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***QUESTION 1***

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

***WHAT IS VASCULATURE?***

Vasculature is a network of blood vessels connecting the heart with all other organs and tissues in the body.

The vascular system has a crucial role in bringing oxygen and nutrients to every organ and tissue, and removing waste products through a series of blood vessels. In conjunction with the heart which acts as a pump, it forms the cardiovascular system.

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.

***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 the lymph nodes, where the lymph is filtered. The Tonsils, Adenoids, Spleen and Thymus are all part of the lymphatic system.

The lymphatic vasculature has been regarded as a passive conduit for interstitial fluid and responsible for the absorption of macromolecules such as proteins or lipids and transport of nutrients from food. However, emerging data show that the lymphatic vasculature system plays an important role in immune modulation. One of its major roles is to coordinate antigen transport and immune-cell trafficking from peripheral tissues to secondary lymphoid organs, lymph nodes. This perspective was recently updated with the notion that the interaction between lymphatic endothelial cells and leukocytes controls the immune-cell migration and immune responses by regulating lymphatic flow and various secreted molecules such as chemokines and cytokines.

The lymphatic vasculature system, which has a specialized network of structures to transport tissue fluid and materials such as proteins and lipids to blood vasculature, closely interacts with distinct immune cells for execution of specific functions. For efficient flow from lymphatic capillaries to lymph nodes, LECs interact with myeloid cells in adipose tissue to regulate lymphatic permeability. For an immune reaction, activated immune cells such as DCs and memory T cells can actively or passively migrate from the tissue to lymph nodes through lymphatic vessels.

The lymphatic vasculature system is important for at least three functions;

* It controls the absorbance of nutrients including proteins and lipids from blood vasculature into peripheral tissues. Moreover, other small molecules such as cytokines and chemokines of interstitial fluids are transported through the lymphatic vessels.
* Lymphatic vessels are used as a route of immune cell trafficking from peripheral tissues into lymph nodes. Lymphocytes and dendritic cells that have encountered foreign antigens can access the lymphatic capillaries dependent on chemokine gradients.
* The lymphatic vasculature system maintains the homeostasis of tissue fluid by regulating lymph transport.

***WHAT IS COVID-19?***

SARS-CoV-2 virus popularly known as coronavirus. Coronaviruses are positive-sense, single-stranded RNA viruses of the family Coronaviridae subfamily Coronavirinae that infect a wide range to produce diseases ranging from common cold to severe/fatal illnesses. Coronavirus disease (COVID-19) is an infectious disease caused by a new virus.

When the disease is contracted, it usually causes

* Respiratory illnesses so the lungs are usually affected first.
* Early symptoms include fever, shortness of breath and cough. These appear as soon as 2 days or as long as 14 days after exposure to the virus.
* Damage can also occur to other parts of the, especially during serious illness.
* Parts of the body that can also be affected asides the Lungs include the stomach and intestines, the heart and blood vessels, liver and kidneys and majority of these sum up to form the body’s immune system.

Now with any infection, the body’s immune system responds by attacking the foreign virus or bacteria. While this immune response can rid the body of the infection, it can also sometimes cause collateral damage in the body.

This can come in form of an intense inflammatory response, sometimes called a “cytokine storm.” The immune cells produce cytokines to fight infections, but if too many are released, it can cause problems in the body .

“A lot of (the damage in the body during COVID-19) is due to what we call a sepsis syndrome, which is due to complex immune reaction.” “The infection itself can generate an intense inflammatory response in the body that can affect the function of multiple organ systems.”

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.

***QUESTION 2***

***SUBSARTORIAL CANAL IS AN IMPORTANT AREA IN THE LOWER LIMB, DICUSS.***

Subsartorial canal is also known as adductor canal or Hunter’s canal.

The **subsartorial canal** (**hunter’s, adductor canal**) is an aponeurotic tunnel in the middle third of the thigh extending from the apex of the femoral triangle to the opening in the adductor magnus the adductor hiatus. It is 15cm long and serves as a passageway for structures moving between the anterior thigh and posterior leg.

***STRUCTURE***

***BOUNDARIES OF SUBSARTORIAL CANAL***

The subsartorial canal is bordered by muscular structures:

* **Anterior:** Sartorius
* **Lateral**: Vastus medialis
* **Posterior**: Adductor longus and adductor mangus

The apex of the adductor canal is marked by the adductor hiatus – a gap between the adductor and harmstring attachments of the adductor magnus.

It is covered in by a strong aponeurosis, the anteromedial intermuscular septum (subsartorial fascia) which extends from the vastus medialis, across the femoral vessels to the adductor longus and adductor magnus. Lying on the aponeurosis is the sartorius (tailor's) muscle.

***CONTENT***

The canal contains the following:

* Femoral artery,
* Femoral vein,
* Branches of the femoral nerve (specifically, the saphenous nerve, and the nerve to the vastus medialis).

It consists of three foramina: superior, anterior and inferior.

The femoral artery with its vein and the saphenous nerve enter this canal through the superior foramen. Then, the saphenous nerve and artery and vein of genus descendens exit through the anterior foramen, piercing the vastoadductor intermuscular septum. Finally, the femoral artery and vein exit via the inferior foramen (usually called the hiatus) through the inferior space between the oblique and medial heads of adductor magnus.

***CLINICAL RELEVANCE***

***SUBSARTORIAL CANAL BLOCK***

In the subsartorial 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 anaesthesia for 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.

***SUBSARTORIAL COMPRESSION SYNDROME***

Subsartorial canal compression syndrome describes entrapment of the neurovascular bundle within the subsartorial canal. A rare condition, it is usually caused by hypertrophy of adjacent muscles such as vastus medialis. It is most common in young males, who may present with claudication symptoms due to femoral artery occlusion (more common) or neurological symptoms due to entrapment of the saphenous nerve.

***QUESTION 3***

***DESCRIBE THE EXTRAOCULAR AND INTRAOCULAR MUSCLES WITH THEIR NERVE SUPPLY***

The **extraocular muscles** are the six muscles that control movement of the eye and one muscle that controls eyelid elevation (levator palpebrae). The actions of the six muscles responsible for eye movement depend on the position of the eye at the time of muscle contraction.

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 two groups:

* **Responsible for eye movement**– Recti and oblique muscles.
* **Responsible for superior eyelid movement**– Levator palpebrae superioris.

**Levator palpebrae Superioris**

**The levator palpebrae superioris (LPS) is the only muscle involved in raising the superior eyelid. A small portion of this muscle contains a collection of smooth muscle fibre known as the superior tarsal muscle. In contrast to the LPS, the superior tarsal is innervated by the sympathetic nervous system.**

* **Atttachments:** originates from the lesser wing of the sphenoid bone, immediately above the optic foramen. It attaches to the superior tarsal plate of the eyelid(a thick plate of connective tissue.
* **Actions:** elevates the upper eyelid.
* **Innervation**: the levator palpebrae superioris is innervated by the oculomotor nerve (CN111). The superior tarsal muscle (located within the LPS) is innervated by the sympathetic nervous system.

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

### *Recti Muscles*

There are four recti muscles; superior rectus, inferior rectus, medial rectus and lateral rectus.

These muscles characteristically originate from the **common tendinous ring**. This is a ring of fibrous tissue, which surrounds the optic canal at the back of the orbit. From their origin, the muscles pass anteriorly to attach to the sclera of the eyeball.

The name recti is derived from the **latin** for ‘straight’ – this represents the fact that the recti muscles have a direct path from origin to attachment. This is in contrast with the oblique eye muscles, which have an angular approach to the eyeball.

***Superior Rectus***

* **Attachments**: Originates from the superior part of the common tendinous ring, and attaches to the superior and anterior aspect of the sclera.
* **Actions**: Main movement is elevation. Also contributes to adduction and medial rotation of the eyeball.
* **Innervation**: oculomotor nerve(CN III).

***Inferior Rectus***

* **Attachments**: 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***

* **Attachments**: 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***

* **Attachments**: Originates from the lateral part of the common tendinous ring, and attaches to the anterolateral aspect of the sclera.
* **Actions**: Abducts the eyeball.
* **Innervation**: Abducens nerve (CN VI).

### *Oblique Muscles*

There are two oblique muscles – the superior and inferior obliques. Unlike the recti group of muscles, they do not originate from the common tendinous ring.

From their origin, the oblique muscles take an **angular** approach to the eyeball (in contrast to the straight approach of the recti muscles). They attach to the posterior surface of the sclera.

***Superior Oblique***

* **Attachments**: 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***

* **Attachments**: Originates from the anterior aspect of the orbital floor. Attaches to the sclera of the eye, posterior to the lateral rectus
* **Actions**: Elevates, abducts and laterally rotates the eyeball.
* **Innervation**: Oculomotor nerve(CN III).

***INTRAOCULAR MUSCLE***

The intraocular muscles, which are responsible for pupil accommodation and reaction to light; and the protractor and retractors of the eyelids. Deficits in the muscles or the nerves innervating these muscles can result in functional impairment of the involved structures.

The **intraocular muscles** include the

* ciliary muscle
* sphincter pupillae
* dilator pupillae

The ciliary muscle is a smooth muscle ring that controls accommodation by altering the shape of the lens, as well as controlling the flow of aqueous humor into Schlemm's canal. The ciliary muscle is attached to the zonular fibers which suspend the lens. Upon contraction of the ciliary muscle, the tension on the lens is lessened which causes it to adopt a more spherical shape to focus on near objects. Relaxation of the ciliary muscle has the opposite effect, optimising distant focus. The sphincter pupillae and dilator pupillae are also composed of smooth muscle. The sphincter pupillae encircles the pupil and is responsible for the constriction of its diameter, while the dilator muscle is arranged radially and increases the pupillary diameter.

The ophthalmic nerve (CN V: V1) branches into the frontal, nasociliary, and lacrimal nerves. The ciliary ganglion is made up of postsynaptic parasympathetic nerve cell bodies associated with the ophthalmic nerve. The short ciliary nerves originate from the ciliary ganglion and carry parasympathetic and sympathetic fibers to the iris and ciliary body. The long ciliary nerves branch off of the nasociliary nerve and carry postsynaptic sympathetic fibers to the dilator pupillae and afferent fibers from the cornea and iris. The sphincter pupillae is parasympathetically-stimulated while the dilator pupillae is sympathetically-stimulated.