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Circulatory System

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Circulatory System

The vascular or circulatory system controls the circulation of the blood and lymph throughout the body by means of the hear, blood and lymph vessels.

Cardiovascular System (Blood-Vascular System)

a closed circuit system

continuously circulates blood throughout body

there is a constant and extensive interchange of fluids and substances

Cardiovascular system includes:

Blood, heart and blood vessles (arteries, capillaries and veins

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Heart

An efficient pump that keeps the blood circulating through a closed system

Three distinct layers
Four chambers
Four valves

Pericardium	a double layered membrane that encloses hear
Epicardium	protective outer layer of the heart
Myocardium	cardiac muscle
Endocardium	thin, innermost layer of heart
Septum	wall that separates the heart's chambers
Tricuspid Valve	allows blood to flow from right atrium into righ ventricle
Pulmonary Semilunar Valve	directs blood from right ventricle into pulmonary arteris
Bicuspid or Mitral Valve	allows blood to flow from left atrium into left ventricle
Aortic Semilunar Valve	permits blood to be pumped from left ventricle into aorta

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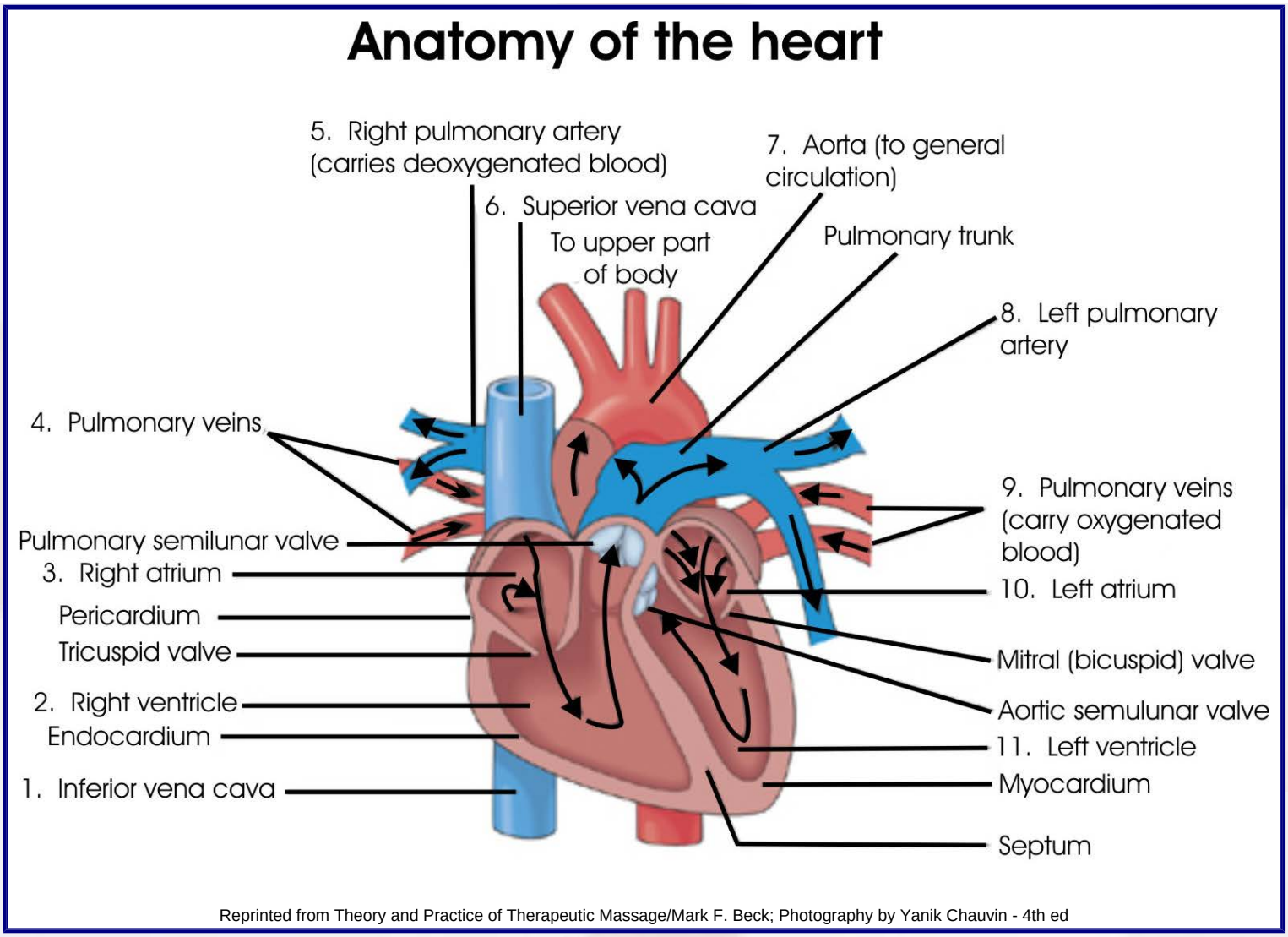
Heart



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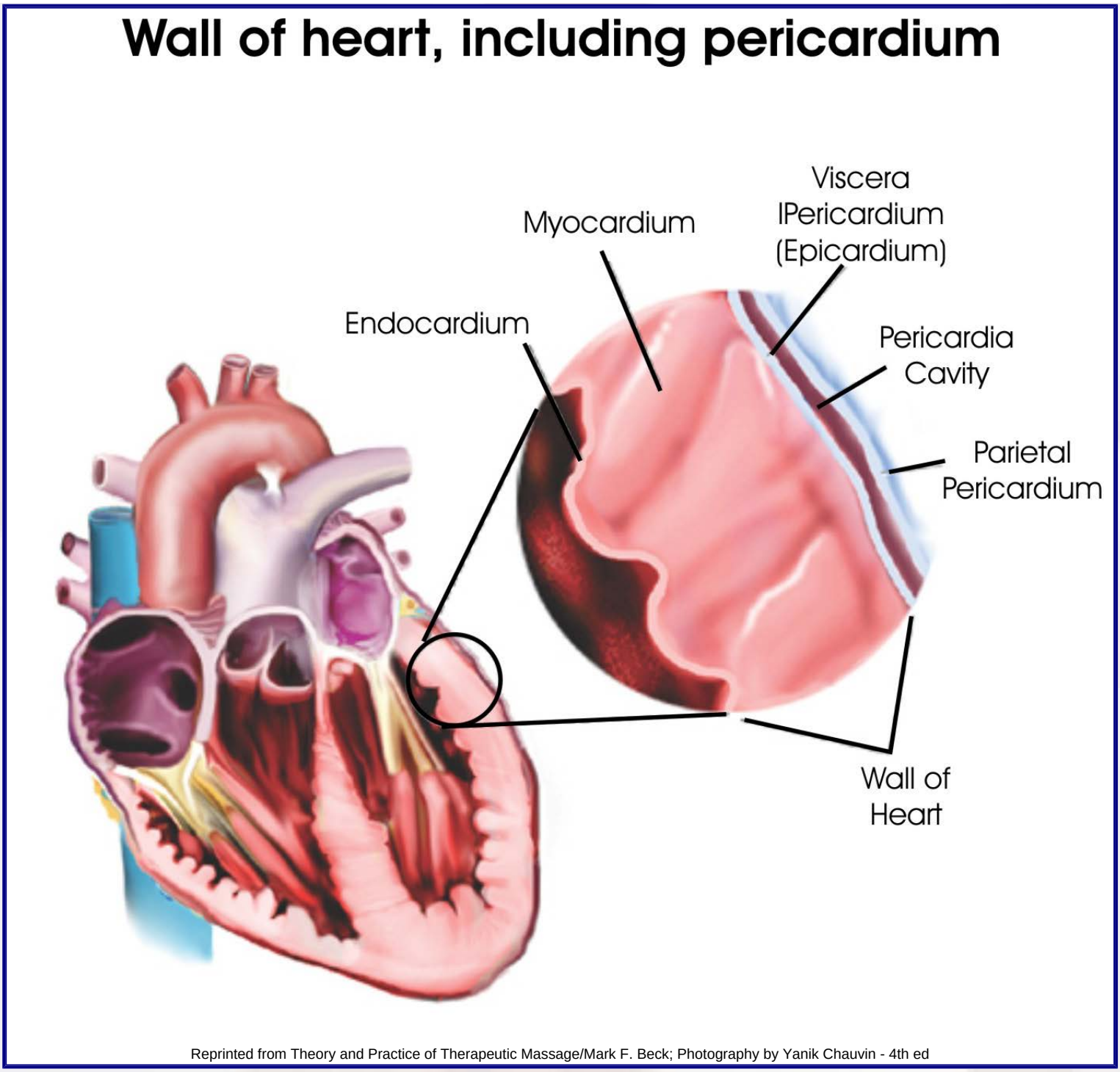
The Heart



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Blood Vessels

The arteries, arterioles, capillaries, venules and veins transport blood from the heart to the various tissues of the body and back again to the heart.

Arteries	thick-walled muscular and elastic vessels that transport oxygenated blood from the heart membrane that encloses hear
Arterioles	small blood vessels between the arteries and capillaries
Capillaries	the smallest blood vessels and conect arterioles with the venules
Venules	microscopic vessels that continue from the capillaries and merge to form veins

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Arteries and Arterioles

TArteries are thick-walled muscular and elastic vessels that transport oxygenerated blood (except for the pulmonary artery) under relatively high pressure from heart.

Veins	thinner-walled blood vessels that carry deoxygenated blood and waste-laden blood from capillaries back to the heart
Aorta	main artery of the body
Vasoconstriction	contraction of the arterial walls
Vasodilation	relaxation and enlargement of the arterial walls

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Capillaries

The smallest microscopic, thin-walled blood vessels whose networks connect the small arterioles with the venules.

Walls of capillaries are extremely thin and permeable

Diffusion	a process in which substances move from an area of higher concentration to an area of lower concentration
Filtration	process in which blood pressure pushes fluids and substances through the capillary wall and into the tissue spaces

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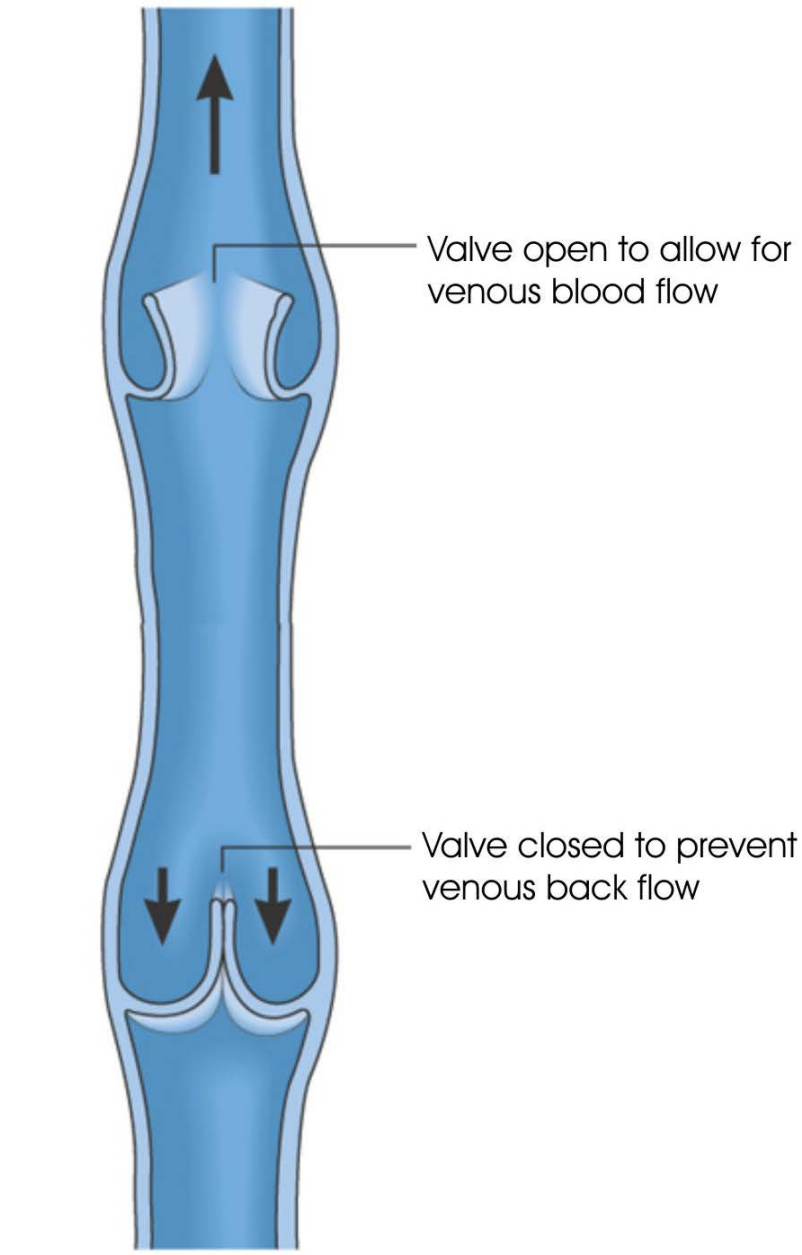
Veins and Venules

Venules are the microscopic vessels that continue from the capillaries and merge to form veins; Veins carry deoxygenated and waste-laden blood from the various capillaries back to the heart

Many veins (especially in arms and legs) have a system of valves that prevent blood from flowing backward.

Valves in the veins



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Circulation of the Blood

The blood is in constant circulation from the moment it leaves until it returns to the heart.

Pulmonary Circulation: circulation from the heart to the lungs and back again to the heart

General or Systemic Circulation: circulation from the left side of the heart throughout the body and back again to the heart.

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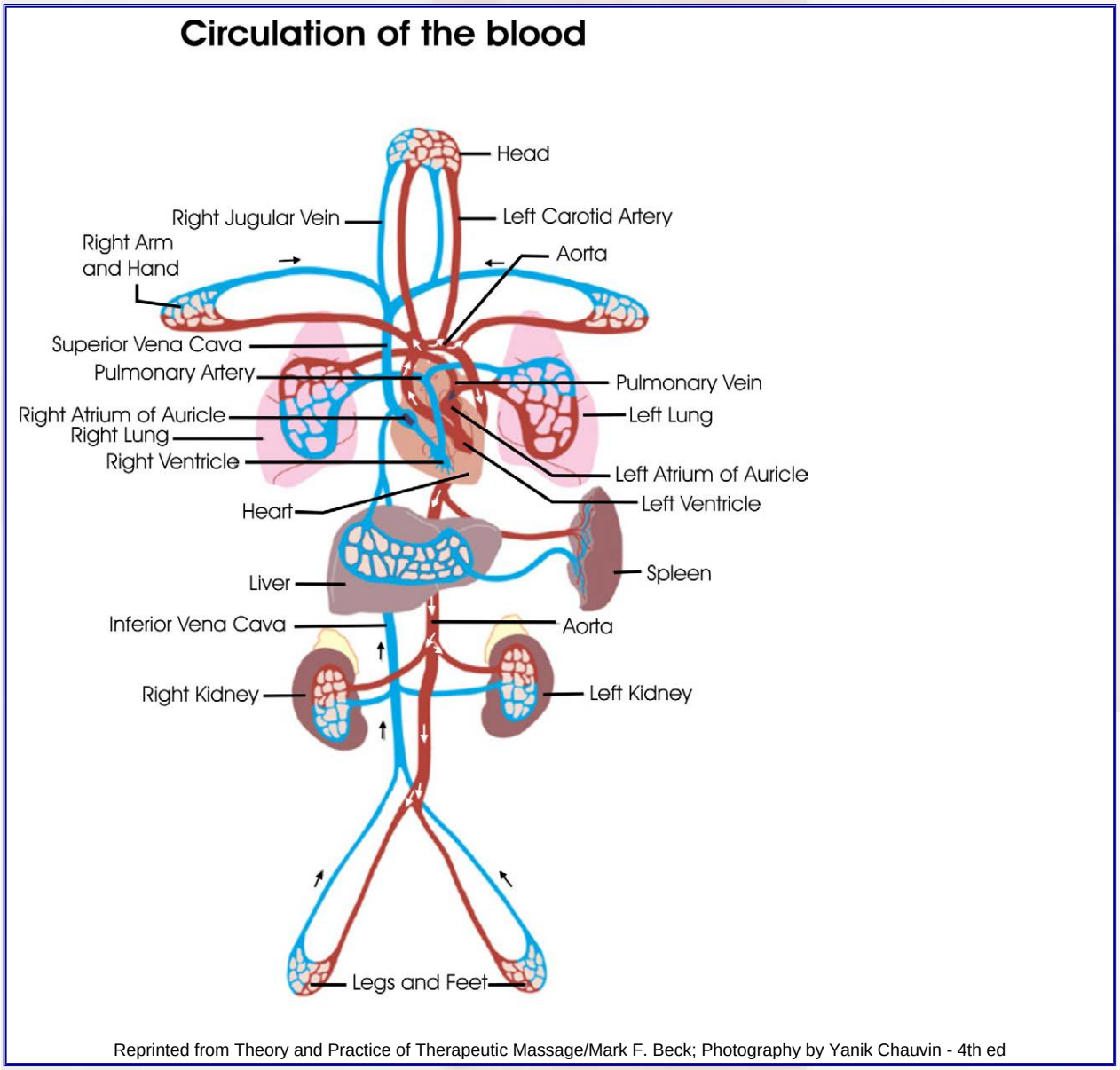
Circulation of the Blood



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Right atrium receives oxygen-poor blood from large superior and inferior vena cava

|

Venous blood passes through tricuspid valve into right ventricle

|

Venous blood is pumped thru pulmonary semilunar valve and is carried through pulmonary arteries to lungs

|

Freshly oxygenated blood is collected from capillaries into pulmonary veins and returned to heart

|

Left atrium receives oxygenated blood from pulmonary veins

|

Blood passes through the bicuspid or mitral valve into the left ventricle

|

Blood is pumped through aortic semilunar valve and into aorta

|

Blood is distributed to major arteries except for lungs. Blood moves into smaller

branches until it flows into arterioles

|

Blood moves into capillaries

|

Blood is collected from capillary beds into venules and larger veins until blood flows into inferior or superior vena cava

|

Cycle is repeated as venous blood is brought back again to right atrium of heart

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Disorders of the Blood

Atherosclerosis	an accumulation of fatty deposits on the inner walls of the arteries
Phlebitis	an inflammation of a vein
Thrombophlebitis	signifies the presence of a blood clot in an inflamed vein
Aneurysm	a local distention or ballooning of an artery due to a weakening wall
CVA	a cerebrovascular accident or stroke which is caused by a disturbance in the cerebral circulation
Myocardial Infarction	a heart attack resulting from reduced blood flow to the heart
Varicose Veins	protruding, bulbous, distended superficial veins usually in the lower legs
Hematoma	a result of bleeding under the skin or deep in the tissues; commonly called bruises
Edema	a condition of excess fluid in the interstitial spaces

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Functions of the Blood

Carries water, oxygen, food and secretions to the body
Carries carbon dioxide and wastes away
Equalizes body temperature
Coagulates to prevent blood loss in injury
Protects the body with white blood cells

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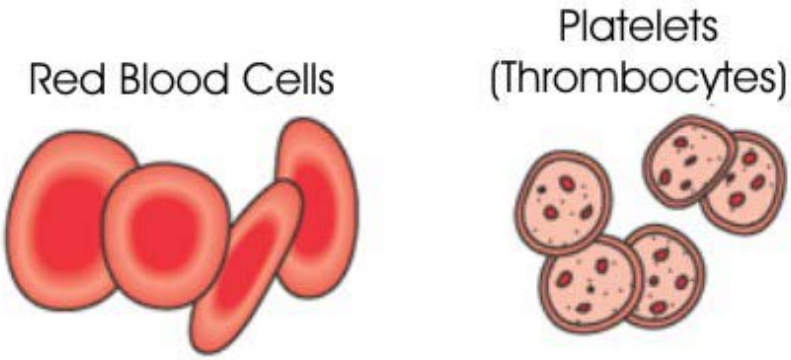
Composition of the Blood

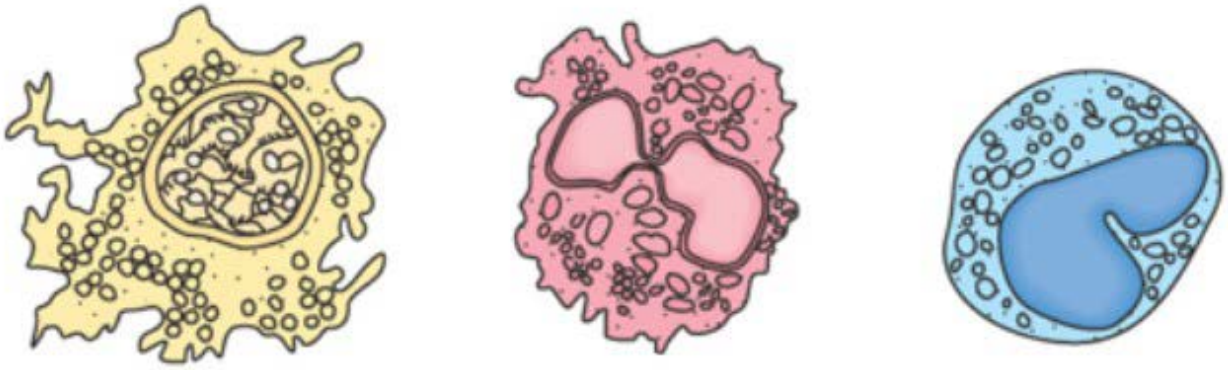
Liquid connective tissue consisting of fluid called blood plasma & solid components including: red corpuscles, white corpuscles and blood platelets

Red Blood Cells (red corpuscles)	carry oxygen and transport carbon dioxide; are far more numerous than white blood cells
White Blood Cells (white corpuscles)	also called leukocytes; are different from red blood cells in that they are larger, colorless, and change shape according to their function in the immune system
Blood Platelets (thrombocytes)	colorless, irregular bodies that are much smaller than red blood cells; play a big role in the blood clotting procedure

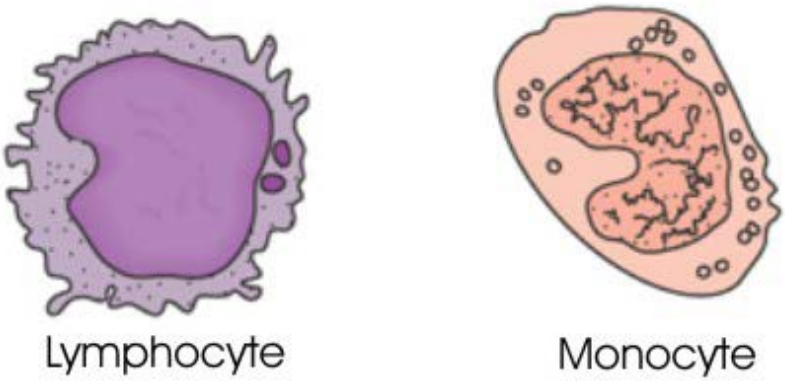
Blood cells and platelets



White Blood Cells (Leukocytes
Granulocytes
(Granular Leukocytes)



Agranulocytes
(Nongranular Leukocytes)



Blood Coagulation or Clotting

Caused when a blood vessel is damaged

Blood platelets adhere to ragged edges of injured vessel and change shape as protrusions form from their cell membrane, sticking together to cerate a plug
Platelets release serotonin, a vasoconstrictor, that causes a vascular spasm that temporarily closes the blood vessel
Tissue damage causes an enzyme to be released that acts on on plasma component (fibrogen) to activate and form threads of fibrin
Fibrin sticks to the damaged blood vessels, forming a meshwork that entraps other platelets and blood cells in a blood clot.

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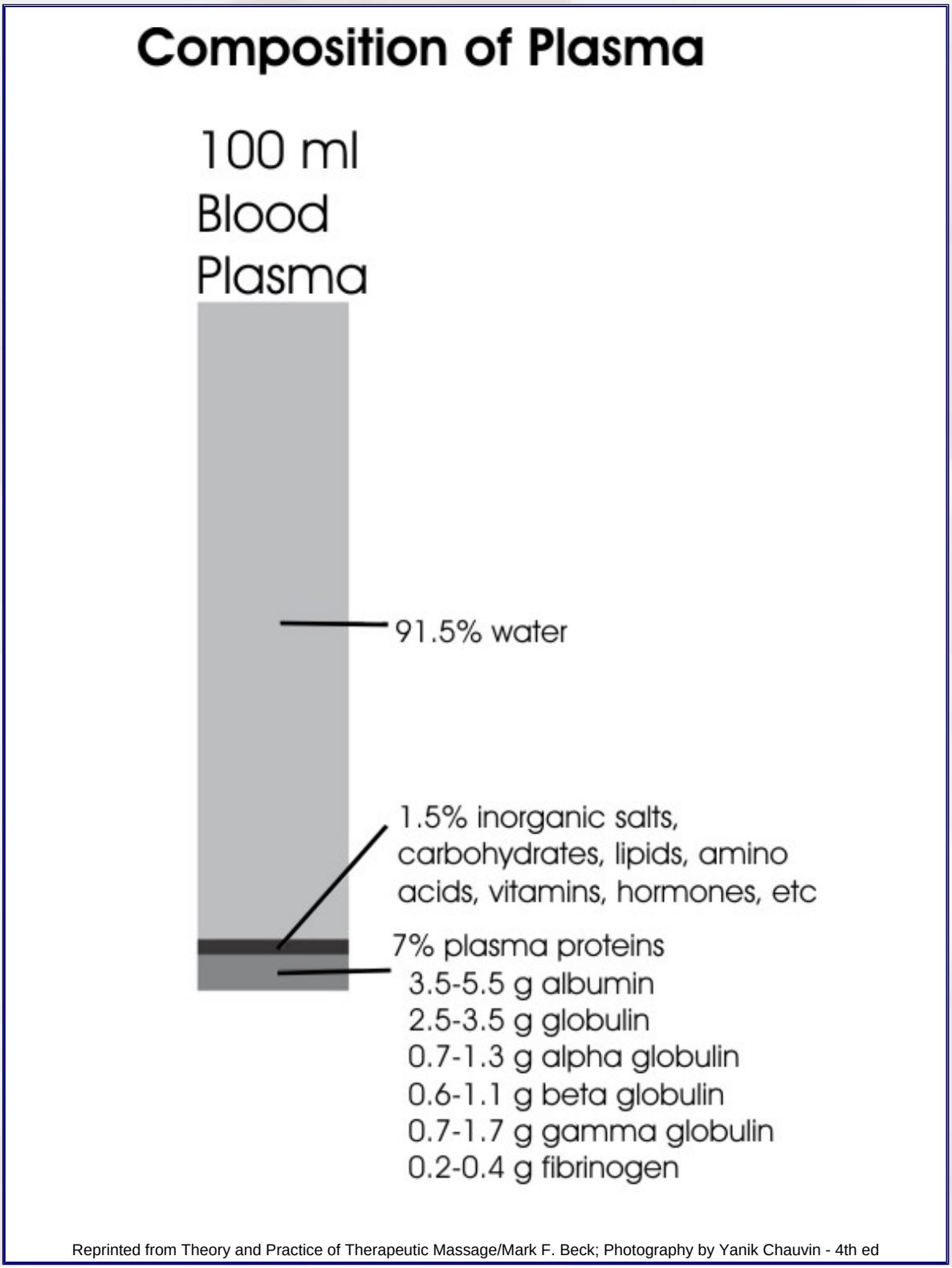
Plasma

Strawlike colored fluid component of the blood inwhich red corpuscles, white corpuscles and blood platelets are suspended; about 90% is water



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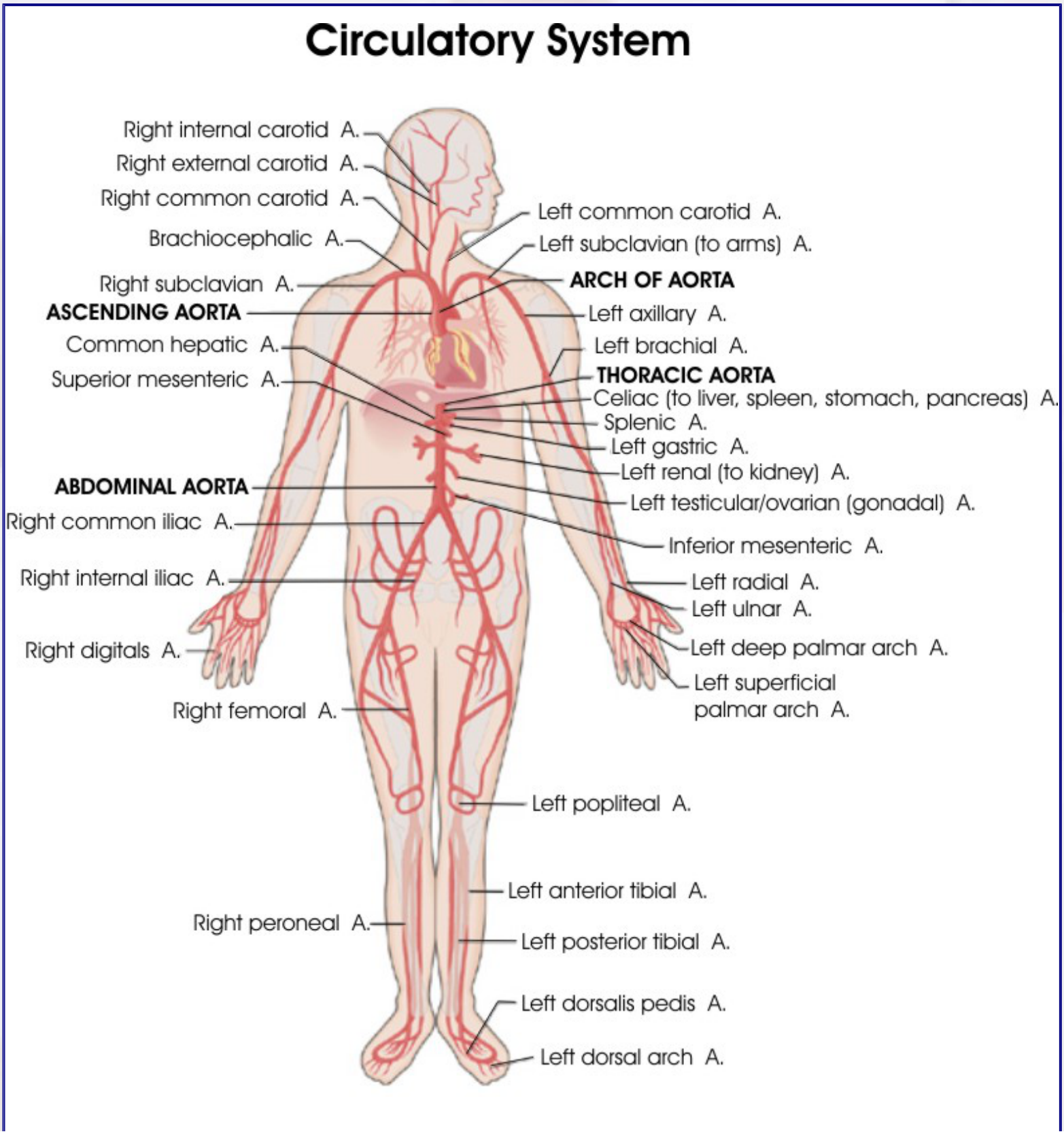
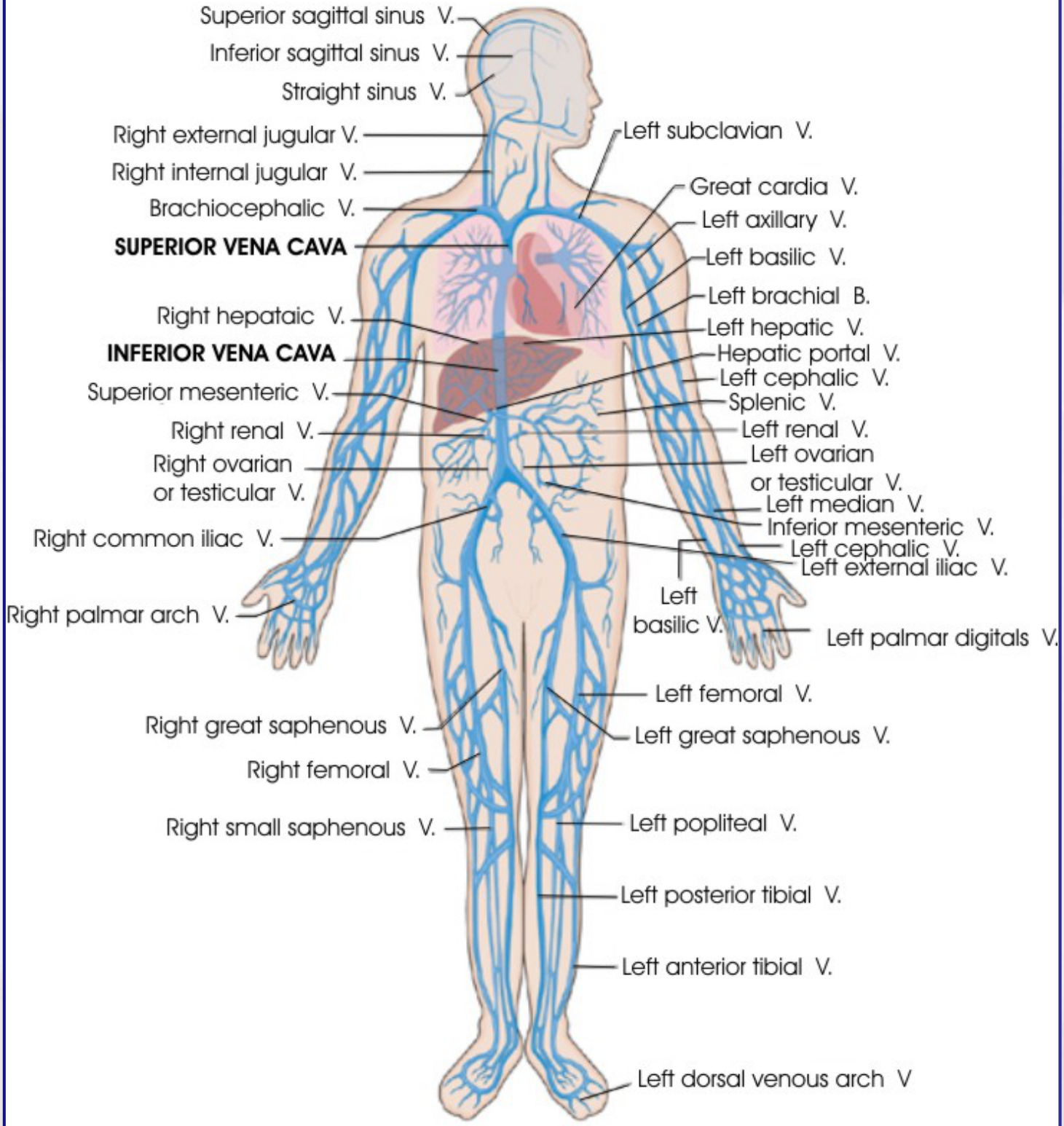


Circulatory System



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Diseases of the Blood

Hemophilia	extremely slow clotting of the blood and excessive bleeding from even small cuts
Anemia	result in a rapid loss or inadequate production of red blood cells
Nutritional Anemia	caused by dietary deficiencies; lack of iron, folic acid, B_{12} protein or copper can all affect the production of hemoglobin
Pernicious Anemia	results from a lack of production of intrinsic factor needed to assimilate B_{12}. Injections are necessary.
Hemorraghic Anemia	results form excessive blood loss due to injury or menstruation
Aplastic Anemia	occurs when the bone marrow slows or stops production of blood cells
Sickle Cell Anemia	an inherited condition when the hemoglobin molecule changes to a rod shape after delivering oxygen which causes it to become stuck in capillaries
Leukemia	a form of cancer in which there is an uncontrolled production of white blood cells

Sickle cell anemia is an inherited disorder in which abnormal hemoglobin causes red blood cells to assume a sickle shape

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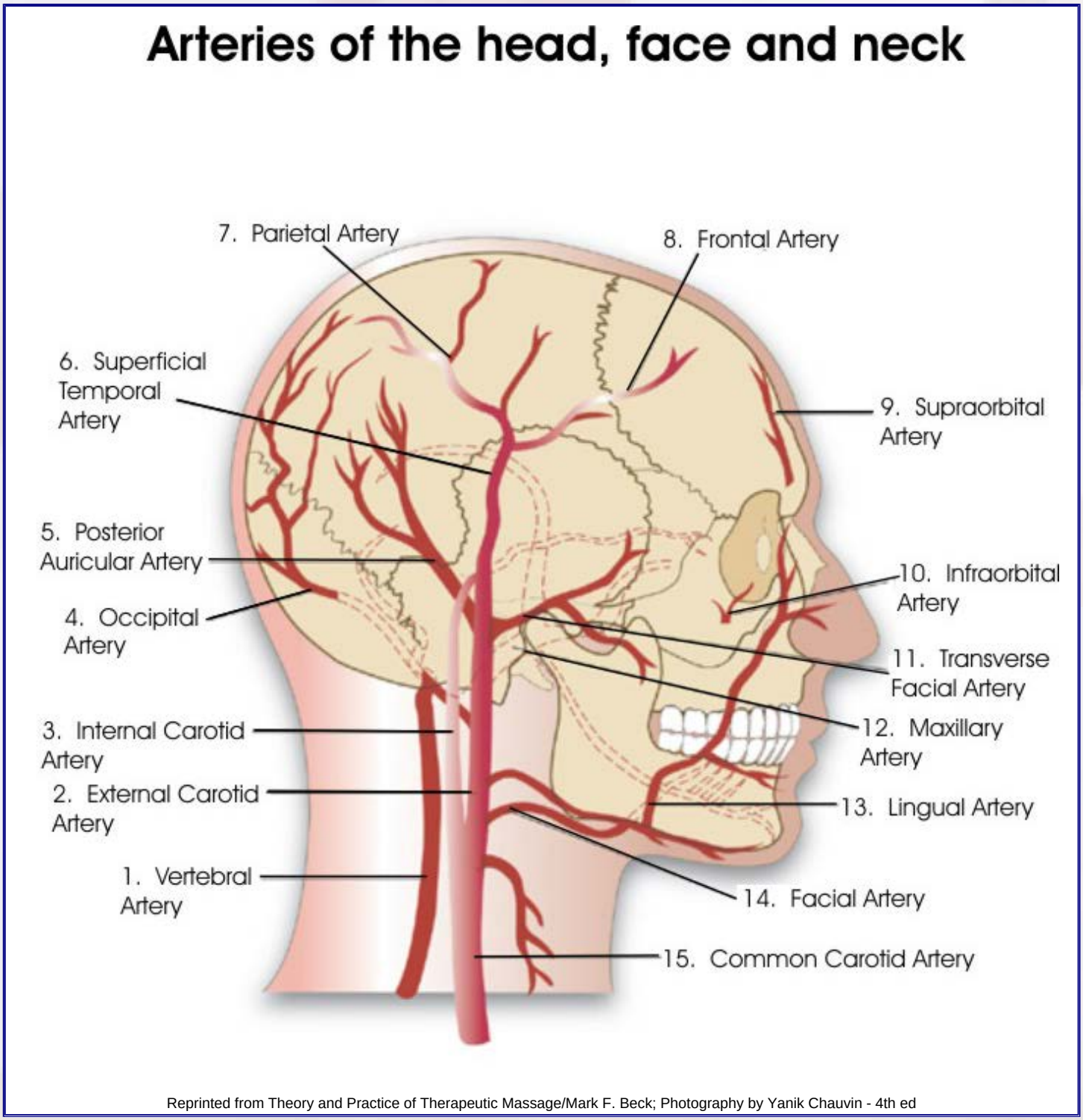
Arteries of the Head, Face and Neck

Common carotid arteries are the main sources of blood supply; located on either side of the neck; each artery divides into an internal and external branch



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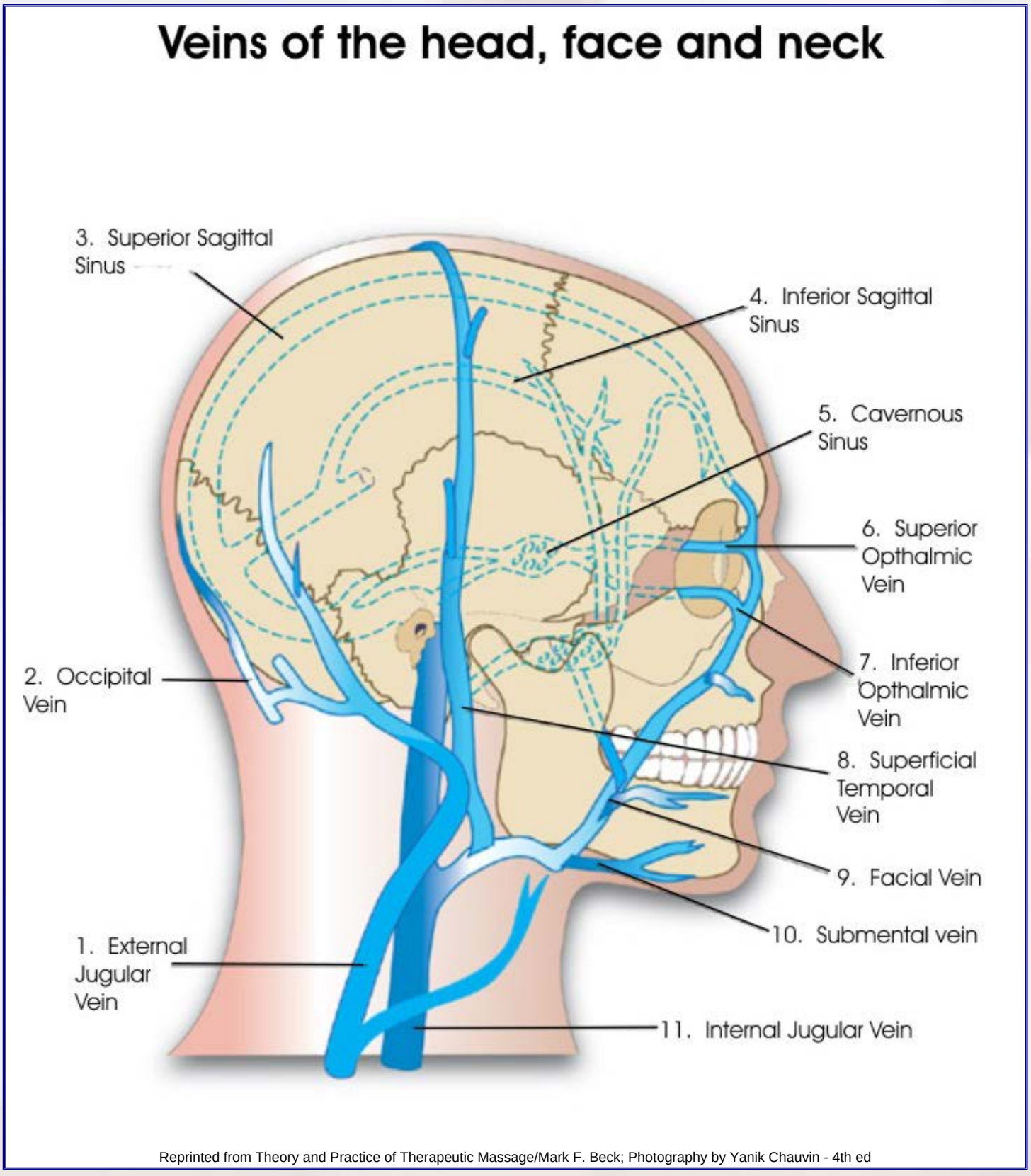
Veins of the Head, Face and Neck



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