1. Describe the importance of vasculature in relation to immune system and outbreak of Pandemic Covid-19 on the human body.

The immune system is the body’s multi-level defense network against potentially harmful bacteria, viruses and other organisms. The coronavirus pandemic has turned the world’s attention to the immune system, the body’s defense force against disease-causing bacteria, viruses and other organisms that we touch, ingest and inhale every day. The vascular endothelial cells (ECs) line the inner surface of blood vessels, **providing a critical barrier between the vasculature and organ systems.** ECs represent an important target for infection of most human viruses like Covid-19.Infection of the endothelium has profound implications for both the virus and the host. For the virus, infection of ECs can provide a gateway for dissemination to organs and a reservoir for long-term persistence. For the host, virus replication and the ensuing immune response at the endothelium increases tissue permeability and inflammation contributing to vascular and pulmonary disease and to the security of the viral diseases.

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes disease 2019 (COVID-19) has reached a pandemic level. Coronavirus are known to affect the cardiovascular system. When the virus enters your body it binds to two cells in the lungs – **goblet** cells that produce mucus and **cilia** cells which have hairs on them and normally prevent your lungs filling up with debris and fluid such as virus and bacteria and particles of dust and pollen. This virus attacks these cells and starts to kill them – so the lungs begin to fill up with fluid making it hard to breathe. This phase of the disease is thought to last about a week. At this point, **the immune** **system** starts to kick in and fight off the invaders. Fever develops and high body temperature will create a hostile environment for the virus. Coughing and a runny nose is a form of getting rid of the mucus. But in some people – particularly the elderly and those with other health conditions – the immune system can go into overdrive. As well as killing the virus, it starts to kill healthy cells. This heightened immune response can trigger a “cytokine storm” – white blood cells activate a variety of chemicals that can leak into the lungs, which along with the attack on the cells damages them even further. Scans of the lungs show “ground-glass” opacity and then “crazy paving” patterns, as they fill up with mucus making it harder and harder to breathe.

Normally when the body gets an infection, chemicals are released into the bloodstream to fight the infection. Sometimes, though, the body creates an overwhelming response to an infection, and the chemicals released into the bloodstream can cause inflammation throughout the body. This reaction is called ***sepsis.*** The inflammation can cause blood clots and leaky blood vessels. The poor blood flow can then cause damage to multiple organ systems, and can even cause them to fail.

2. Subsatorial canal is an important area in the lower limb, Discuss.

The subsatorial canal (also known as the adductor canal or the Hunter’s canal) is a narrow conical tunnel located in the thigh. It is an apponeurotic tunnel in the middle third of the thigh, extending from the apex to the femoral triangle to the opening in the Adductor Magnus, the adductor hiatus. Lying on the aponeurosis is the Sartorius (tailor’s) muscle.

The canal serves as a passageway for structures moving between the anterior thigh and 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 the femoral nerve. As the femoral artery and vein exit the canal, they are called the popliteal artery and vein respectively.

3. Describe the Extraocular and Intraocular Muscles with their nerve supply

**Extraocular 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:

1. The Levator Palpebrae Superioris (LPS)

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)

Action: Elevates the upper eyelid.

Innervation: The LPS is innervated the oculomotor nerve (CN III). The superior tarsal muscle (located within the LPS) is innervated by the sympathetic nervous system.

1. Inferior Rectus

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

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

Innervation: Oculomotor nerve (CN III)

1. 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 adduction and medial rotation of the eyeball.

Innervation: Oculomotor nerve (CN III)

1. Medial Rectus

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

Action: Adducts the eyeball.

Innervation: Oculomotor nerve (CN III)

1. 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: Abducens nerve (CN VI)

1. Inferior Oblique

Attachment: Originates from the anterior aspect of the eye, posterior to the lateral rectus.

Action: Elevates, adducts and laterally rotates the eyeball.

Innervation: Oculomotor nerve (CN III)

1. Superior Oblique

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

Action: Depresses, abducts and medially rotates the eyeball.

Innervation: Trochlear nerve (CN IV)

**Intraocular Muscles**

Intraocular muscles are responsible for pupil accommodation and reaction to light. They change the shape of lens and size of pupil. There are three intraocular muscles:

1. Ciliary muscle

Attachment: The 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 adapt a more spherical shape to focus on near objects. Relaxation of the ciliary muscle has the opposite effect, optimizing distant focus.

Action: A smooth muscle ring that controls accommodation by altering the shape of lens, as well as controlling the flow of aqueous humor into schlemm’s canal.

Innervation: Oculomotor nerve (CN III) – Parasympathetic postganglionic myelinated nerve fibres from the ciliary ganglion.

1. Sphincter Pupillae

Origin and Insertion: Pupillary margin of iris.

Action: A smooth muscle that encircles the pupil and is responsible for the constriction of its diameter (miosis).

Innervation: Oculomotor nerve (CN III) – Parasympathetic fibres of oculomotor nerve via short ciliary nerves.

1. Dilator Muscle

Origin: Outer margins of iris.

Insertion: Inner margins of iris.

Action: A smooth muscle that dilates the pupil – increases the pupillary diameter (midriasis).

Innervation: Oculomotor nerve (CN III) – Sympathetic postganglionic nerves arising from the superior ciliary ganglion.