7

Physiology sheet

Doctor 2021 -mercy- I medicine I MU

DONE BY:

Hiba Makkawi

Shahd Shamaseen

Raneem Jaafreh

CORRECTED BY:

Emran Younis

Shahd Ayobeen

DOCTOR

Dr. Arwa Rawashdeh

RESISTANCE

The resistance The major thing that gravely affected when any type of heart diseases or respiratory ones. So, we need to keep it normal

How to relate TPR to blood pressure

$\mathbf{F = \Delta P/R}$ Ohm's Law

$$\mathbf{CO = \frac{\Delta P}{TPR}}$$

Ohm's law:
F(co) = ΔP\R(TPR).
F: blood flow or cardiac output
ΔP: blood Perfusion pressure or pressure gradient (difference in pressure gradient)
F=Co ——> cardiac output
R= TPR -> Total peripheral resistance.
when ↑ P then ↑ R
when ↑ F then ↓ R
when ↑p then ↑F

$\mathbf{R = 8nl/\pi r4}$ **Poiseuille's law**

$\mathbf{n \, \alpha \, R}$

$\mathbf{n = \ viscosity}$

poisenille's law (collected the factor that affected the resistance)

$R=8\eta l/\pi r^4$

n: viscosity of the blood (increasing layers of the RBC inside the vessel) if it increases causing decreases the flow of the blood—> increasing the resistance

r: radius

L: length of Blood vessel (directly with resistance)

↑R: when ↑n and ↑ L

* ↓R when ↑r

FACTORS AFFECTING THE RESISTANCE

Polycythemia (high Hct)α n ; a lot of friction between the layers, because whenever blood is flowing it flows in layers when there is a lot of friction rubbing up against between those layers because increase in viscosity and slow the flow down

HCT or PCV: the percentage of red blood cells to plasma Or blood water = ECM. The higher the percentage of red blood cells compared to plasma, the higher hematocrit or PCV.PCV = packed cell volume

Hematocrit HCT (checking the volume of stacked erythrocytes) is the percentage of red blood cells in the blood.

…when high Number of cells Increase in viscosity so high resistance. so the flow decrease.

Polycythemia increasing the number of RBCs. High viscosity So high resistance

Anemia $\frac{1}{\alpha}$n

Anemia (decreasing the number of RBC) a little Number of cells so decrease the viscosity so decrease the resistance.

$$L \alpha R$$

Increase in Weight and height increases in L

$r = 1/\alpha R$ indirect

the most important factor that affecting the R because it is raised to power 4

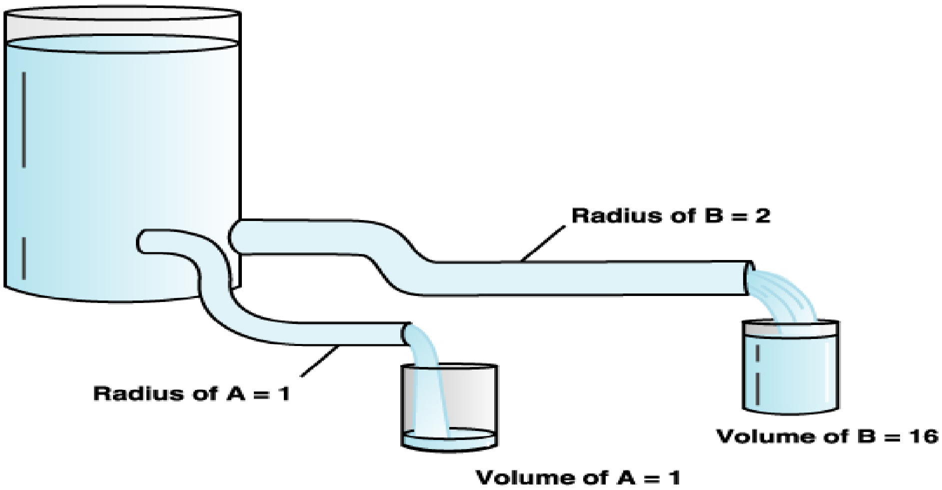
Vasodilation increases in r

Vasoconstriction decreases in r

The most factor affect the resistance even is the Radius raised to power 4 So called the primary factor that affect the resistance (when any small change in the radius it will cause big change in resistance)

How our body handle with High or Low pressure?

Effect of radius on resistance and blood flow



Resistance $\sim \frac{1}{radius^4}$	
Tube A	Tube B
$R \sim \frac{1}{1^4}$	$R \sim \frac{1}{2^4}$
$R \sim 1$	$R \sim \frac{1}{16}$

Flow $\sim \frac{1}{resistance}$	
Tube A	Tube B
$Flow \sim \frac{1}{1}$	$Flow \sim \frac{1}{\frac{1}{16}}$
$Flow \sim 1$	$Flow \sim 16$

Increasing the radius in only one value will increasing the flow 16 times than normal(it not really) if it really it will cause rupture of blood vessels so it does need a balance in flow

when pressure rise or decrease, our body will change the radius to handle this change (keep the blood flow constant) to ensure that resistance still constant also.

* Vaso construction when need to decrease blood flow (decreasing the radius) , Vaso dilatation to increase it (increasing the radius) more blood flow

BLOOD PRESSURE

- **Blood pressure =cardiac output X total peripheral resistance**

  $$BP = CO \times TPR$$

First, we want to decide what CO and TPR is, then we get to the right meaning of BP

- **Cardiac output (Flow)= Heart rate X Stroke volume**

$$CO\ (F) = HR \times SV$$

ml/min= Beat/min X ml/ Beat

*** From the Last lecture we knew that increase end diastolic volume will cause increase in stroke volume and now we know that it also will rise the cardiac output**

1 BP when ↑ R

↑ BP when ↑ F

⬆ F when ⬆ Heart rate + ↑ Stroke Volume

Increasing the force of contraction (per minute) this will decrease the stroke volume according to the relation and cardiac output (cardiac output: the blood that released from heart per minute)—> (stroke volume *heart rate)

Heart rate: stretching and relaxation of Heart chambers.(per minute)

Heart rate relating to the heart chamber

Pulse pressure: stretching wall of aorta and relaxing wall of aorta relating to the aorta

Pulse Pressure Hearing the contraction and relaxation of Ventricle from away the heart (systemic) Starting from the aorta till back to the heart.

Pulse pressure indicates the difference between stretching and relaxation of a blood vessel wall (not from the heart it self)

pulse rate: the pulsation of heart rate(الارتدادات) we can hear it either from radial or nick

CONTINUED CARDIA OUTPUT

- **Anther formula relate to CO**

  1 ml= 1 Cm3

  Flow = Cm3/min

- **Anther formula relate to flow**

  $$\text{Velocity (Cm2/min)} = \frac{\text{Flow (cm3/min).}}{\text{Cross sectional area (Cm2)}}$$

  It should—> velocity Cm / min

  V= F/A

- **How to relate this to cardiac output**
- **Increase Flow (CO)   Increase V**
- **Cross sectional area: measured in units of bier square because the blood vessels are cylinder in shape**

A (πr2); Increase A   Decrease V

Imagine a hose and water coming out of the hose at a nice pace then I put my thumb on the edge of the hose and I make A smaller the flow of the water is going to shooting out that means the velocity increases

V=F/A

V: VELOCITY

F: b. Flow

A: cross sectional area

The velocity increases when the cross sectional area decrease

It crosses a cross section of a region that is never equal to the radius.

The radius decreases as we move from the aorta to the capillaries.

Cross sectional area we take it with the total length of the blood vessels

Cross sectional area of the region increases as we move from the aorta to the capillaries and decreases as we move from the capillaries to the venules to the vena cava.

when A↑. The flow ↑

when ↓ V the F ↓

when ↑A the V ↓

Mean arterial blood pressure increasing cause increasing stroke volume which cause increasing the cardiac output

The increasing of stroke volume cause decrease the heart rate

لم ندخل الطب لنفشل، لم ندخله إلا لنكون سبب حياة، لنكون سبب ابتسامة،
لنعيد ترتيب ميم الألم و لام الأمل، لم نأتِ لنجني درجات أو نحصد تصفيقات،
جئنا نبحث عن العلم عن المعرفة، عن تلك السطور التي قد ننقذ حياة أحدهم بها
يوماً ما بإذن الله 💙🦋 .