BLOOD VESSELS

ARTERIES

ARTERIOLES

CAPILLARIES

VENULES

VEINS

STRUCTURE OF BLOOD VESSELS

Related to blood pressure and function

LAYERS

Tunica Intima

endothelium

elastic lamina

Tunica Media

Tunica Externa

VALVES

SIZE
BLOOD PRESSURE AND BLOOD FLOW

PULSE PRESSURE

Systolic - Diastolic = Pulse
120 - 80 = 40

MEAN PRESSURE

Diastolic + 1/3 of Pulse = Mean
80 + 1/3 of 40 = 93

FLOW OF BLOOD TO ORGANS

Blood will flow along paths of least resistance

Flow = \frac{\text{Mean Pressure}}{\text{Resistance of Organ}}

Resistance controlled by changing diameters of arterioles

Local Control

CO₂, Metabolites, Prostaglandins

Hormones

Sympathetic - Parasympathetic Nerves
Factors Affecting Transfer of Fluids

1. Capillary Pressure

2. Interstitial Fluid Pressure

3. Plasma Colloid Osmotic Pressure

4. Interstitial Fluid Colloid Osmotic Pressure

Example:

Forces effecting outward flow

Mean Capillary Pressure  =  17 mmHg

Interstitial Fluid  = -7 mmHg

IFCOP  = 4.5 mmHg

Total Outward Force  = 28.5 mmHg

Forces effecting inward flow

PCOP  = 28 mmHg

Net Outward Force  = 0.5 mmHg
resulting in a slight filtration causing lymph formation.
Capillary Pressure Higher at Arterial End

Arterial End Pressure = 28-30 mmHg

Venous End Pressure = 7-10 mmHg

Therefore:

Capillary Filtration at Arterial End

outward flow about 17 ml/min

Capillary Reabsorption at Venous End

inward flow about 15.3 ml/min

Lymph formation about 1.7 ml/min
or about 2.5 l/day
CAPILLARIES

Large number - 10 billion

Large Surface Area - 100 sq meters

Close to all tissue cells - not more than 20-30 microns from capillary

Arterioles

Precapillary

sphincter

AV Shunt

True Capillaries

Venules

Sphincter contraction - 6-12 times/min

Regulation of Blood Flow and Pressure

Diameter - 7-9 microns

Pores - 80-90 Å

25X size of H₂O molecules
SPECIAL CIRCULATION

HEPATIC PORTAL SYSTEM

Superior & Inferior Mesenteric Arteries

Intestinal Capillaries

Hepatic Portal Vein

Liver Capillaries (sinusoids)

Hepatic Vein

Inferior Vena Cavae

Hepatic Artery
FETAL CIRCULATION

Placenta

Umbilical Arteries

Umbilical Vein

Liver

Ductus Venosus

Heart

Foramen Ovale

Ductus Arteriosus