⊠CORONARY CIRCULATION.

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⊠OBJECTIVES

⊠Describe the physiological anatomy of coronary circulation.

⊠Identify the values for normal coronary blood flow.

⊠Discuss control of coronary blood flow.

- Describe the physiological features of coronary circulation.
- Correlate knowledge to clinical conditions related to myocardial
- Coronary Circulation.
- **Def:** Blood flow to heart through coronary arteries is called coronary circulation.
- **Normal value**: 250 mL/min at rest.

or 70 ml / 100 gm / min.
This may increase to 2000 ml / min.

Anatomy of blood vessels:

⊠Arteries: Right and Left coronary arteries supply the heart (They are the first branches of Aorta)

⊠Coronary Circulation.

⊠Coronary Circulation.

⊠Distribution:

In 30% people,

⊠Rt coronary artery supplies: Rt atrium, Rt. Ventricle, posterior aspect of inter ventricular septum and

conducting system except LBB.

☒Lt.coronary artery supplies- Lt. atrium, Lt.vent. LBB abd rest of interventricular septum.

☒Coronary Circulation.

In 50 % of people : Rt coronary artery predomoniates.
In 20 % of people Lt. coronary artery predominates.

☒The arteries run from epicardium into endocardium almost **perpendicularly** between myocardial cells.

☒They are **end arteries-** i.e. no anastomosis.

☒Coronary circulation

☒Coronary Circulation.

☒Coronary Circulation.

Venous drainage:

• Coronary sinus-opens in Rt. Atrium

- Other veins are: Anterior cardiac vein.

3. Thebassian vein.

☒Coronary Circulation.

Mechanical:

☒Coronary blood flow is more during diastole than during systole. It is because, during systole, the myocardial cells compress the coronary arteries and its

branches. During diastole , the compression is minimal and flow is more.This is called **Phasic flow**.

⊠There fore any condition which decreases diastolic period decreases coronary blood flow.

⊠Coronary Circulation. Mechanical

In systole, when compared to blood flow through LCA & RCA, there is more blood flow through RCA than LCA, as Rt. Vent.generates only 25mmHg pressure where as Lt. vent. Generates 120 mmHg.

Coronary Circulation.

Factors Determining:

- Mechanical
- Metabolic
- Mean Aortic Pressure.

- Neuronal.

✉Coronary Circulation.

Aortic Pr	pr.in RV	pg	Pr.in LV	pg
Sy	120	25	95	120 0
Dia	80	10	70	10 70

Pg=pressure gradient

✉Coronary Circulation.
✉Metabolic factors:

⊠HYPOXIA is a potent vasodilator of coronary vessels. It increases the coronary blood flow by 2 ways:

⊠1. Direct
   2. Through ADENOSINE

⊠Coronary Circulation.

⊠Direct:

Hypoxia

Intra cellular acidosis

Calcium binding

Contractility of smooth muscle

Of blood vessels

Coronary vasodilation
CBF

✉Coronary Circulation.
✉Through Adenosin:
Hypoxia

✉Coronary Circulation.

✉ **Mean Aortic Pressure:**
Normal MAP = 100 mmHg &
CBF=250ml / min when MAP = CBF
MAP = CBF

✉ **Neuronal**:   Sympathetic
stimulation

coronary   HR   SV
vasoconstriction
Myocardial activity
CBF   Metabolic end
products

Hypoxia + Hypercapnoea

Vasodilation

CBF

Note: Indirect effect of vasodilatation exceeds vasoconstriction

and net effect is: Increased CBF

⊠Coronary Circulation.

⊠ Determination of CBF

- Direct method

- Indirect method: Kety's method.

It is modified Fick's principle. Sub. Used is N_2O or I131,

Procedure: Inhale mixture of N20=15%,02=21% & N2=64% for 10min. Blood samples from any artery and coronary sinus are analysed.

Then CBF= Qx / Ax – Vx.

✉Coronary Circulation.

Applied Aspect:

- **Coronary thrombus**: Thrombus in coronary artery or its branches   CBF Ischaemia / MI

- **Angina Pectoris**: Pain in the chest due to myocardial ischaemia / MI

  R :Medical: Nitrites(isosorbid dinitrite)

    supported by Beta blockers,
    ca.channel blockers

    Surgical: Angioplasty
      Bypass surgery

3. **Myocardial Infarction.**

⊠MI

⊠Myocardial infarction is a common presentation of <u>ischemic heart disease</u>. The WHO estimated that in 2002, 12.6 percent of deaths worldwide were from ischemic heart disease. Ischemic heart disease is the leading cause of death in developed countries, but third to <u>AIDS</u> and <u>lower</u>

respiratory infections in developing countries.

- **Risk factors**
- Risk factors for atherosclerosis are generally risk factors for myocardial infarction:
- Older age
- Male sex.
- Tobacco smoking
- Hypercholesterolemia (more accurately hyperlipoproteinemia, especially high low

density lipoprotein and low high density lipoprotein)

⊠Hyperhomocysteinemia (high homocysteine, a toxic blood amino acid that is elevated when intakes of vitamins B2, B6, B12 and folic acid are insufficient)
⊠Diabetes (with or without insulin resistance)
⊠High blood pressure

- Obesity(defined by a <u>body mass index</u> of more than 30 kg/m², or alternatively by waist circumference or <u>waist-hip ratio</u>).
- <u>Stress</u> Occupations with high stress index are known to have susceptibility for <u>atherosclerosis</u>.

- Treatment in MI
- **First line**
- <u>Oxygen</u>, <u>aspirin</u>, <u>glyceryl trinitrate</u> (nitroglycerin) and <u>analgesia</u> (usually

morphine, although experts often argue this point),

✉hence the popular mnemonic *MONA, morphine, oxygen, nitro, aspirin*) are administered as soon as possible.

✉Cardiac Function Tests

1. Serum Enzymes
2. Resting ECG
3. Stress ECG
4. X ray.
5. Echocardiography.

6. Phonocardiography.
7. Radionucleide scanning.
8. Lipid profile.
9. BP recording.

☒Cardiac Function Tests.
Serum Enzymes:
☒Creatin Kinase: 30-200U/L
☒Aspartate AminoTransferase(AST)
: 10-30 U/L.
☒Myocardial isoenzyme of CK (CK-MB)

: < 5 % of CK.

Lactate dehydrogenase: 100 – 300 U/L

⊠Cardiac Function Tests

⊠Lipid profile:

* Serum cholesterol =150-230mg%

* LDL = < 130 mg%

* HDL = > 70 mg%

* Triglycerides = 160 mg%

- CORONARY CIRCULATION
- Definition
- Anatomy of blood vessels
- Normal value
- Factors determining
- Peculiarities
- Method of measurement
- Applied aspect.

- References:- Guyton & Hall,12th edition.
- Ganong-24th edition.

✉Internet.

THANK YOU.