The Heart – 2., subsystems: Vessels, Nerves, Conduction System & Topography

- Coronary arteries
- Cardiac veins
- Lymphatics
- Sympathetic nerves
- Parasympaticus
- Pacemaking & Conducting system
- Topography

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Surface of the Heart
Some histology - epicardium

CT, Ep, N, M, F
A bit of histology - endocardium
Some more histology – AV valve
Overview of Blood Supply
The Blood Supply: Origin

Left coronary artery

Right coronary artery
The Blood Supply: Course
The Blood Supply: X-ray - right
The Blood Supply: X-ray - left
Review: Coronary Arteries and Veins
Review: Coronary Arteries and Veins

Left coronary artery:
- anterior interventricular branch
  -- diagonal branch
- circumflex branch
  -- obtuse marginal branch

Right coronary artery:
- artery to SA node
- acute marginal branch
- posterior interventricular branch

Great cardiac vein
Left oblique atrial vein (of Marshall) => coronary sinus
Middle cardiac vein (with posterior interventricular branch)
Small cardiac vein
Anterior cardiac veins (to right atrium)
Thebesian veins
The Lymphatic Drainage

Along the blood vessels
The Blood Supply: Troubles...

Stenosis of the anterior interventricular ramus of the left coronary artery
The Blood Supply: Solution !?

**PTCA:**  
Percutaneous  
Transluminal  
Coronary  
Arterioplasty  

Via catheter with balloon
The Innervation

Parasympathetic: n. X (vagus) - rr. cardiaci
Stimulation slows down the rate (S-A node), conduction (A-V node) and decreases force of contraction (via coronary vasoconstriction).

Sympathicus comes from C and T region via cardiac plexus together with coronary arteries - nn. cardiaci
Stimulation increases heart rate (S-A node), shortens A-V delay, increases force of contraction (directly) and dilates coronary arteries. Afferent fibers carry pain (MI).
The Innervation
The Innervation

- Sympathetic presynaptic
- Sympathetic postsynaptic
- Vagal presynaptic
- Vagal postsynaptic
- Sympathetic afferent
- Vagal afferent
The Conduction System

S-A node
(Internodal tracts)
A-V node
His bundle
Left and Right bundle branches
Purkinje fibers
Working myocardium
Electrical insulation
AV node and Bundle Branches

Triangle of Koch: delimited by the venous valve->the tendon of Todaro and the anulus of the tricuspid valve.
Tawara: ventricular conduction system

Tawara (1906)
GFP: Cx40 labeling of conduction system

- Septum
- Left bundle branches
- Purkinje fibers
- Ventricular walls

Lucille Miquerol, IBDM, Marseille
Position of the Heart in the Chest
Position of the Heart 2. X-Ray
Position of the Heart 2. X-Ray
Position of the Heart 2. MRI
Position of the Heart 2. MRI
Syntopy of the heart - CT
Projection and auscultation points of cardiac valves on body surface
Projection on the body surface
Movements with respiration
Position in differently shaped chests
The Pericardium

- Parietal pericardium
- Pericardial fluid
- Visceral pericardium (epicardium)
- fat
Heart in the pericardial cavity
Pericardial cavity with the heart removed
Pericardial Cavity & Sinuses

- Transverse sinus
- Oblique sinus
Transverse and oblique pericardial sinus
Hydropneumopericardium
Development of the pericardium
Development of the pericardium

Pericardium gives rise to:
- cardiac fibroblasts
- coronary smooth muscle
- subepicardial fat

Coronary endothelium
- derived from the liver sinusoids
References

- Čihák: Anatomie 3.
- Told: Anatomical atlas
- Netter: Anatomical atlas
- Anderson a Becker: Cardiac Anatomy
- Grant’s Dissector
- Original research & review papers