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Physiology sheet

Doctor 2021 -mercy- I medicine I MU

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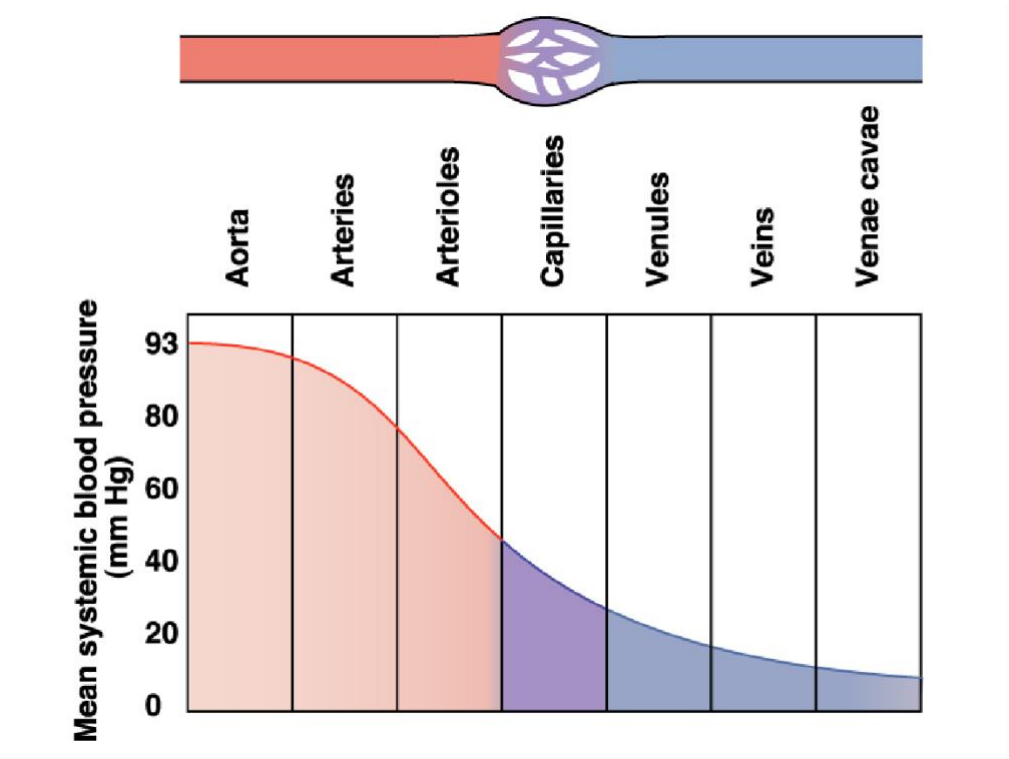
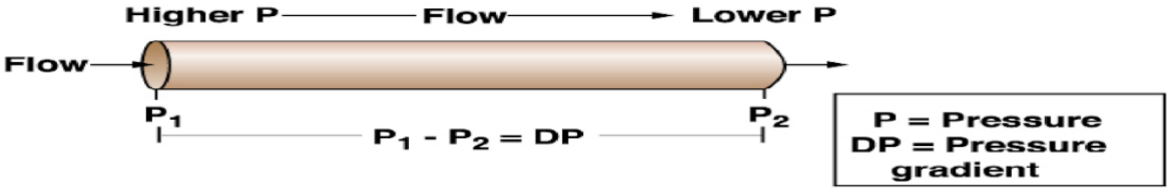
Vascular system and arterial blood pressure





- **Blood flows down a pressure gradient**
- **The absolute value of the pressure is not important to flow, but the difference in pressure (DP or gradient) is important to determining flow.**

- **Stages of blood pumping :**

1. **The pressure of the left ventricle will exceed the pressure of the aorta .**

When there is a lot of blood pressure inside the ventricle when compared to the pressure inside the aorta. Mainly the pressure inside the aorta will be zero compare to the high pressure inside the ventricle due to the volume of blood in the left side

2. **It will cause pressure on The semilunar valve (aortic valve) and opens it as a door by its to sides**
3. **The blood will be pumped from the ventricle to the aorta , pressure of the aorta will exceed the pressure of the ventricle(a lot of pressure inside the aorta compare to the pressure inside the ventricle) the aorta would be stretched to increase its ability to contain a lot of blood, and – as we take in the last lecture- a little back flow of the blood from the aorta to the aortic valve and closing the semi lunar valve and the blood pumped from the aorta to the systemic circulation .and this is the systolic pressure (starting from the early systole to the late systole)**

4.The blood will start its systemic circulation and will leave the aorta, aorta will relax .... This is the diastolic pressure

- **The aorta is very large elastic artery**
- **We measure the blood pressure by mmHg unit**

Systimic circulation

It is the circulation of blood from heart to the tissues .

- **The blood flow as follows :**

aorta – arteries – arterioles – capillaries – venules – veins – venae cavae

The movement of the blood inside the body depending on the perfusion pressure and gradient (the difference of the gradient from site to the site this will cause the movement of the fluid)

- **The starting point of systemic circulation is aorta , it have a highest pressure (average is 93mmHg) and known as mean arterial pressure (MAP) As we going away from the starting point the pressure will decrease gradually**

- **The capillaries is the site of exchange between blood and tissues , its pressure approximately between (30 – 35) mmHg .low comparing to the pressure inside the aorta**
- **The blood flow from highest pressure (aorta) to lowest pressure (vena cava)**
- **Vena cava pressure is the lowest pressure in this circulation , very close to zero and known as central venous pressure (CVP)**
- **At starting point systolic pressure occurs once the blood in the ventricle will be pumped into aorta , and at relaxation point diastolic pressure occurs**
- **Perfusion pressure (difference of the pressure between starting point and the lowest point)**
  Perfusion pressure (Δp) = Mean arterial pressure (MAP) – the central venous pressure(CVP)
- ***The central venous pressure (CVP) determines the right atrial pressure (RAP)***
- ***The volume of blood pumped toward heart is your central venous pressure and the venous pressure affect your right atrium pressure and it is about 3-8mmHg; it is small we don't even consider it often***
- ***So what we say that the***
- ***(Δp) = Mean arterial pressure (MAP) what does that mean???***

Systolic pressure the stretching wall of the aorta (contraction of heart)

- ***When ever the heart contracting it pumping the blood outside the heart ; the force at which we are trying to push the blood out of the heart and into the actual major arteries is the systolic pressure (left ventricles to aorta) and on average it is a bout 120mmHg***
- ***When ever the blood comes into the aorta it stretches the wall of the aorta so the wall of the aorta is going to be stretched now this is not that is stretching the walls is the systolic pressure but what happens is eventually; the actual aorta is very elastic and wants to recoil and squeeze the blood downwards or upwards to the head and the neck***

Diastolic blood pressure

- ***Whenever the aorta is coming back to it is natural size recoil the point when is relaxing and going back to its normal size original size ; this is called the diastolic blood pressure and on average it is about 80mmHg***
- **Notes**
  The average of adult healthy person pressure is 120/80

systolic = 120mmHg (from the contraction of the left ventricle in order to pump blood from the ventricle into the aorta then closing the semi lunar valve)

diastolic = 80

- **All values of pressure between (140 / 90) to the (90 / 60)**

considered as normal pressure

- **Hypotension = low blood pressure lower than 90/60**
- **Hypertension = high blood pressure (a lot of tension inside the wall of the arteries) higher than 140/90**
- **Pulse pressure = systolic BP – diastolic BP**

Mean arterial blood pressure

- $\boldsymbol{MAP = diastolic\ pressure + 1/3\ pulse\ pressure = 93mmHg}$
- **Pulse pressure**
- **The difference between systolic and diastolic pressure which is 40mmHg on average**

❑**To calculate a mean arterial pressure, double the diastolic blood pressure and add the sum to the systolic blood pressure. Then divide by 3. For example, if a patient's blood pressure is 83 mm Hg/50 mm Hg, his MAP would be 61 mm Hg(very low compared to the average 93mmHg) . Here are the steps for this calculation:**

- **MAP =(SBP + 2 (DBP)) /3**

the ventricles spend approximately one-third (1/3) of their time in systole, and two-thirds (2/3) in diastole

The time that taking from the stretching wall of the systole its just one third of the time compared to the diastole 2 third

- **It is so important because it determines the actual pressure by which will propel the substances out of the capillary beds into the tissues**

If the MAP affected it will affect on the exchange the nutrients from the capillary to the tissue

Cross –sectional area and velocity

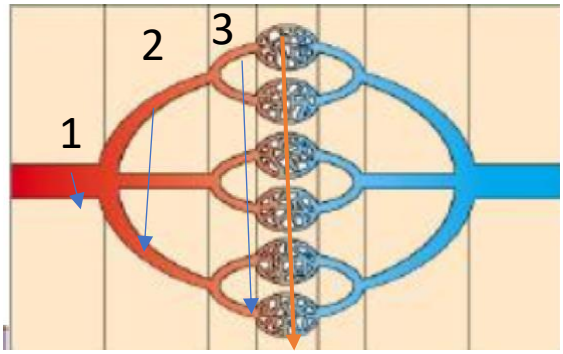
- ***This big one here is aorta (1) then the aorta splits it gives off arteries (2) then arterial branches arterioles (3) and then capillary branches ten to hundred per capillary bed (4) and after drain from the capillary bed then they go to what called venules (5) and from the venules they come eventually into the veins (6) and again to vena cava system***
- ***compare the cross sectional are the capillary and cross-sectional area aorta and velocity***
- ***As you increase the cross-sectional area the velocity decrease***
- ***The velocity is the slowest in the capillaries and faster in the aorta***

The highest point of cross sectional area is point 3 ... Describe capillaries

- **The lowest point is point 1 and 5 describe the aorta and vena cava**
- **Cross sectional area moving away from the aorta and become longer**

As we going away from the capillary it's starting to

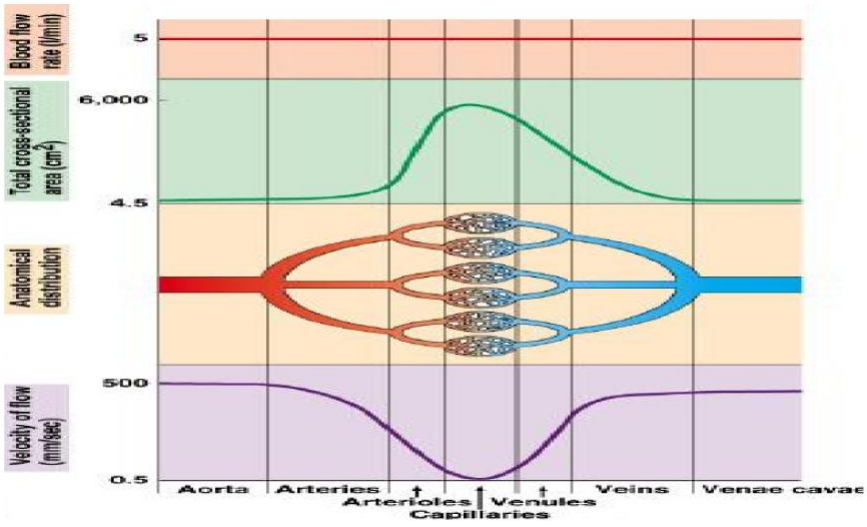
Going down



Velocity and cross-sectional area (Inverse relationship)

Velocity of the blood inside the systemic circulation

- **The cross-sectional area for the aorta is going to be very small as you start to move toward arterioles to capillaries it is going to start rising**
- **As you get towards the venules it starts decreasing again and comes back down**
- **Once you hit the arterioles that's when the actual specifically the cross-sectional area increases**
- **At capillaries, the velocity of the blood is the lowest to exchange of blood nutrients between tissues and capillaries occur , so we need slow Velocity to have enough time**
- **As you move away from the capillaries the velocity will increase gradually to the highest in the vena cava (yet less than aorta)**



"لقد تعِبنا مِن المَسير، ومَللنا، وسئِمنا، لكِنَنا نريد الوصول، ويجب أن نصِل، ومِن أجل الوِجهة تَهُن عذابات المَسير!"