Histology lecture 2

The dr started the lecture by asking applied questions:
-what happens if the bicuspid valve is narrowed or is abnormally enlarged?
-what happens if the wall of the left ventricle is weakened (i.e. myocardial infarction)?

As a rule: VENOUS RETURN = CARDIAC OUTPUT

Blood will accumulate in the left atrium and return through the **valveless pulmonary veins** → congestion of the lungs → dyspnea (shortness of breath) → blood accumulate in the right ventricle → overstretch and weakness of the right ventricle → blood starts to accumulate in the systemic veins , liver , spleen , then capillaries → eventually leading to edema.

Please refer to handout 1

Page 3 C:
Tunica Adventitia: is formed of connective tissue containing elastic tissue and collagen fibers.
There are vessels called vasa vasorum in the adventitia of large vessels.

Internal elastic lamina: is part of tunica intima, and separates tunica media from intima.

External elastic laminae: separate tunica media from adventitia.

Note that: blood vessel wall layers receive nutrients from blood through diffusion. (That's why we need vasa vasorum in the wall of large vessels)

Page 5:
The difference between muscular (medium) and elastic (large) arteries

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1- Tunica intima is much thicker in the elastic artery.
2- Internal elastic lamina is well developed in the muscular artery and incomplete in the elastic artery.
3- Tunica media is composed of 40-70 layers of fenestrated elastic laminae in the elastic artery (in between these laminae there are various amounts of smooth muscle cells and collagen fibers), whereas tunica media in the muscular artery is composed of 40 layers of smooth muscle cells (in between them are few amounts of elastic laminae and collagen fibers).
4- External elastic laminae are more prominent in the muscular artery.
5- Vasa vasorum are more prominent in the adventitia of elastic arteries.

Page 6:

There are two phases in systole:
-First phase: **isovolumetric** contraction during which blood pressure increases inside the ventricle leading to opening of the semilunar valve.
-Second phase: Ejection (**isotonic** contraction). In this phase, muscle fibers of the ventricle shorten in order to increase the pressure inside it.

Please note that the elastic feature of large blood vessels maintains blood pressure during **diastole (i.e. maintains normal blood flow).
**Elastic artery converts blood flow from intermittent to continuous (due to recoiling) and this really important for vital organs such as the brain.

Page7:

Example on muscular (medium) arteries: radial – ulnar – brachial – popliteal – femoral – ant tibial – post tibial.

Page 8:

Sympathetic stimulation → vasoconstriction
Absence of sympathetic stimulation → vasodilation
Exception to this rule is the ***external genitalia*** where **parasympathetic** stimulation leads to vasodilation.

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Arterioles are richly innervated (sympathetic stimulation is responsible for their constriction)
While metarterioles and thoroughfare channels are poorly innervated, their muscles contract and relax depending on the presence of metabolites

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(↑CO2, ↑adenosine, ↑lactate)
Note that thoroughfare channels lack sphincters.

Page 10 A:
Filtration and absorption depend on the state of precapillary sphincter:
-if opened → ↑blood flow → ↑pressure →filtration happens even at venous end of the capillary
-if closed →↓blood flow → ↓pressure → reabsorption happens even at the arterial end of the capillaries

Page 10 B:
In continuous and fenestrated capillaries, the endothelium is continuous as there are NO GAPS between endothelial cells. But in fenestrated capillaries, there are holes in the cell membrane.
Please differentiate between: gaps between endothelial cells and holes in their membrane.
The presence of holes in the cell membrane in the **fenestrated capillaries allow** filtrates to pass quickly that's why this type of capillaries is commonly seen in kidney, intestinal villi and endocrine tissues. Whereas **continuous capillaries restrict** the passage of substances from blood to tissues, thus this type is seen in CNS (forming the blood brain barrier), muscles and connective tissue.

Page 12:
Arteriovenous anastomosis is important to regulate body's temperature.
For example, if body's temperature increases, muscles of glomus contract so that blood passes through capillaries in order to lose some heat. This process is regulated by hypothalamus, and in this particular example we need sympathetic stimulation from the hypothalamus to cause vasoconstriction).
*Glomus is a large muscular arteriovenous shunt exclusively found in nail beds and auricle of the ear.

Page 13:
Most important characteristics of medium veins:
1- Tunica adventitia is the thickest of the tunics
2- Presence of **venous valves** which guarantee unidirectional blood flow.
*Venous valve: is nothing but a connective tissue surrounded by endothelium.

Good luck ☺

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