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COURSE: GROSS ANATOMY

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

**ANSWER**

**IMMUNE SYSTEM:** The bodily system that protects the body from foreign substances, cells, and tissues by producing the immune response and that includes especially the thymus, spleen, lymph nodes, special deposits of lymphoid tissue (as in the gastrointestinal tract and bone marrow), macrophages, lymphocytes including the B cells and T cells, and antibodies.

The **immune system** is made **up** of special organs, cells and chemicals that fight infection (microbes). The main parts of the **immune system** are: white blood cells, antibodies, the complement **system**, the lymphatic **system**, the spleen, the thymus, and the bone marrow.

The pandemic “COVID-19” also known as corona virus, has only one way to fully infect a human being. This virus is considered very viral and deadly because it attacks the weaker immune systems.

This virus attaches itself to a host through a receptor called Angiotensin-converting enzyme 2(ACE2)this is an enzyme attached to the outer surface (cell membrane) of cells in the lungs, arteries, heart, kidney and intestines. ACE2 lowers blood pressure by catalyzing the cleavage of angiotensin, infection is triggered by binding of the spike protein of the virus to ACE2, which is highly expressed in the heart and lungs, SARS-CoV-2 mainly invades alveolar epithelial cells, resulting in respiratory symptoms. This is the reason why patients who are positive to the virus often have symptoms related to the lungs and heart. The virus became a pandemic because of its mode of transmission from person to person because its highly concentrated in the lungs and its channels to the mouth and nostrils so each cough or sneeze can expose the virus into the air, if inhaled by a healthy victim, the virus will go directly to the lungs where the infection takes place.

Until a vaccine is developed, the immune system will have to adapt unaided to fight off the virus. Although a healthy lifestyle helps ones immune system to tackle pathogens.( like; not smoking, reducing alcohol intake to the minimum, eating healthy, exercising and avoiding touching our faces, nose, ears and eyes with unwashed hands).

**Question 2: Subsartorial canal is an important area in the lower limb, Discuss.**

**Answer**

The **adductor canal** (subsartorial canal) is a narrow conical tunnel located in the thigh. It is approximately 15cm long, extending from the apex of the [femoral triangle](http://teachmeanatomy.info/lower-limb/areas/the-femoral-triangle/) to the adductor hiatus of the adductor magnus. The canal serves as a **passageway** from structures moving between the anterior thigh and posterior leg.

The adductor canal is bordered by muscular structures:

* **Anteromedial:** Sartorius.
* **Lateral**: Vastusmedialis.
* **Posterior**: Adductor longus and adductor magnus.

The adductor canal runs from the apex of the femoral triangle to the **adductor hiatus**- a gap between the adductor and hamstring attachments of the adductor magnus muscle .The adductor 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 vastusmedialis 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.

**Question 3: Describe the Extraocular and intraocular Muscles with their nerve supply.**

**Answer**

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 levatorpalpebraesuperioris, 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 - Levatorpalpebraesuperioris.

**Levatorpalpebraesuperioris**

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

Attachments: Originates from the lesser wing of the [sphenoid](http://teachmeanatomy.info/head/osteology/sphenoid-bone/) 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 levatorpalpebraesuperioris is innervated by the [oculomotor nerve](http://teachmeanatomy.info/head/cranial-nerves/oculomotor/) (CN III). The superior tarsal muscle (located within the LPS) is innervated by the sympathetic nervous system.

**Muscles of Eye Movement**

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](http://teachmeanatomy.info/head/organs/eye/bony-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: [Oculomotornerve](http://teachmeanatomy.info/head/cranial-nerves/oculomotor/)(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: [Oculomotornerve](http://teachmeanatomy.info/head/cranial-nerves/oculomotor/)(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](http://teachmeanatomy.info/head/cranial-nerves/oculomotor/) (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](http://teachmeanatomy.info/head/cranial-nerves/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](http://teachmeanatomy.info/head/osteology/sphenoid-bone/)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](http://teachmeanatomy.info/head/cranial-nerves/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](http://teachmeanatomy.info/head/cranial-nerves/oculomotor/) (CN III)

The intraocular muscles include the ciliary muscle, the sphincter pupillae, and the 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.

There are three primary axes of ocular movements: vertical, transverse, and anteroposterior. Rotation around the vertical axis results in either adduction (medial movement) or abduction (lateral movement) of the eye. Rotation around the transverse axis causes elevation (superior motion) or depression (inferior motion). The anteroposterior axis enables movement of the superior pole of the eye medially (intorsion) or laterally (extorsion). The rotations around the anteroposterior axis allow the eye to adjust to tilting of the head. The medial rectus muscle is responsible for medial rotation around the vertical axis, and the lateral rectus lateral rotation. The superior rectus muscle primarily elevates the eye and contributes to adduction and intorsion. The inferior rectus depresses and laterally rotates the eye and contributes to adduction and extorsion. The superior oblique abducts, depresses, and medially rotates the eye, while the inferior oblique abducts, elevates, and laterally rotates the eye.

The primary retractor of the upper eyelid is the levator palpebrae superioris, which is a skeletal muscle. The superior tarsal muscle (Müller's muscle) is comprised of smooth muscle and also contributes to the elevation of the upper eyelid. In the lower eyelid, the retractors are the capsulopalpebral fascia and the inferior tarsal muscle. The orbicularis oculi is the main protractor (closure) of the eyelids. It is a flat, ringlike band of skeletal muscle surrounding the anterior orbit composed of three parts: the orbital portion, the palpebral portion, and the lacrimal portion.