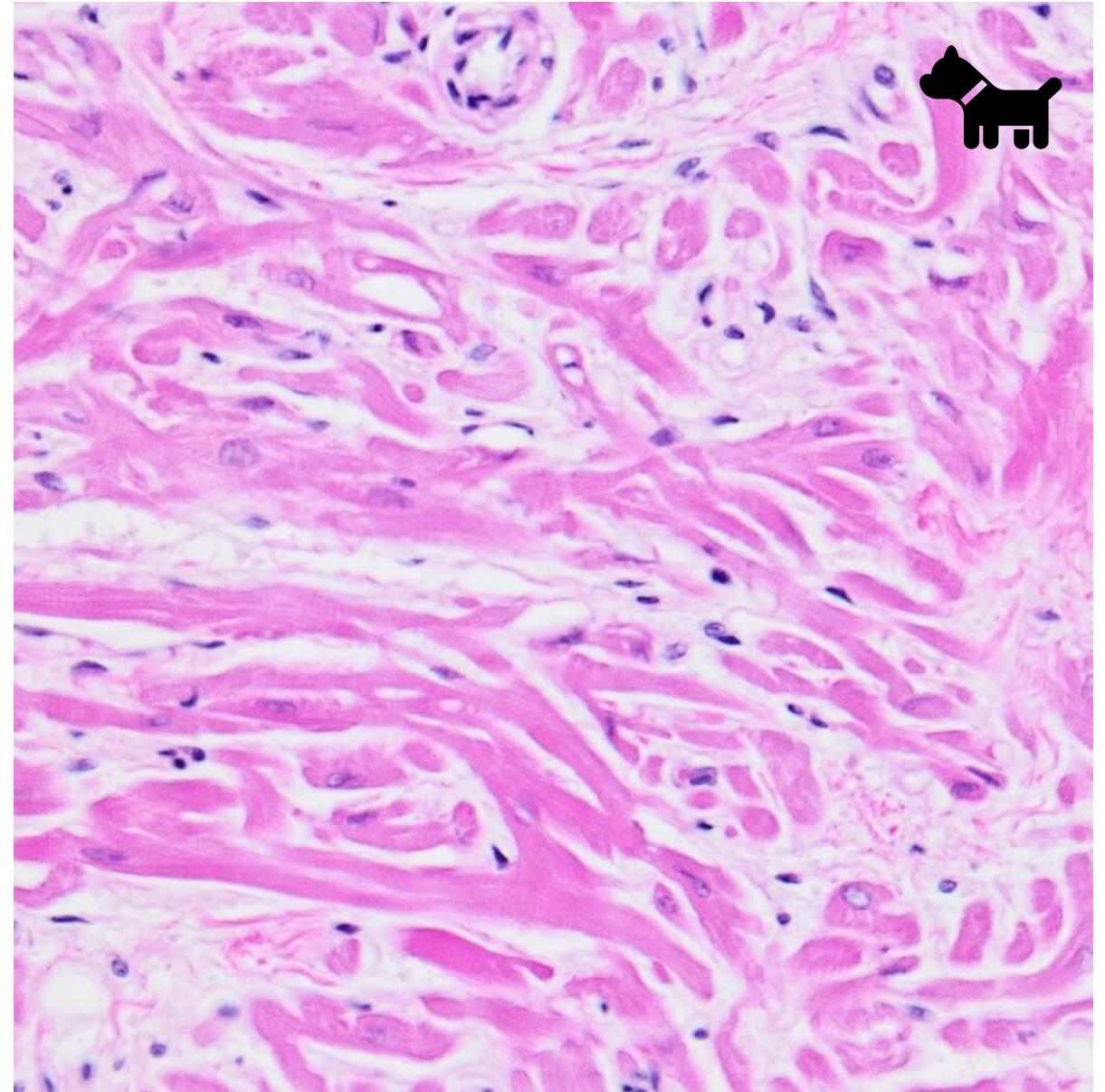
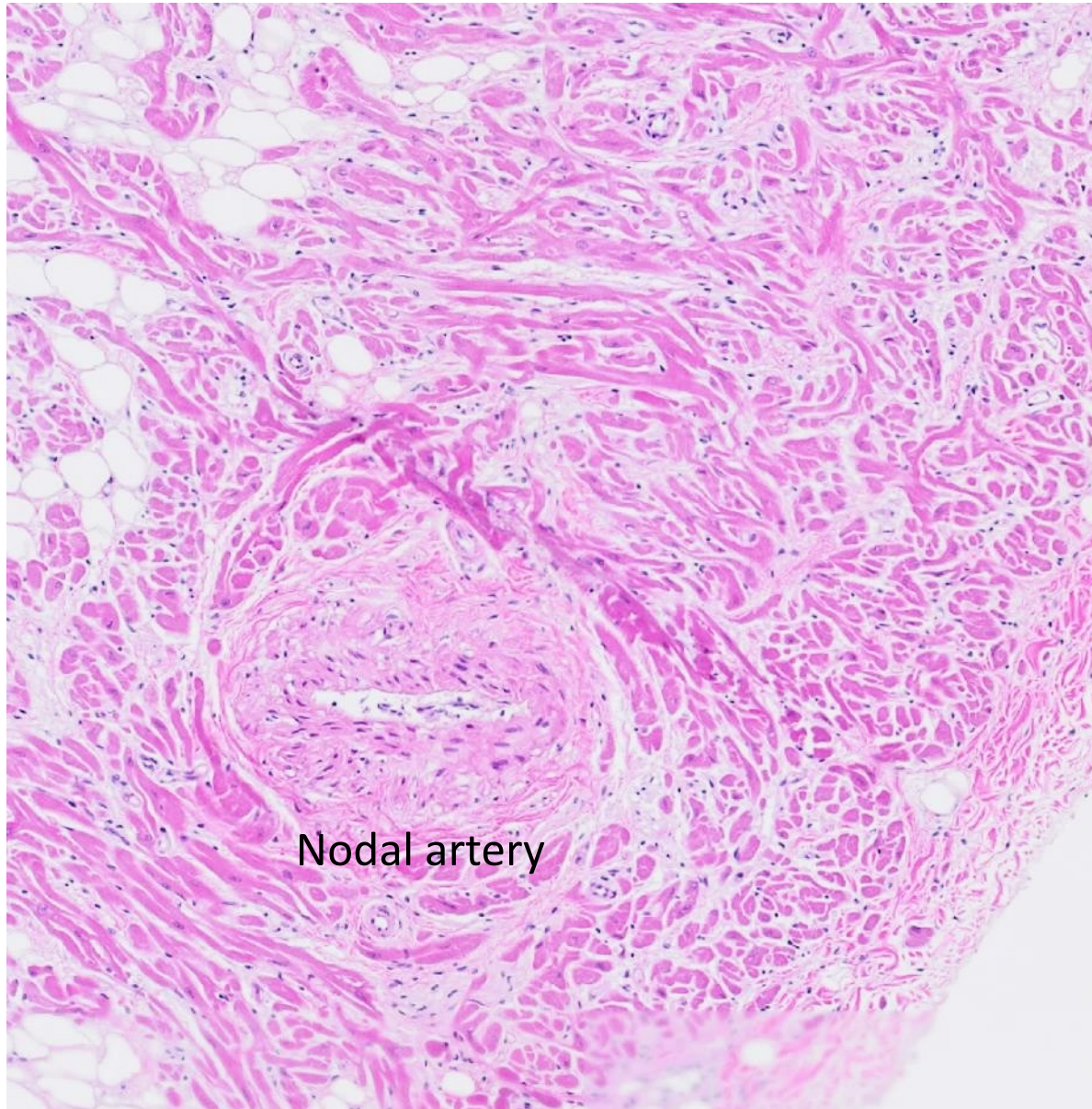




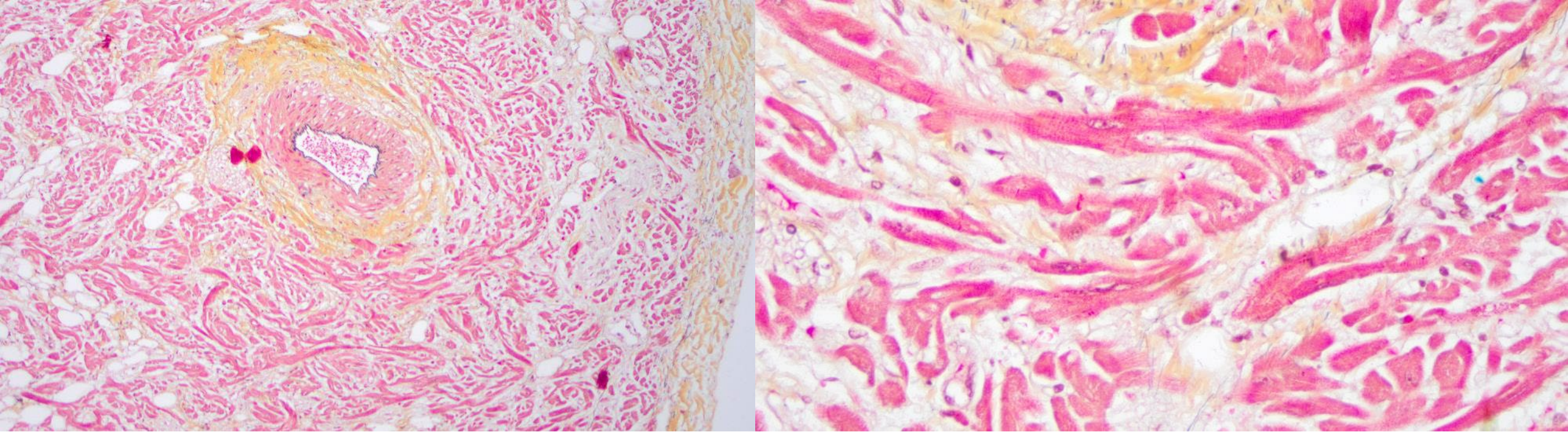
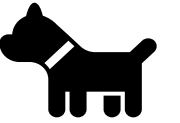
Sinoatrial node



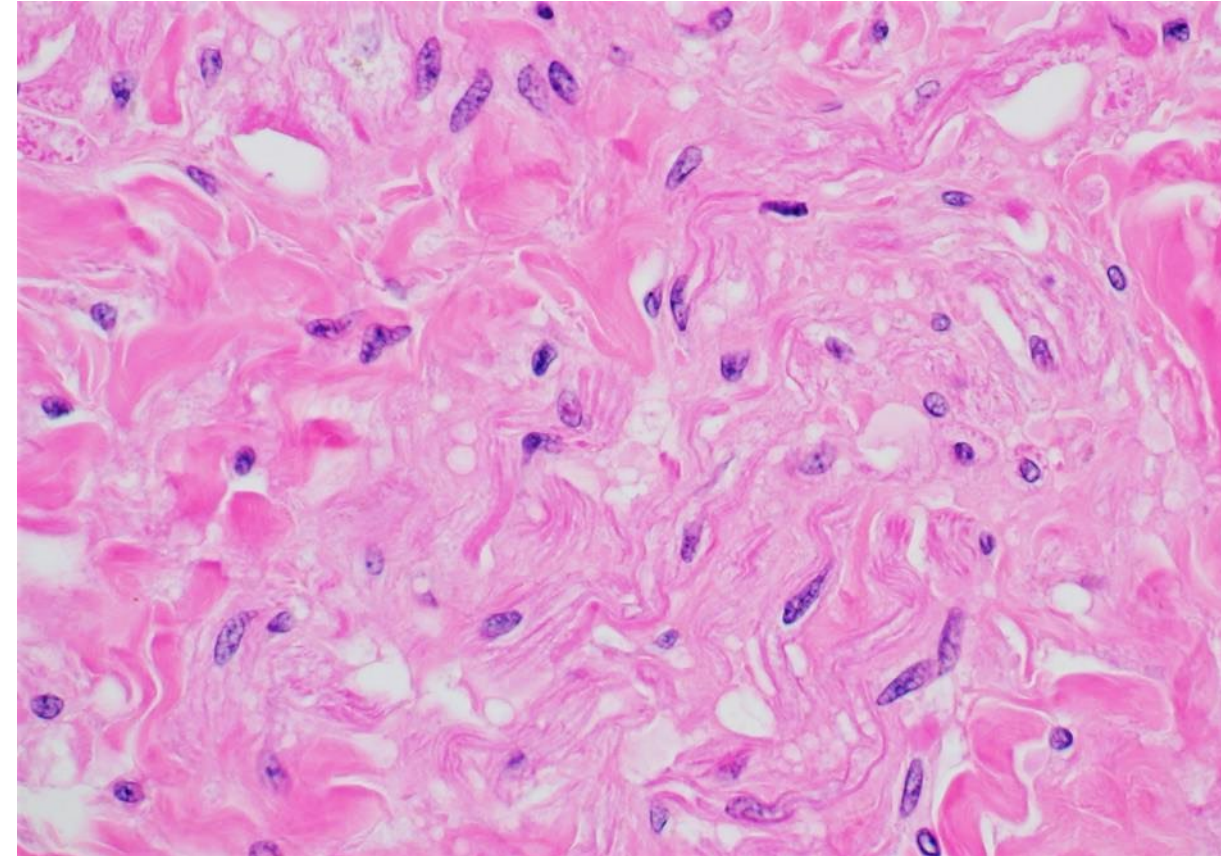
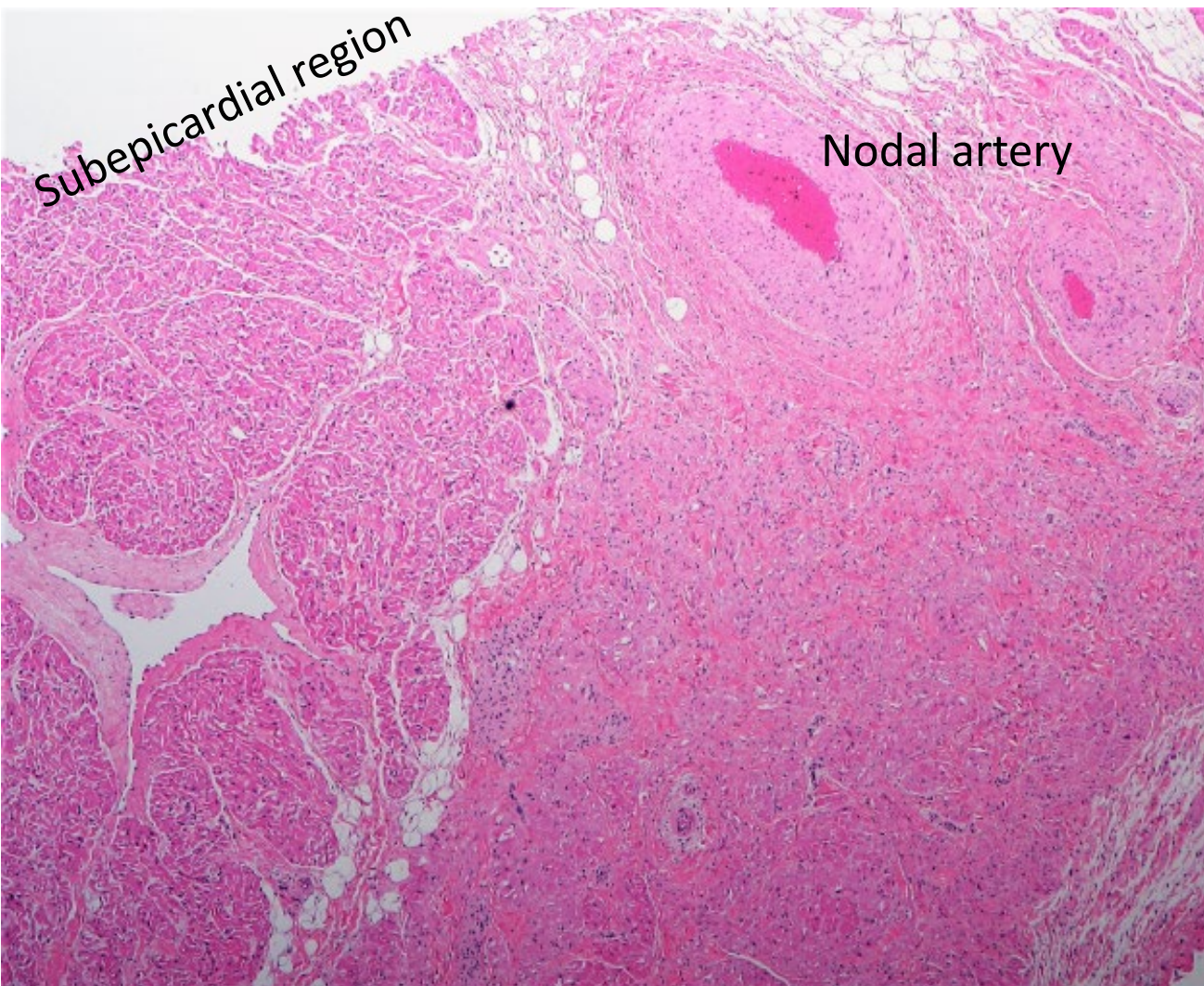
Sinoatrial node



Sinoatrial node Pentachrome stain

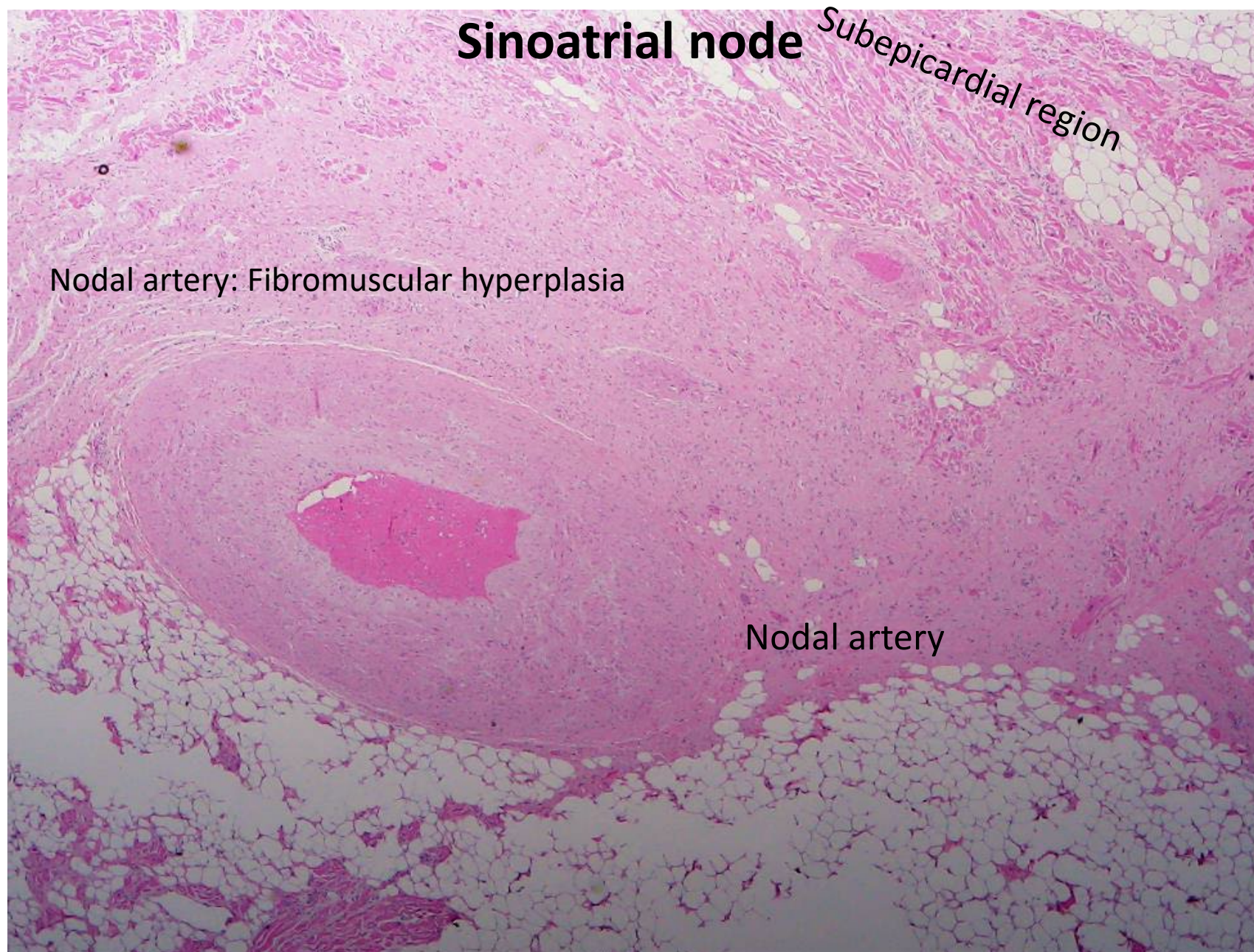


Sinoatrial node





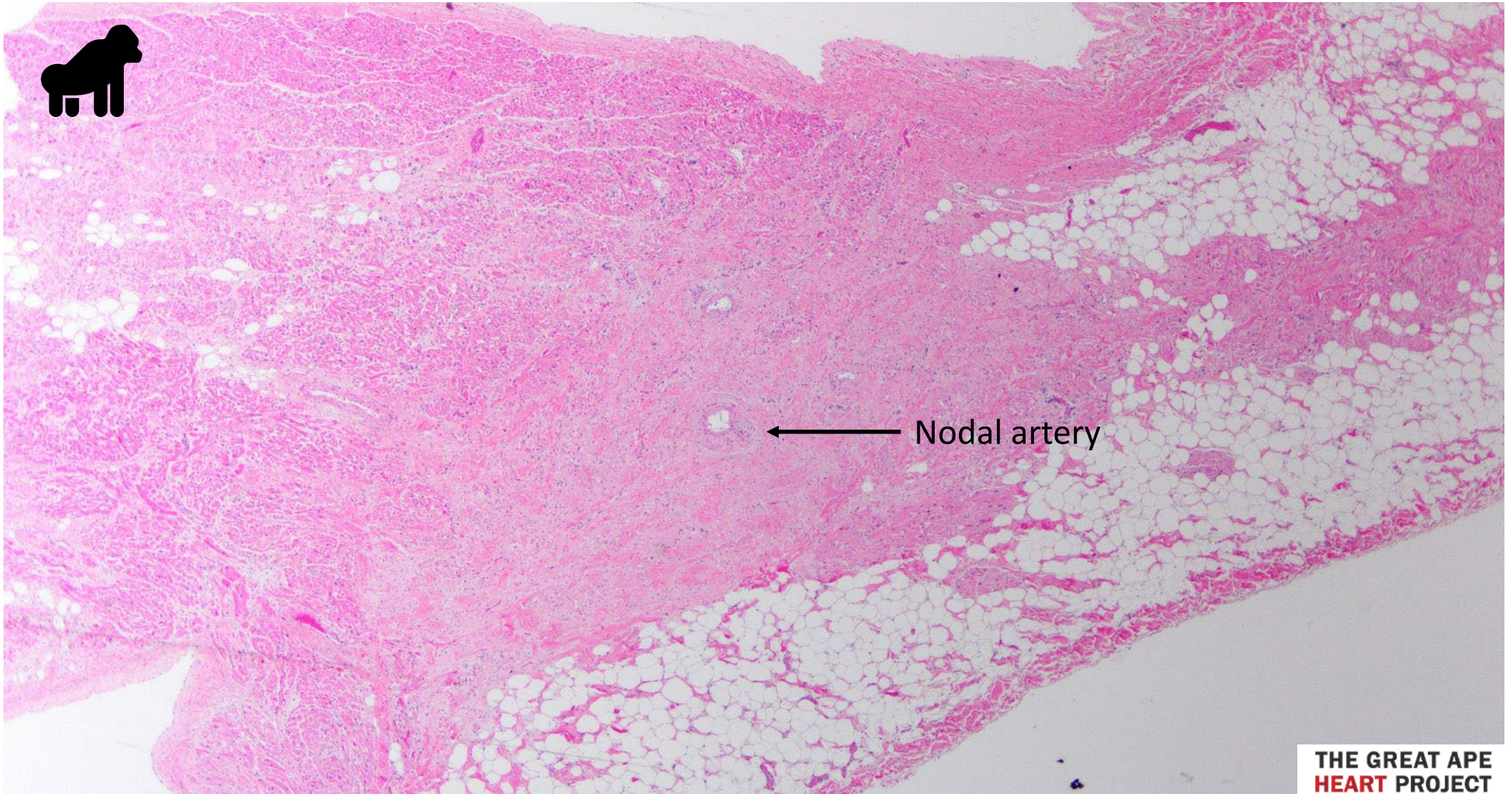
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Sinoatrial node

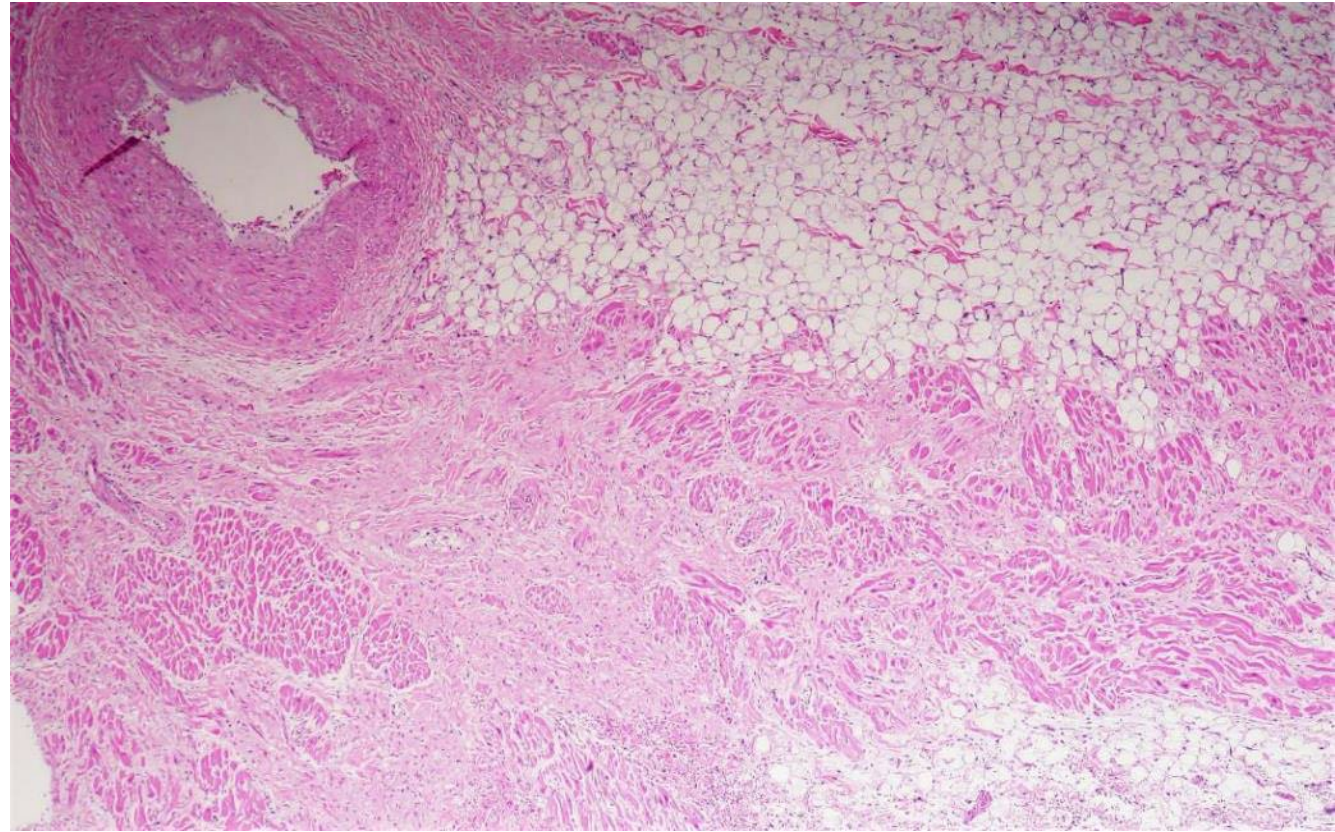
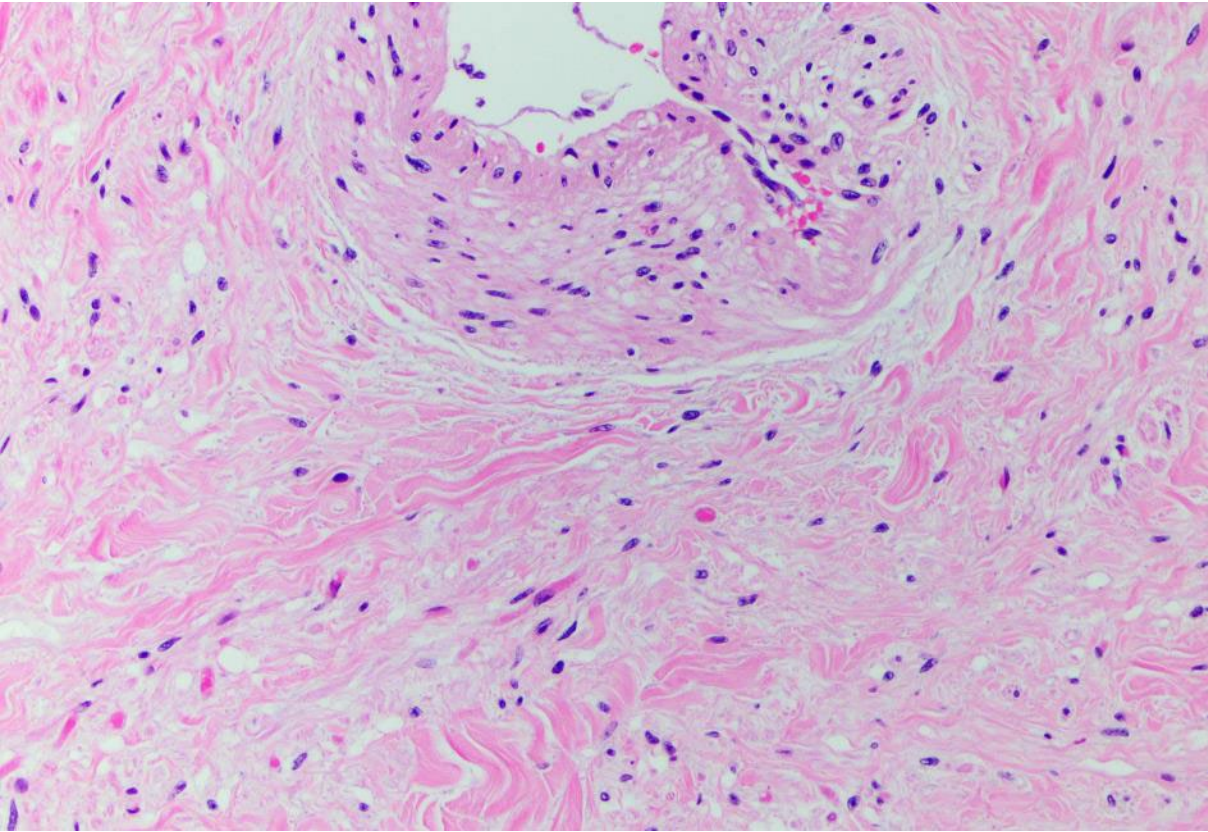
Fibrosis





Sinoatrial node: Fibrosis (age related)

Nodal artery: Fibromuscular hyperplasia



Nodal artery: Fibromuscular hyperplasia



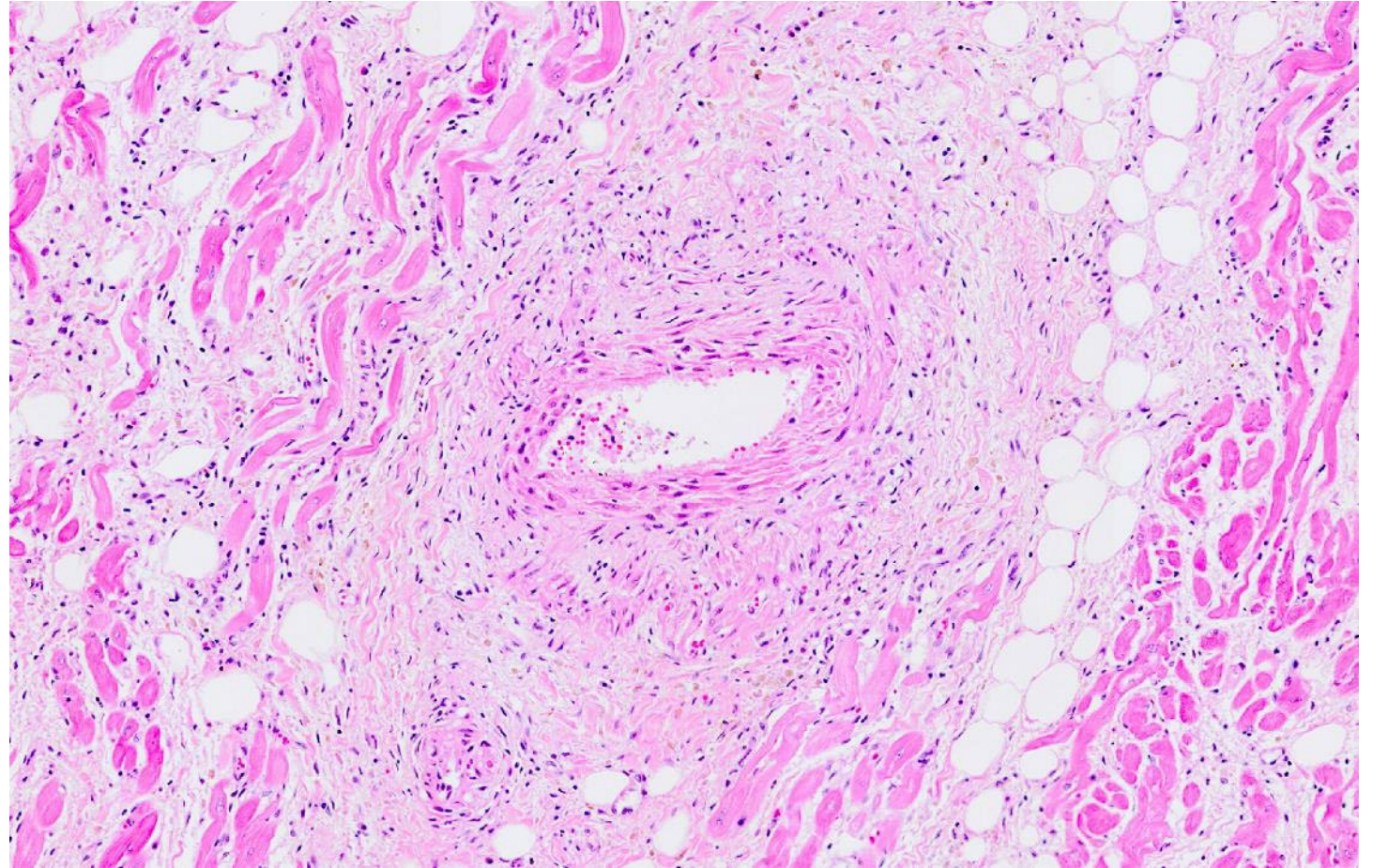


Nodal
artery



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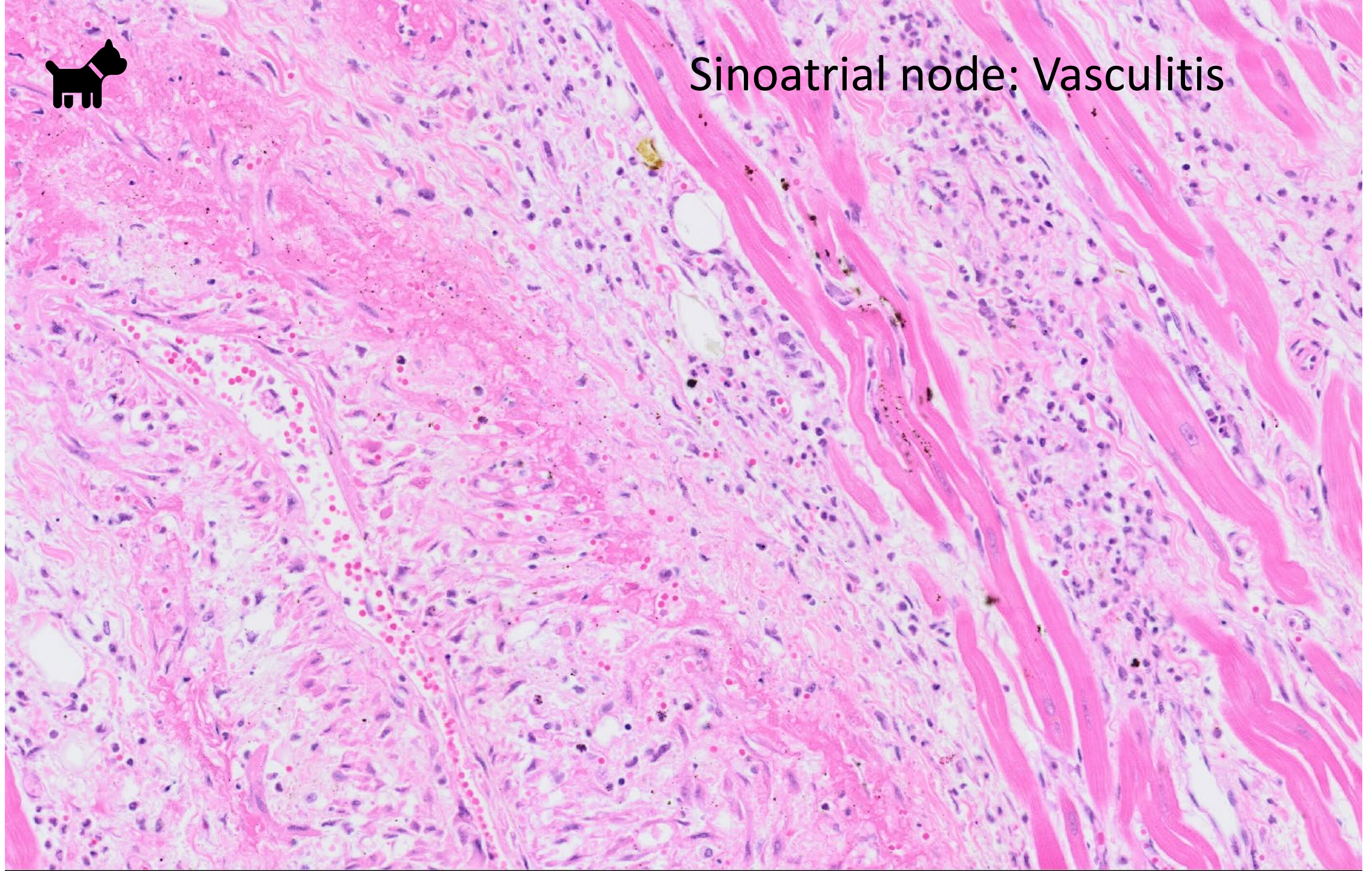
Sinoatrial node: Vasculitis



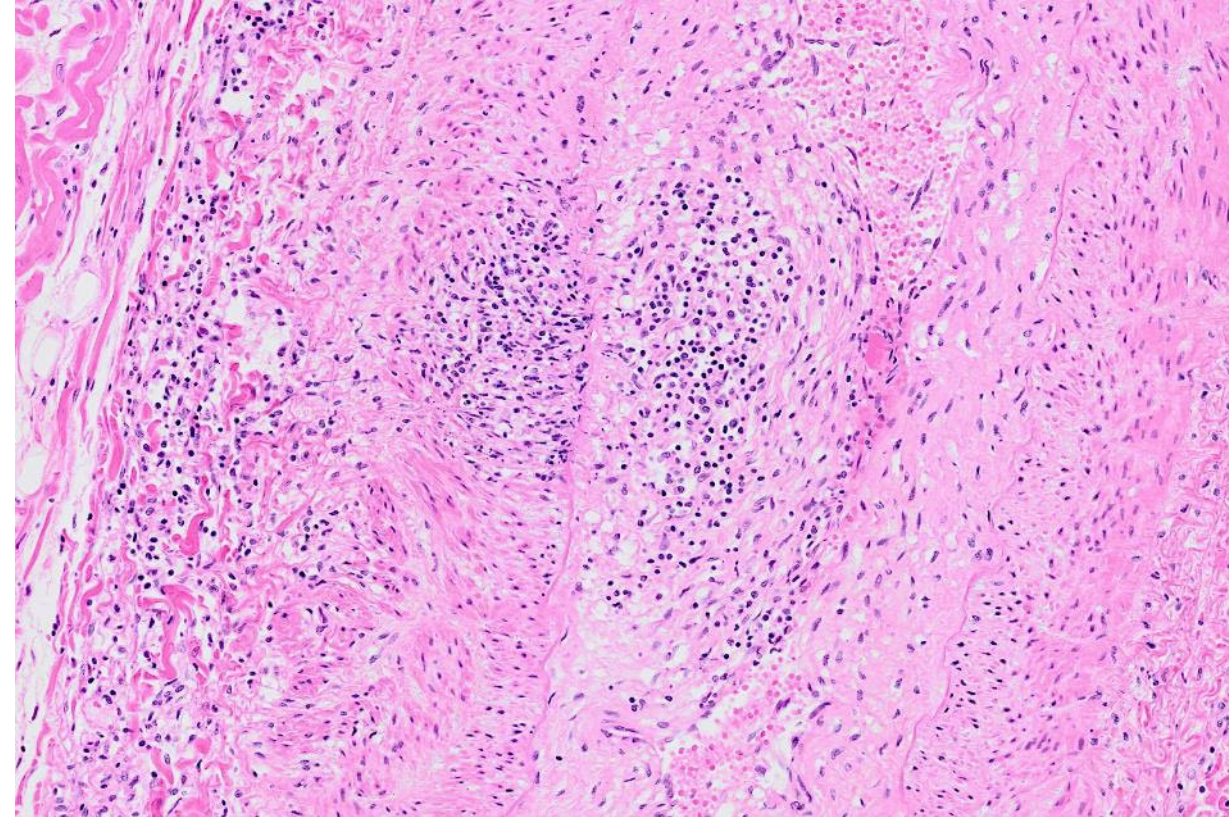
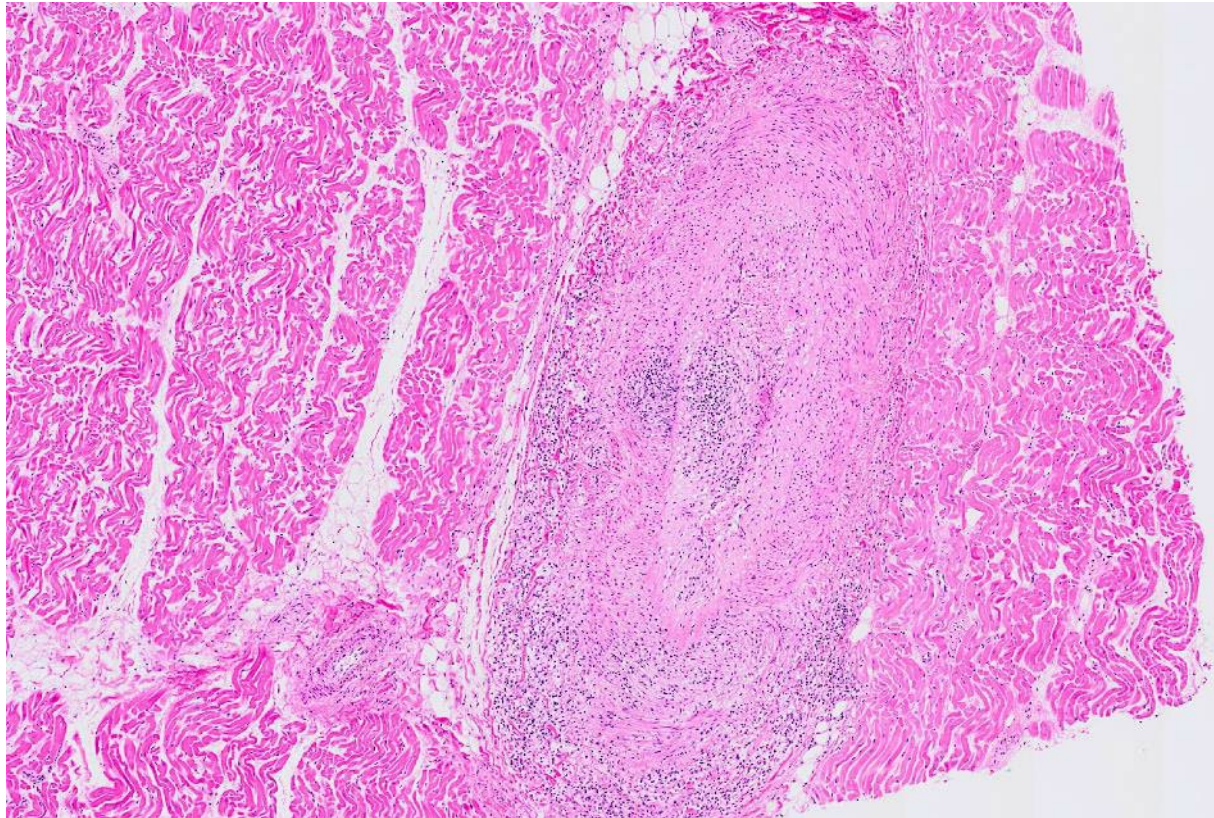
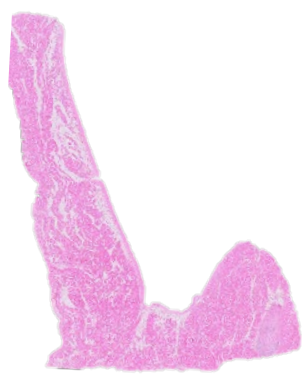
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Sinoatrial node: Vasculitis



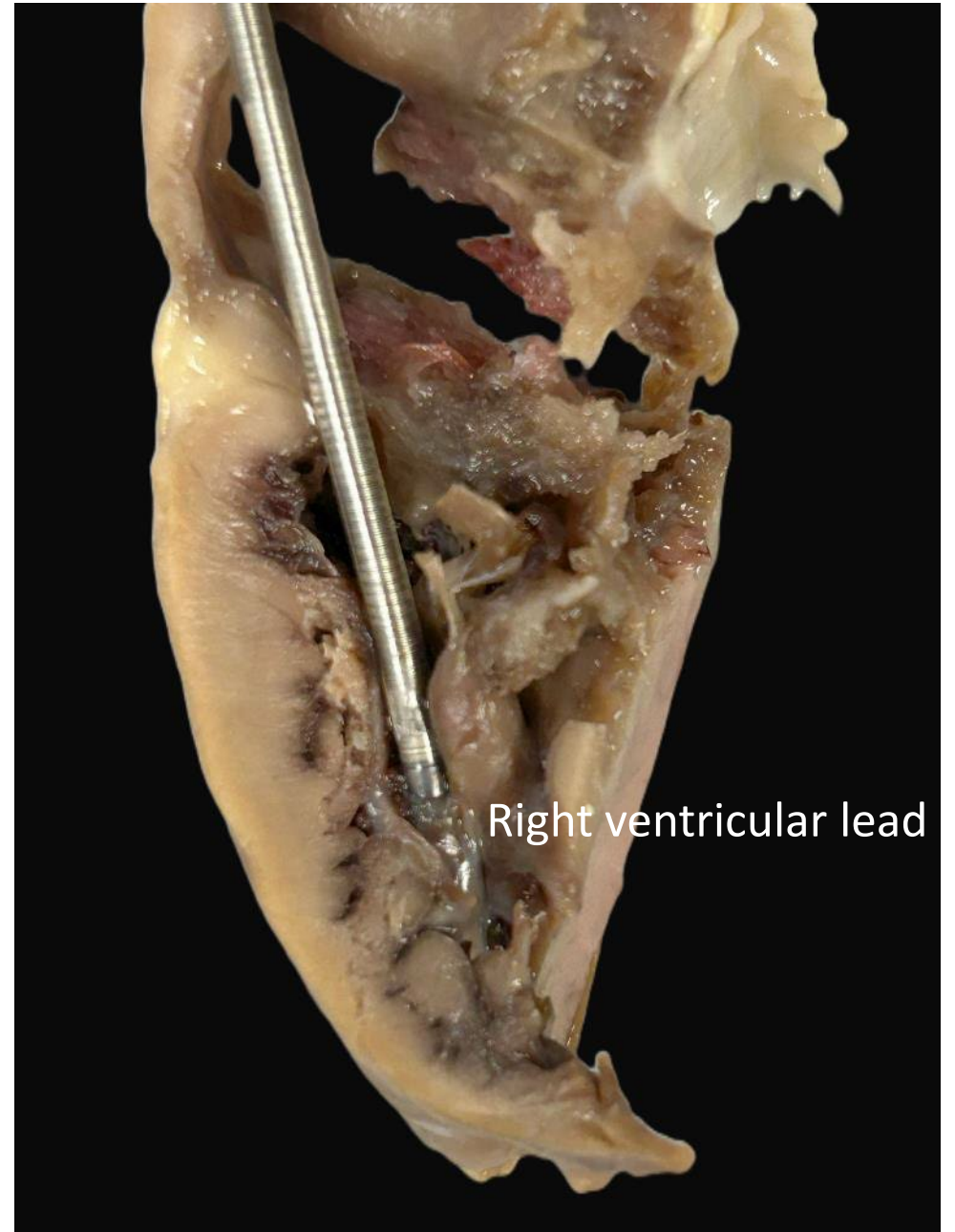
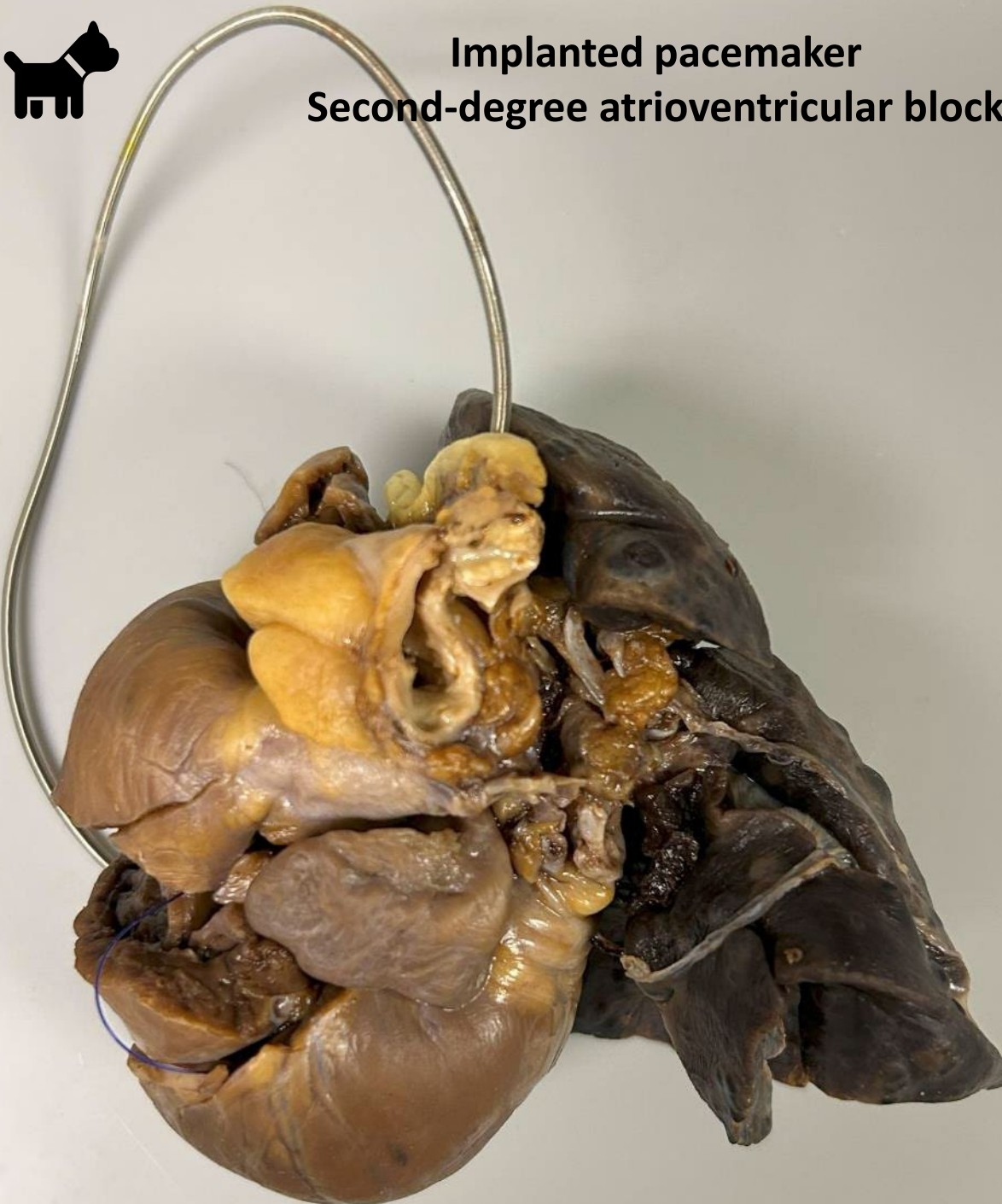
Sinoatrial node: Vasculitis



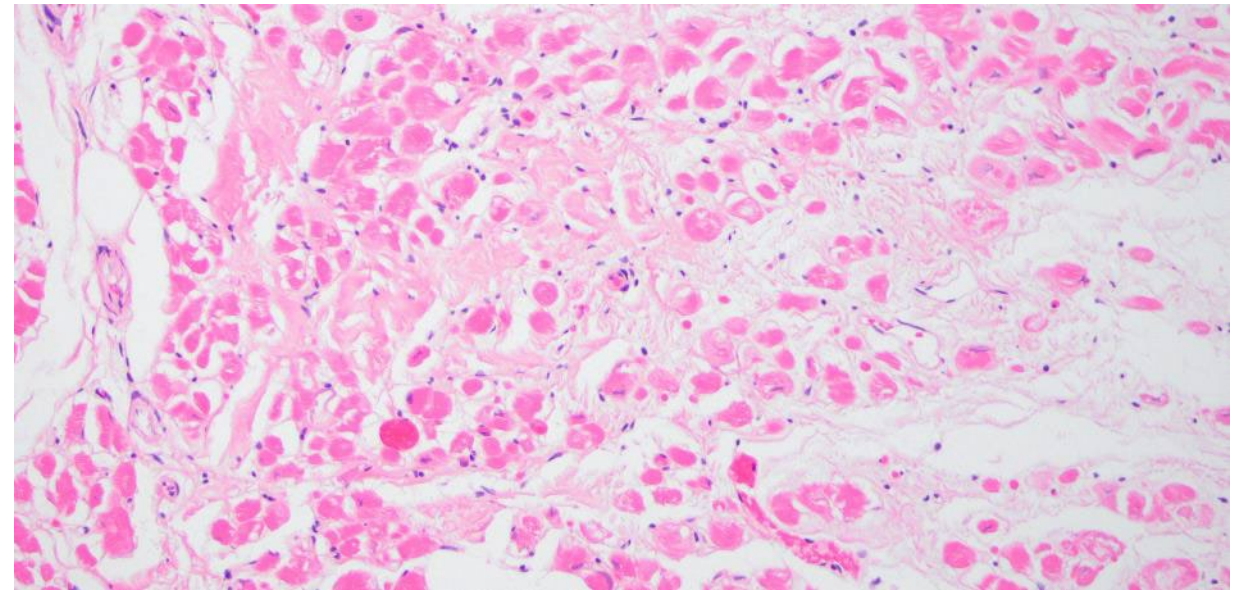
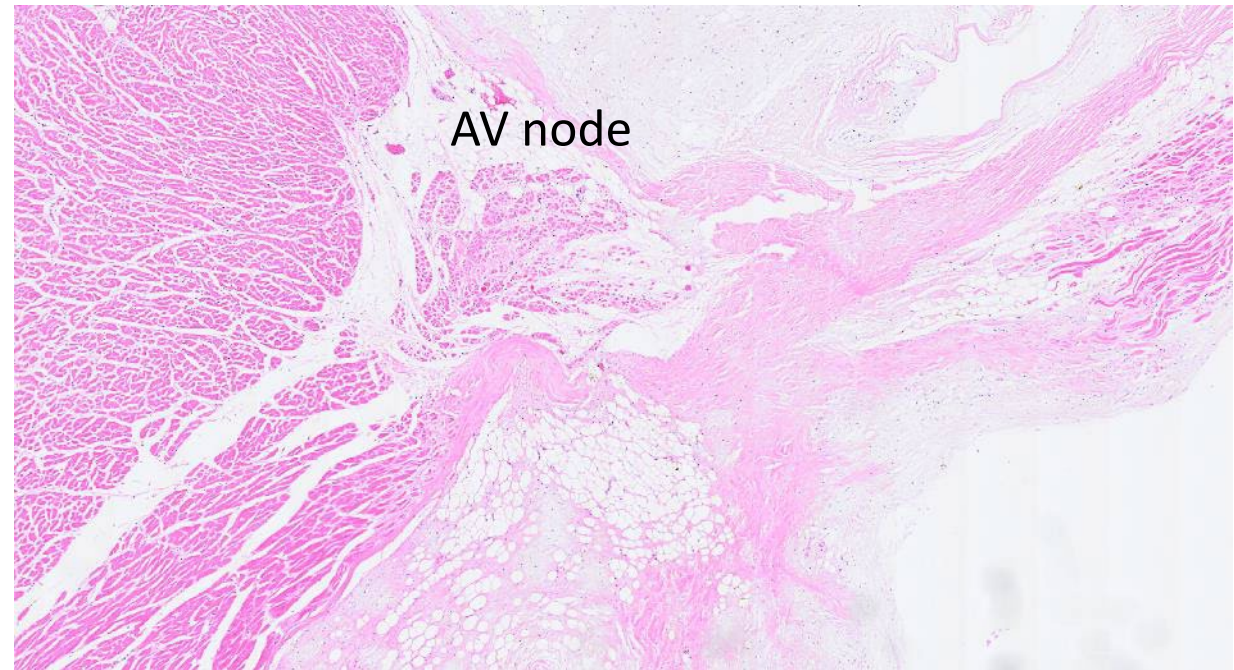
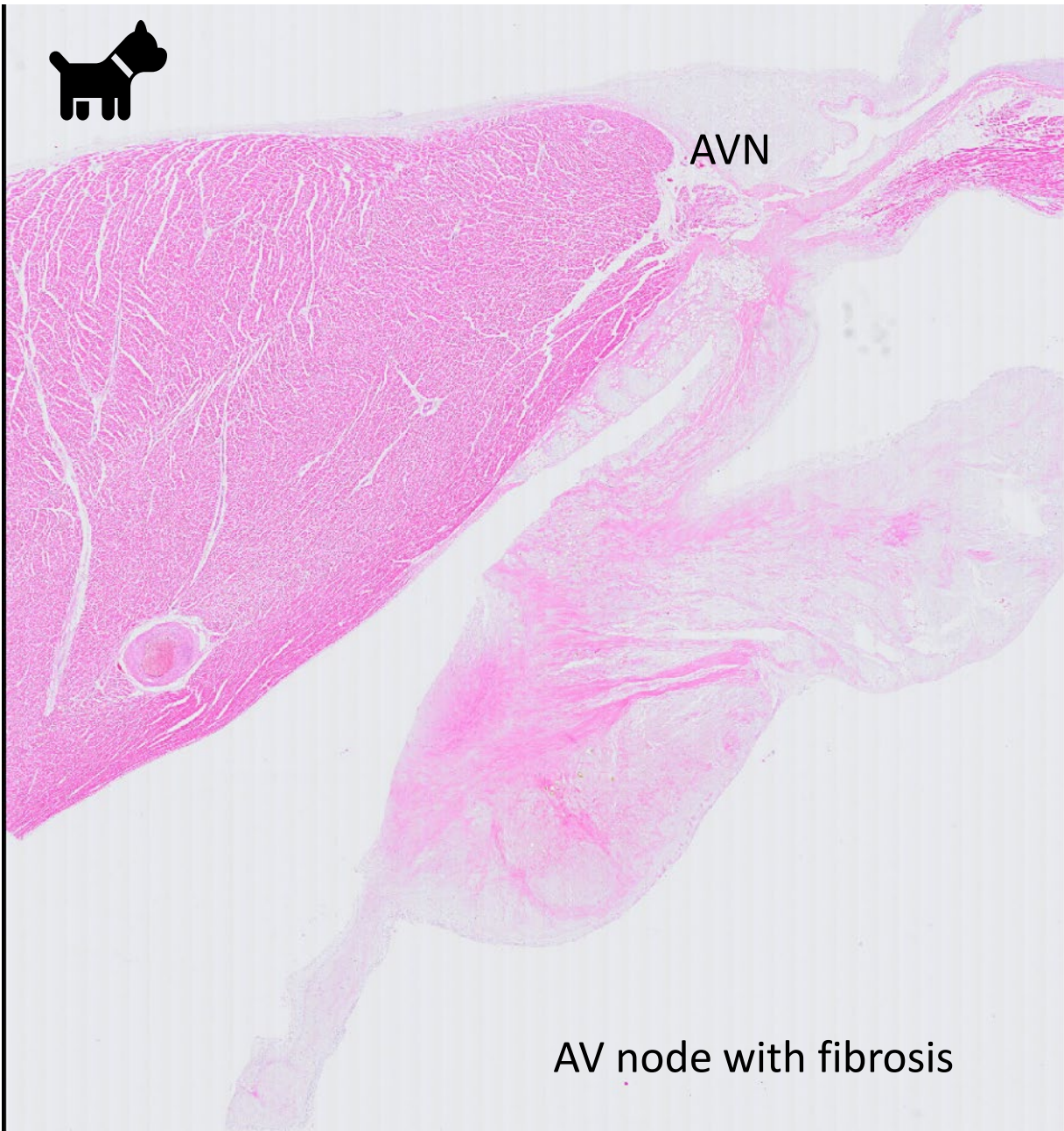
Coronary arteritis affecting the nodal artery is extremely rare
Can potentially lead to SA node dysfunction by compromising its blood supply and causing ischemia



Implanted pacemaker
Second-degree atrioventricular block

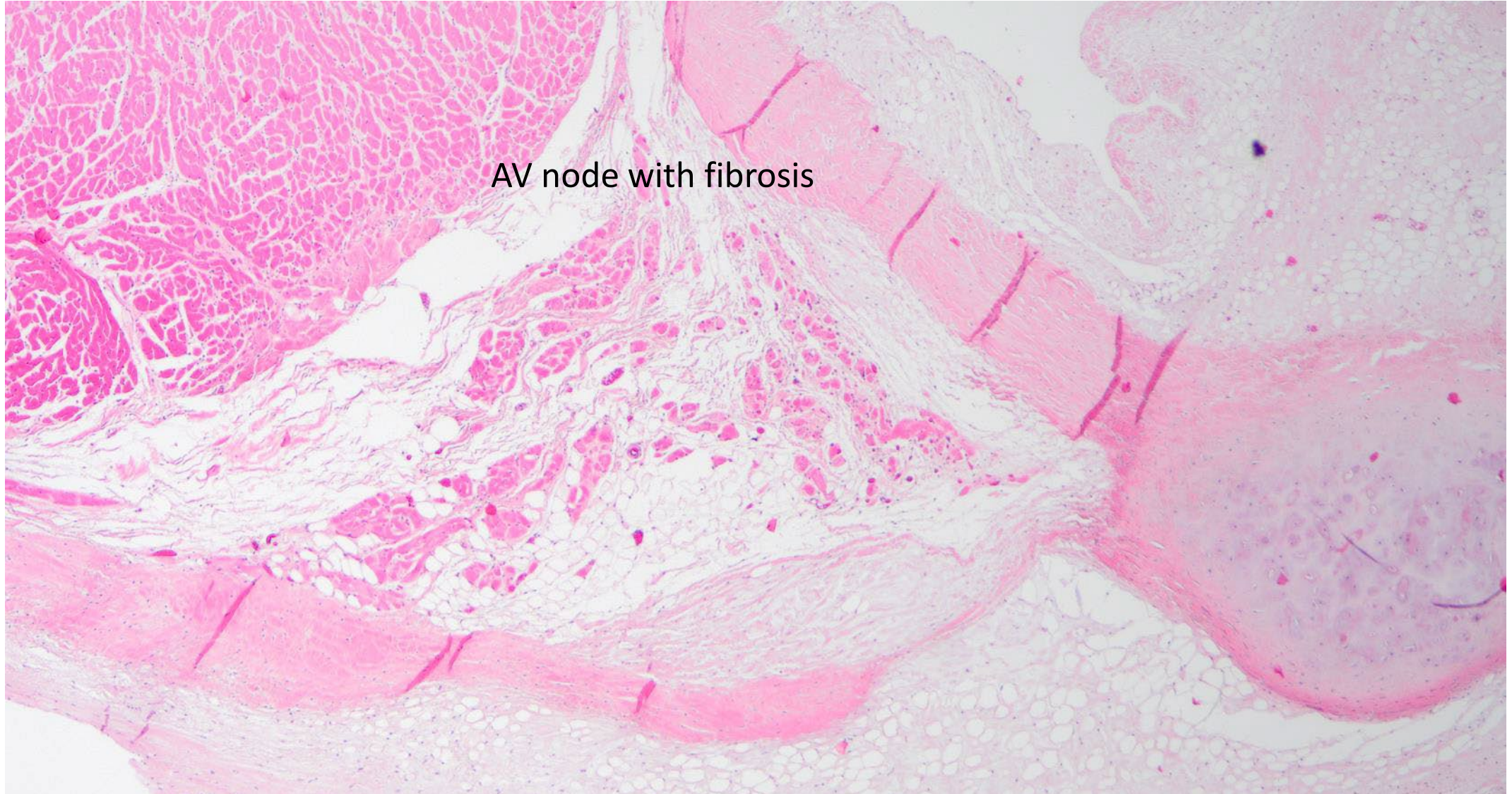


Right ventricular lead



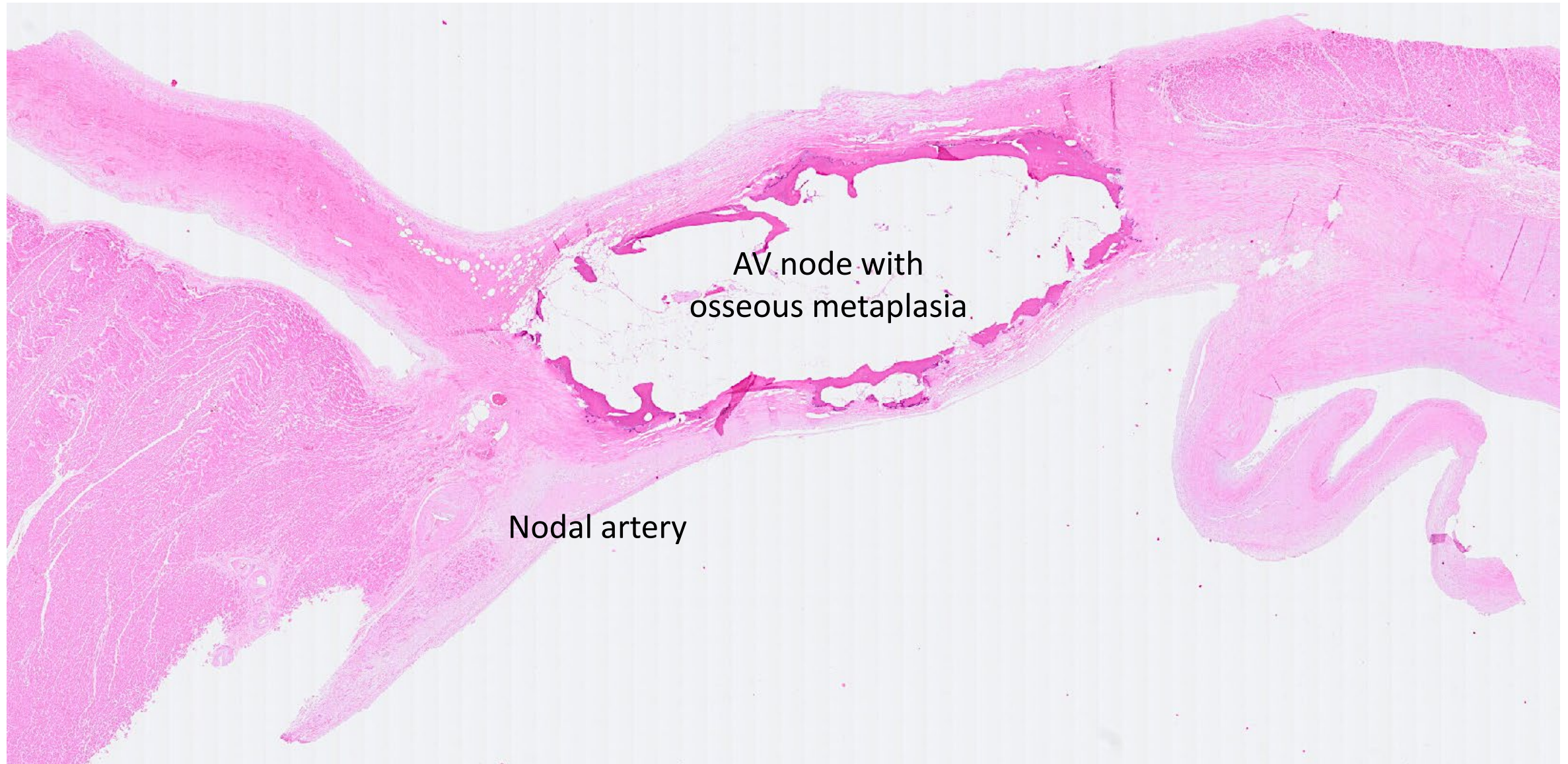


Implanted pacemaker Second-degree atrioventricular block

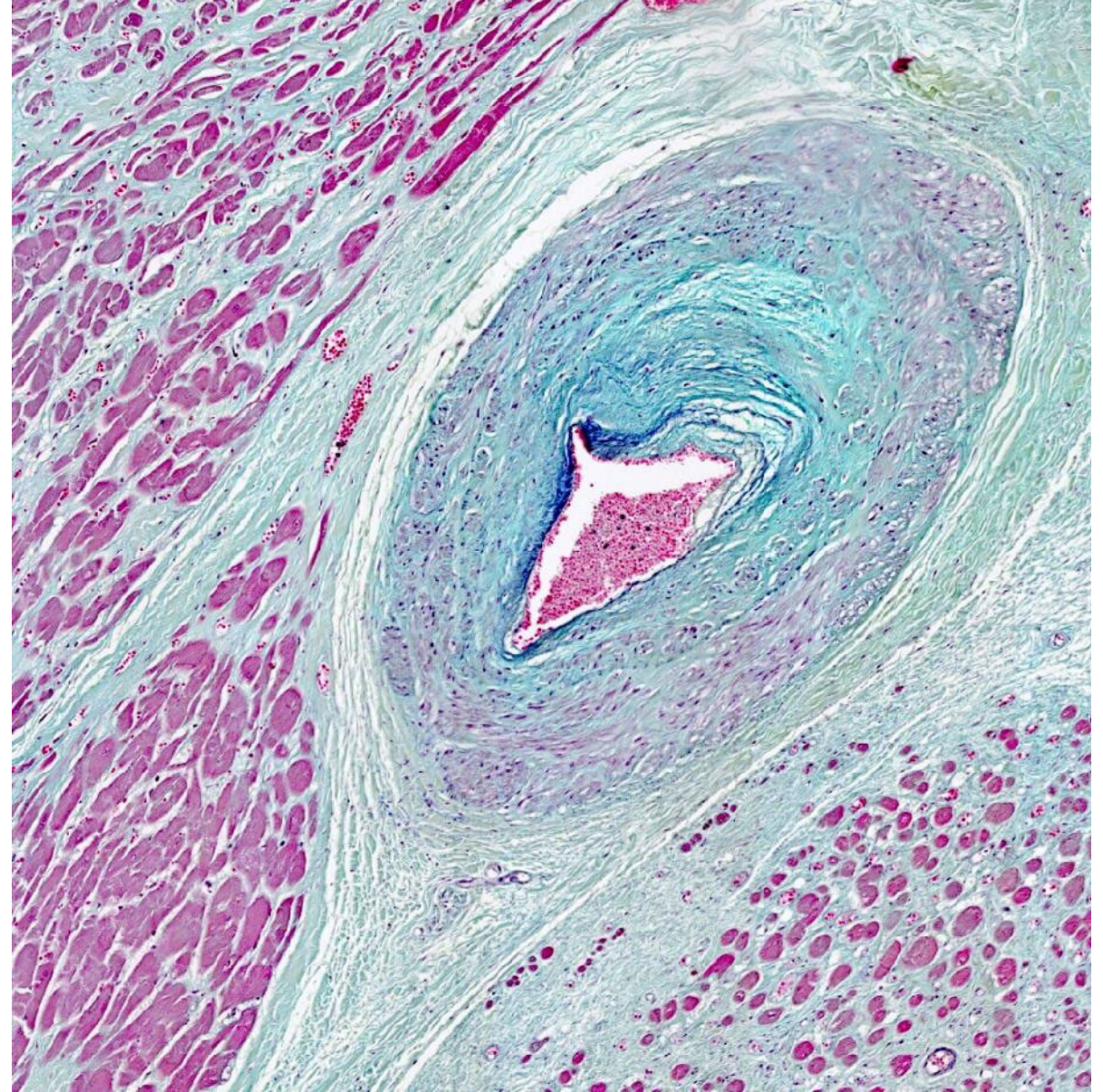




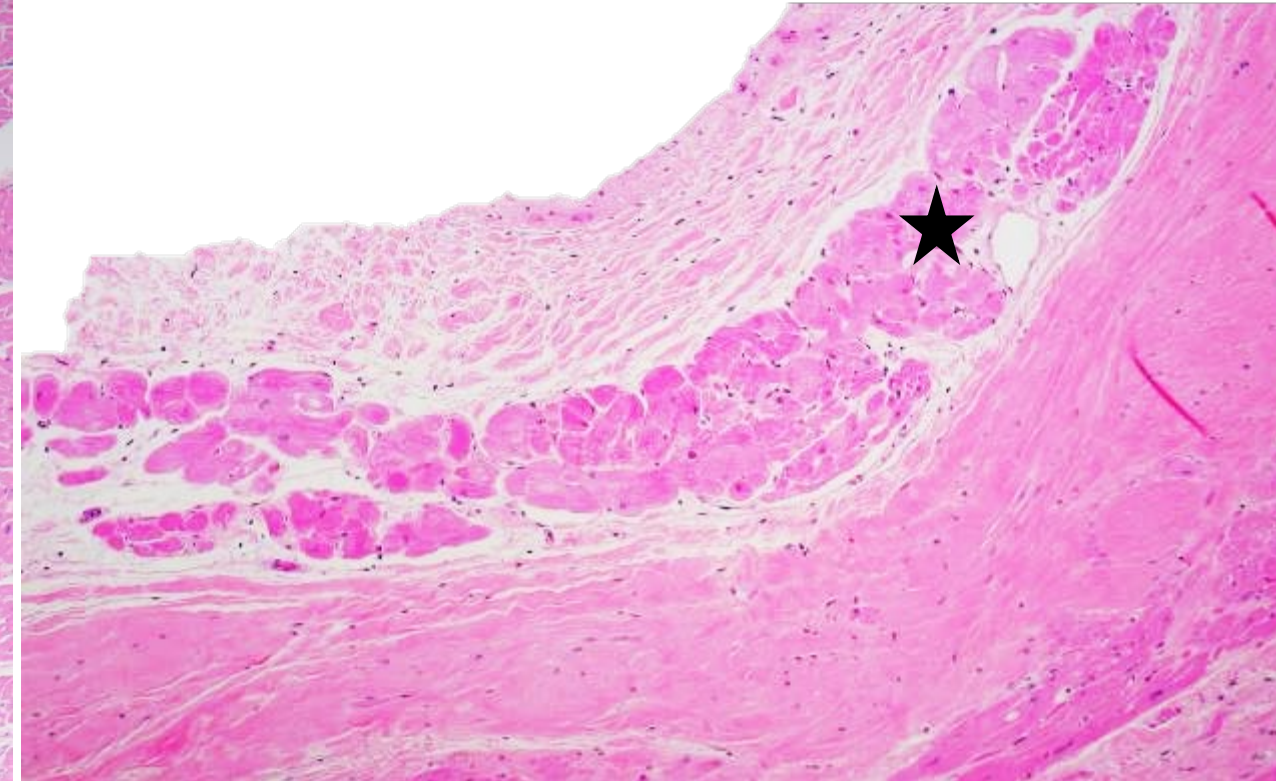
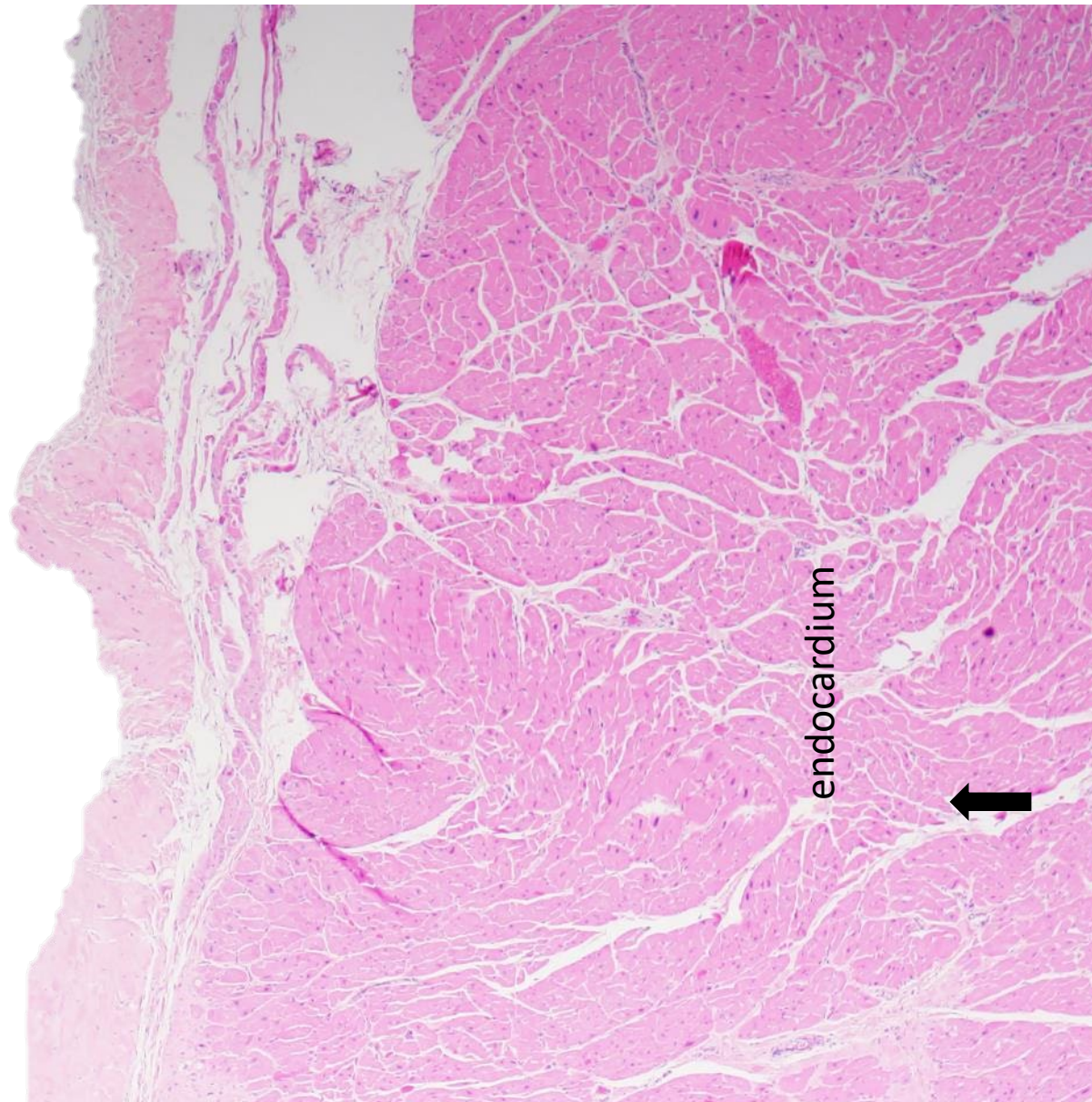
Atrioventricular node



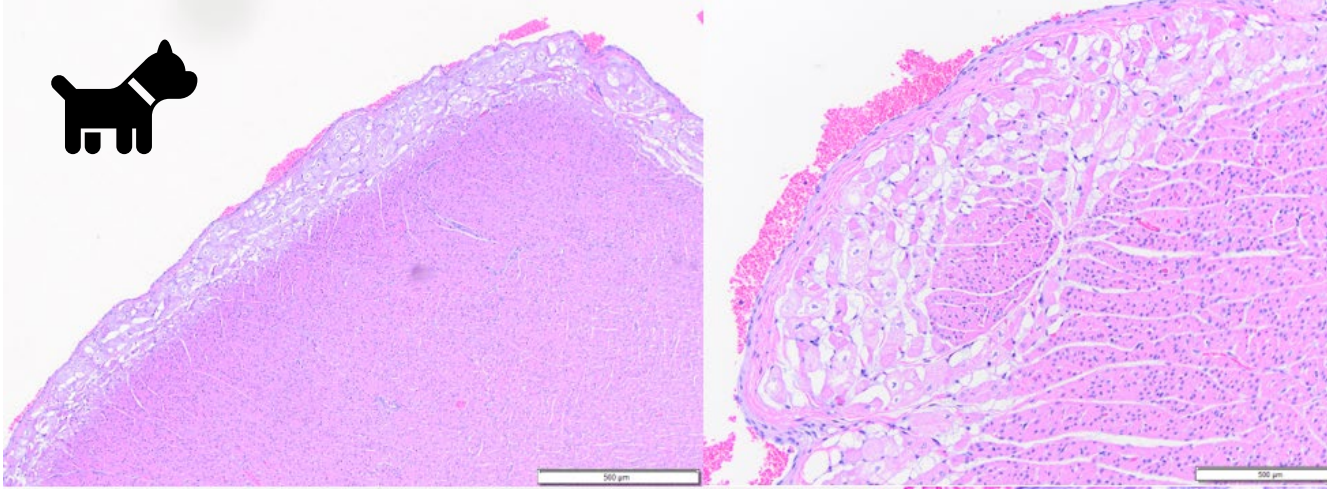
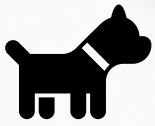
Nodal artery with fibromuscular hyperplasia



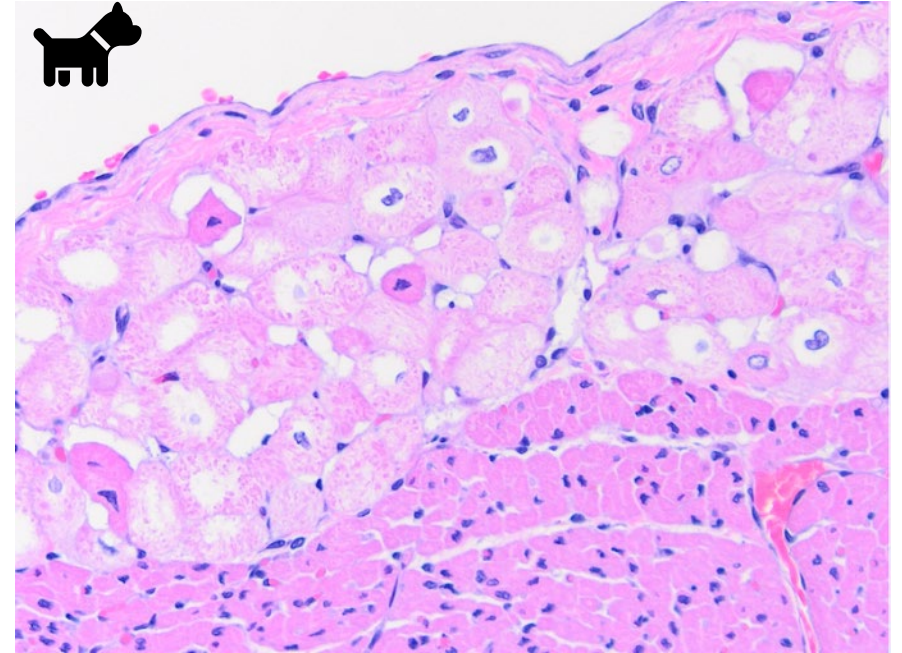
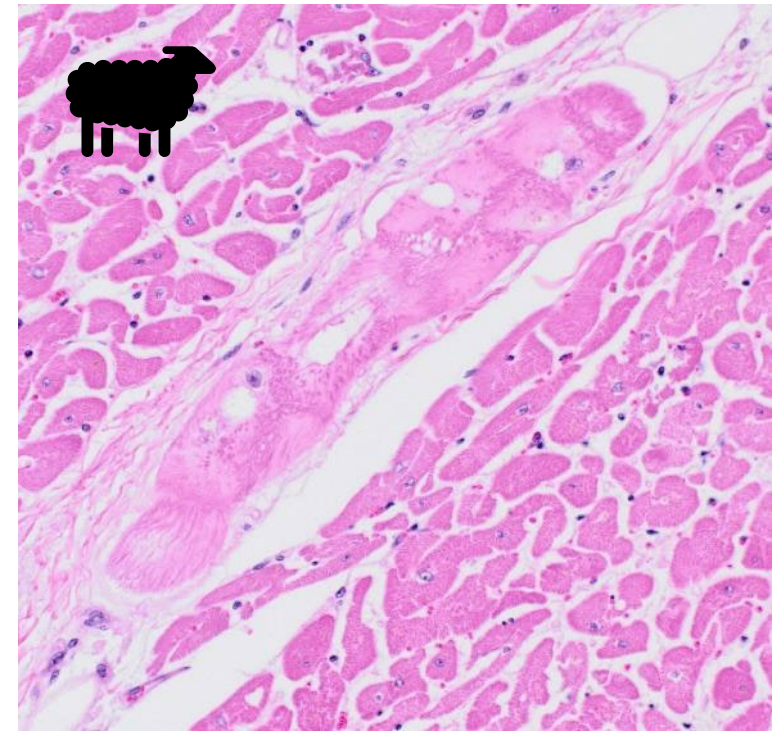
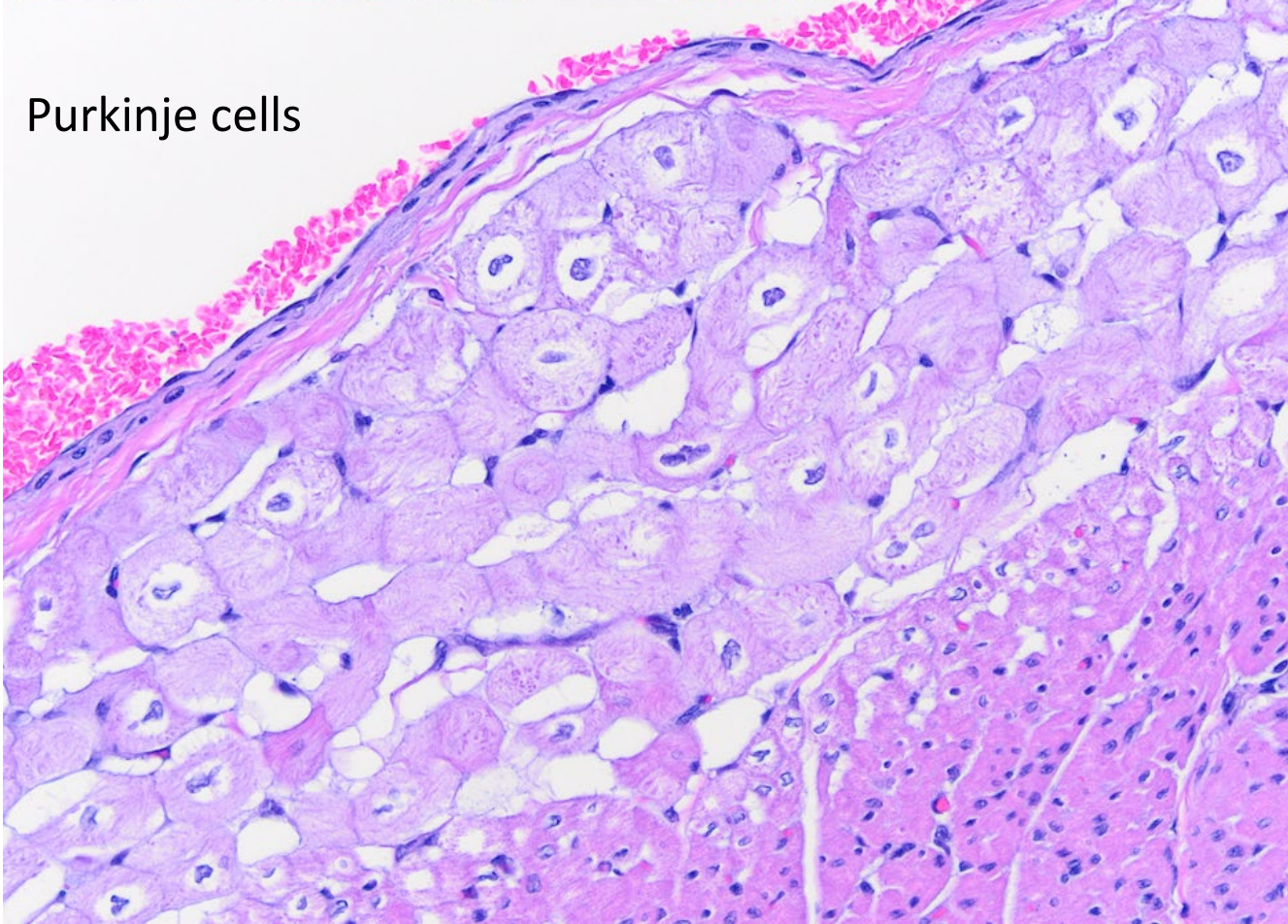
Left bundle branch



IV septum

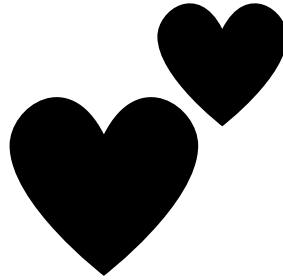


Purkinje cells





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