

ANA 210 ASSIGNMENT

1. DESCRIBE THE IMPORTANCE OF VASCULATURE IN RELATION TO IMMUNE SYSTEM AND OUTBREAK OF PANDEMIC COVID-19 ON THE HUMAN BODY.

WHAT IS VASCULATURE?

The vasculature is a network of blood vessels connecting the heart with all other organs and tissues in the body. Arteries and arterioles bring oxygen-rich blood and nutrients from the heart to the organs and tissues, while venules and veins carry deoxygenated blood back to the heart. The exchange of gases and transfer of nutrients between blood and tissues take place in the capillaries.

There are five classes of blood vessels, namely;

- ❖ Arteries and Arterioles (the Arterial system)
- ❖ Veins and Venules (the Venous system)
- ❖ and Capillaries (the smallest blood vessels, linking arterioles and venules through networks within organs and tissues) .

Arteries are described as branching or bifurcating vessels, as great arteries (such as the aorta) branch off into smaller arteries and arterioles. Veins are described as converging or joining vessels, as venules and veins join to return blood to the heart through the largest veins (such as the superior and inferior venae cavae) . Capillaries are in intimate contact with the tissues, providing nutrients and removing waste products through their thin walls at a cellular level.

FUNCTIONS OF THE FIVE BLOOD VESSELS

- ❖ Arteries: they transport high-pressure blood from the heart to smaller arteries and arterioles
- ❖ Arterioles: connect arteries and capillaries
- ❖ Veins: act as reservoir of blood and transport low-pressure blood from venules to heart
- ❖ Venules: connect capillaries and veins
- ❖ Capillaries: allow gas exchange, nutrient transfer and waste removal between blood and tissue fluids

THE IMMUNE SYSTEM

The immune system is one of the most complex systems within the human body, made up of both physical structures and processes, comprising a network of organs, tissues, and cells that protect the body from disease and foreign invaders. Its main function is to keep us healthy and prevent illness. The major component of the immune system is the lymphatic system, composed of the bone marrow, spleen, and thymus gland, as well as the lymph nodes and ducts. In addition, there are specialized blood cells (lymphocytes and leukocytes) that work within the immune system. The human immune system acts as the guardian of our physical health by providing safeguards to the outside invasion of pathogens, which include viruses and bacteria.

The immune system includes primary lymphoid organs, secondary lymphatic tissues and various cells in the innate and adaptive immune systems.

The key primary lymphoid organs of the immune system include the thymus and bone marrow, as well as secondary lymphatic tissues including spleen, tonsils, lymph vessels, lymph nodes, adenoids, skin and liver.

The thymus educates T cells and provides an inductive environment for the development of T cells from hematopoietic progenitor cells. The thymus is largest and most active during neonatal and pre-adolescent periods of development.

Bone marrow is the flexible tissue found in the interior of bones. In humans, red blood cells are produced in the heads of long bones. The red bone marrow is a key element of the lymphatic system, being one of the primary lymphoid organs that generate lymphocytes from immature hematopoietic progenitor cells. Bone marrow and thymus constitute the primary lymphoid tissues involved in the production and early selection of lymphocytes.

LYMPHATIC SYSTEM

The lymphatic system is a network of tissues and organs that help rid the body of toxins, waste and other unwanted materials. The primary function of the lymphatic system is to transport lymph, a fluid containing infection-fighting white blood cells, throughout the body. The lymphatic system primarily consists of lymphatic vessels, which are similar to the veins and capillaries of the circulatory system. The vessels are connected to lymph nodes, where the lymph is filtered. The tonsils, adenoids, spleen and thymus are all part of the lymphatic system.

There are hundreds of lymph nodes in the human body. They are located deep inside the body, such as around the lungs and heart, or closer to the surface, such as under the arm or groin. The lymph nodes are found from the head to around the knee area.

The spleen, which is located on the left side of the body just above the kidney, is the largest lymphatic organ. The spleen acts as a blood filter. It controls the amount of red blood cells and blood storage in the body, and helps to fight infection. If the spleen detects potentially dangerous bacteria, viruses, or other microorganisms in the blood, it along with the lymph nodes creates white blood cells called lymphocytes, which act as defenders against invaders. The lymphocytes produce antibodies to kill the foreign microorganisms and stop infections from spreading. Humans can live without a spleen, although people who have lost their spleen to disease or injury are more prone to infections.

Tonsils are large clusters of lymphatic cells found in the pharynx. According to the American

Academy of Otolaryngology, they are the body's "first line of defense as part of the immune system. They sample bacteria and viruses that enter the body through the mouth or nose." They sometimes become infected, and although tonsillectomies occur much less frequently today than they did in the 1950s, it is still among the most common operations performed and typically follows frequent throat infections.

BLOOD SUPPLY

Blood is a combination of plasma and cells that circulate through the entire body. It is a specialized bodily fluid that supplies essential substances around the body, such as sugars, oxygen, and hormones. It also removes waste from the cells in the body.

Blood transports oxygen and nutrients around the body and removes cellular waste, among a range of other vital functions. Plasma makes up 55 percent of blood content. The other 45 percent consists mainly of red blood cells and platelets. Blood groups are categorized based on the antibodies and antigens in the cell. Receiving an incompatible blood donation can lead to fatal complications. Anemia, blood cancer, and clots are all potential disorders of the blood.

FUNCTIONS OF BLOOD

Blood has a number of functions that are central to survival, including:

- ❖ Supplying oxygen to cells and tissues
- ❖ Providing essential nutrients to cells, such as amino acids, fatty acids, and glucose
- ❖ Removing waste materials, such as carbon dioxide, urea, and lactic acid
- ❖ Protecting the body from infection and foreign bodies through the white blood cells
- ❖ Transporting hormones from one part of the body to another, transmitting messages, and completing important processes
- ❖ Regulating acidity (pH) levels and body temperature
- ❖ Engorging parts of the body when needed, for example, a penile erection as a response to sexual arousal

Another important function of the blood is its protective action against disease. White blood cells defend the body against infections, foreign materials, and abnormal cells.

The platelets in blood enable the clotting, or coagulation, of blood. When bleeding occurs, the platelets group together to create a clot. The clot becomes a scab and stops the bleeding, as well as helping to protect the wound from infection. Ischemia or ischaemia is a restriction in blood supply to tissues, causing a shortage of oxygen that is needed for cellular metabolism. Ischemia is generally caused by problems with blood vessels, with resultant damage to or dysfunction of tissue. It also means local anemia in a given part of a body sometimes resulting from constriction.

Ischemia comprises not only insufficiency of oxygen, but also reduced availability of nutrients and inadequate removal of metabolic wastes. Ischemia can be partial or total.

WHAT IS COVID-19?

Coronavirus disease (COVID-19) is an infectious disease caused by a new virus.

The disease causes respiratory illness (like the flu) with symptoms such as a cough, fever, and in more severe cases, difficulty breathing. You can protect yourself by washing your hands frequently, avoiding touching your face, and avoiding close contact (1 meter or 3 feet) with people who are unwell. Coronavirus disease spreads primarily through contact with an infected person when they cough or sneeze. It also spreads when a person touches a surface or object that has the virus on it, then touches their eyes, nose, or mouth. Cases of Covid-19 first emerged in late 2019, when a mysterious illness was reported in Wuhan, China. The cause of the disease was soon confirmed as a new kind of coronavirus, and the infection has since spread to many countries around the world and become a pandemic.

On 11 February the World Health Organization announced that the official name would be covid-19, a shortened version of coronavirus disease 2019. The WHO refers to the specific virus that causes this disease as the covid-19 virus.

This is not the formal name for the virus – the International Committee on Taxonomy of Viruses calls it the “severe acute respiratory syndrome coronavirus 2”, or SARS-CoV-2, because it is related to the virus that caused the SARS outbreak in 2003. However, to avoid confusion with SARS the WHO calls it the covid-19 virus when communicating with the public.

Early in the outbreak, the virus was called 2019-nCoV by the WHO. The virus is also often referred to as the novel coronavirus, 2019 coronavirus or just the coronavirus.

SYMPTOMS OF COVID-19

Signs and symptoms of COVID-19 may appear two to 14 days after exposure and can include:

- ❖ Fever
- ❖ Cough
- ❖ Shortness of breath or difficulty breathing
- ❖ Tiredness
- ❖ Aches
- ❖ Runny nose
- ❖ Sore throat
- ❖ Headache
- ❖ Diarrhea
- ❖ Vomiting

Some people have experienced the loss of smell or taste.

The severity of COVID-19 symptoms can range from very mild to severe. Some people may have no symptoms at all. People who are older or who have existing chronic medical conditions, such as heart disease, lung disease or diabetes, or who have compromised immune systems may be at higher risk of serious illness. This is similar to what is seen with other respiratory illnesses, such as influenza.

PREVENTION

- ❖ Avoid large events and mass gatherings.
- ❖ Avoid close contact (within about 6 feet, or 2 meters) with anyone who is sick or has symptoms.
- ❖ Keep distance between yourself and others if COVID-19 is spreading in your community, especially if you have a higher risk of serious illness.
- ❖ Wash your hands often with soap and water for at least 20 seconds, or use an alcohol-based hand sanitizer that contains at least 60% alcohol.
- ❖ Cover your mouth and nose with your elbow or a tissue when you cough or sneeze. Throw away the used tissue.
- ❖ Avoid touching your eyes, nose and mouth.
- ❖ Avoid sharing dishes, glasses, bedding and other household items if you're sick.
- ❖ Clean and disinfect high-touch surfaces daily.
- ❖ Stay home from work, school and public areas if you're sick, unless you're going to get medical care. Avoid taking public transportation if you're sick

TREATMENT

Although there's no specific treatment or vaccine for the virus, the symptoms of the infected people are treated.

Symptoms of symptomatic positive people are being treated, asymptomatic positive persons are isolated and given proper ventilation while asymptomatic negative persons are advised to isolate themselves in their homes.

If Vasculature is a network of blood vessels connecting the heart with all other organs and tissues in the body then when a person has the virus in them, it can be transferred from the lung to the heart which can result to death but if the person has a good immune system that is able to produce enough lymphocytes which is able to fight viruses and bacteria and there is enough supply of blood around the body then such person should be able to survive the virus.

So it is advisable to eat good food which contains all classes of food to be able to boost the immune system so as to be able to fight any virus that comes into the body. There is no specific medicine to prevent or treat coronavirus disease (COVID-19) . People may need supportive care to

help them breathe.

2. Subsartorial Canal

The subsartorial canal (also called Hunter's canal or adductor canal) is a narrow conical tunnel located in the thigh.

It is approximately 15cm long, extending from the apex of the femoral triangle to the adductor hiatus of the adductor magnus. The canal serves as a **passageway** for structures moving between the anterior thigh and the posterior leg.

BORDERS

The subsartorial canal is bordered by muscular structures;

Anteromedial: Sartorius

Lateral: Vastus medial is

Posterior: Adductor longus and adductor magnus

CONTENTS

The subsartorial canal serves as a passageway for structures moving between the anterior thigh and the posterior leg.

It transmits the femoral artery, femoral vein (posterior to the artery) , nerve to the Vastus medialis and the saphenous nerve-- the largest cutaneous branch of femoral nerve. As the femoral artery and vein exit the canal, they are called popliteal artery an vein respectively.

CLINICAL RELEVANCE

Adductor Canal Block: In the adductor canal block, local anaesthetic is administered in the adductor canal to block the saphenous nerve in isolation, or together with the nerve to the Vastus medialis. The block can be used to provide sensory anaesthetic from procedures involving the distal thigh and femur,knee and lower leg on the medial side. The sartorius and femoral artery are used as anatomical landmarks to locate the saphenous nerve.

3. Extraocular and Intraocular Muscles

The extraocular muscles are located within the orbit, but are extrinsic and separate from the eyeball itself. They act to control the movements of the eyeball and the superior eyelid.

There are seven extraocular muscles- the **levator palpebrae superioris, superior rectus, inferior rectus, medial rectus, lateral rectus, inferior oblique, and superior oblique.**

Functionally, they can be divided into 2 groups;

I. Responsible for eye movement: Recti and Oblique muscles

II. Responsible for superior eye movement: Levator palpebrae Superioris.

LEVATOR PALPEBRAE SUPERIORIS

The LPS is the only muscle involved in raising the superior eyelid. A small portion of this muscle contains a collection of smooth muscle fibres known as superior tarsal muscle.

In contrast to the LPS, the superior tarsal muscle is innervated by the sympathetic nervous system.

ATTACHMENT: Originates from the lesser wing of the sphenoid bone, immediately above the optic foramen. It attaches to the superior tarsal plate of the upper eyelid (a thick plate of connective tissue).

ACTIONS: Elevates the upper eyelid

INNERVATION: The Levator's palpebrae superior is innervated by the oculomotor nerve (CN III). The superior tarsal muscle is innervated by the sympathetic nervous system.

MUSCLES OF EYE MOVEMENT

There six muscles involve control of the eyeball itself. They can be divided into two groups; the four recti muscles and the oblique muscles

RECTI MUSCLES

SUPERIOR RECTUS

ATTACHMENT: Originates from the superior part of the common tendinous ring, and attaches to the superior and anterior aspect of the sclera.

ACTION: Main movement is elevation. Also contributes to the adduction and medial rotation of the eyeball.

INNERVATION: Oculomotor nerve (CN III)

INFERIOR RECTUS

ATTACHMENT: Originates from the inferior part of the common tendinous ring, and attaches to the inferior and anterior aspect of the sclera.

ACTIONS: Main movement is depression. Also contributes to adduction and lateral rotation of the eyeball.

INNERVATION: Oculomotor nerve (CN III)

MEDIAL RECTUS

ATTACHMENT: Originates from the medial part of the common tendinous ring, and attaches to the anteromedial aspect of the sclera.

ACTIONS: Adducts the eyeball

INNERVATION: Oculomotor nerve (CN III)

LATERAL RECTUS

ATTACHMENT: Originates from the lateral part of the common tendinous ring, and attaches to the anterolateral aspect of the sclera.

ACTION: Abducts the eyeball.

INNERVATION: Abducen nerve (CN VI)

OBLIQUE MUSCLES

SUPERIOR OBLIQUE

ATTACHMENT: Originates from the body of the sphenoid bone. Its tendon passes through a trochlear, and then attaches to the sclera of the eye, posterior to the superior rectus.

ACTIONS: Depresses, abducts and medially rotates the eyeball.

INNERVATION: Trochlear nerve (CN IV)

INFERIOR OBLIQUE

ATTACHMENT: Originates from the anterior aspect of the orbital floor. Attaches to the sclera of the eye posterior to the lateral rectus.

ACTION: Elevates, abducts and laterally rotates the eyeball.

INNERVATION: Oculomotor nerve (CN III)

CLINICAL RELEVANCE

CRANIAL NERVE PALSIES

The extraocular muscles are innervated by 3 cranial nerves. Damage to one of the cranial nerve will cause paralysis of it's respective muscle. A lesion of each cranial nerve has its own characteristic appearance

I. Oculomotor nerve (CN III) - A lesion of the nerve affects most of the extraocular muscles. The affected eye is displaced laterally by the lateral rectus and inferiorly by the superior oblique. The eye adopts a position known as 'down and out'.

II. Trochlear nerve (CN IV) - A lesion of CN IV will paralyse the superior oblique muscle. The patient will complain of diplopia (double vision), and may develop a head tilt away from the site of lesion.

III. Abducens nerve (CN VI) - A lesion of CN VI will paralyse the lateral rectus muscle. The affected eye will adduct by resting tone of the medial rectus.

