1. **Importance of Vasculature in relation to Immune system and outbreak of pandemic Covid-19 on the human body.**

The coronavirus is like any other virus, not much more than a shell around genetic material and a few proteins. To replicate, it needs a host in the form of a living cell. Once infected, this cell does what the virus commands it to do: copy information, assemble it, and release it.

But before the war at the cellular level, the virus slips into the body, navigating past defenses in the mucus that gathers in the nose and throats, on the hunt for cells it can comand. At the same time it is trying to disguise its presence to avoid tripping the chemical alarm system of the immune system. In particular Sars-CoV-2 attacks the lungs, an especially sensitive battleground. Also, as the immune system tries to fight a virus that it has never before encountered, it can go into overdrive, causing excessive damage to adjoining cells and tissues.

But this does not go unnoticed. Within a few minutes, the body's immune defense system intervenes with its innate response: Granulocytes, scavenger cells and killer cells from the blood and lymphatic system stream in to fight the virus. They are supported by numerous plasma proteins that either act as messengers or help to destroy the virus.

For many viruses and bacteria, this initial activity of the immune system is already sufficient to fight an intruder. It often happens very quickly and efficiently. We often notice only small signs that the system is working: We have a cold, a fever.

Interferons are a subgroup of signaling proteins that are normally secreted by infected cells. SARS-CoV-1, which was responsible for the SARS epidemic in 2003, appears to have suppressed the production of one of these interferons and thus at least delayed the attraction of immune cells. To what extent this is also the case with SARS-CoV-2, the name given to the coronavirus behind the current pandemic, is still unclear. However, interferons support the body's own virus defense and are now being tested as a therapy in clinical trials.

At a certain point, however, the host response is so strong that its effect can be counterproductive. For example, numerous immune cells can enter our lungs and cause the membrane through which oxygen normally passes from the air into the blood to thicken. The exchange of gases is restricted, and in the worst case, ventilation may be necessary.

Sometimes the reaction can overshoot and be directed against healthy cells as well. This could also be the case with the novel coronavirus. So drugs are also being tested that suppress an excessive immune reaction and that are already known from the treatment of autoimmune diseases. The balance between protective and overly aggressive immune processes in dealing with the coronavirus is currently a big mystery.

After a time delay, the acquired immune system finally sets itself in motion. It is different for every person and depends on what we have experienced and with which pathogens we have come into contact. While T cells help destroy infected cells, B cells form antibodies that can keep the virus in check.In the case of the coronavirus, these are neutralizing antibodies that bind to the spike protein of the virus. This is the site of attack of the virus, with which it enters the host, i.e. our human cell. Neutralizing antibodies specifically incapacitate the spike protein. Our immune system remembers the antibodies it has produced and is thus prepared for a new infection with the same intruder.

"The virus is so new that nobody has a reasonable immune response," says the immunologist. He believes that lifelong immunity is unlikely. This "privilege" is reserved for viruses that remain in the body for a long time and give our immune system a virtually permanent opportunity to get to know it. Since the coronavirus is an RNA (and not a DNA) virus, it cannot permanently settle in the body, says Horauf.

2. **THE SUBSARTORIAL CANAL**

The Subsartorial 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 the 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 sapheneous 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.

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 satrtorius and femoral artery are used ad anatomical landmarks to locate the saphenous nerve.

3. **EXTRAOCULAR MUSCLE AND ITS NERVE**

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. The extraocular muscles, including the levator palpebrae superioris,

are derivatives of periocular mesenchyme. Five of the six extraocular muscles originate at the Annulus of Zinn (a tendinous ring), while the inferior oblique originates on the orbital portion of the bony maxilla. Three patriotic somites found anterior to the developing ear of the embryo are responsible for the development of the extraocular muscles. These three sometimes correspond with the distribution of cranial nerves III, IV, and VI.

The orbicularis oculi is derived from mesenchyme of the second pharyngeal arch, and forms from mesoderm of the 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:

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

Upgaze, or turning the eye upward, is primarily the work of the superior rectus muscle, with some contribution by the inferior oblique muscle.

Downgaze, or turning the eye downward, is primarily the work of the inferior rectus, with some contribution by the superior oblique.

Abduction, or turning the eye outward toward the ear, is primarily done by the lateral rectus.

Adduction, or turning the eye inward toward the nose, is primarily done by the medial rectus.

The eye is rotated medially by the superior rectus and superior oblique, and is rotated laterally by the inferior rectus and inferior oblique. In addition, the levator palpebrae superioris muscle, which is not seen on the drawing, elevates the eyelid.

The extraocular muscles are innervated by three cranial nerves (CN), CN III (oculomotor nerve), CN IV (trochlear nerve), and CN VI (abducens nerve). The relationship between the cranial nerve nuclei in the brainstem, the cranial nerves,

CN VI and IV are fairly straightforward. The paired right and left CN VI arise from the pons in the midbrain, and send their axons into the orbits to innervate the right and left lateral rectus muscles, respectively. Therefore, CN VI is responsible for abducting each eye (turning it to look laterally or toward the ear). The paired right and left trochlear nuclei are in the midbrain. Their axons, which make up CN IV, exit the midbrain, cross the midline, and send their axons into the orbits to innervate the left and right superior oblique muscles, respectively. Therefore, CN IV is primarily responsible for turning each eye downward when it is already looking inward toward the nose.

CN III is a bit more complicated, as it innervates all of the remaining extraocular muscles. Therefore, each oculomotor nucleus is actually made up of overlapping subnuclei, and each subnucleus sends its axons to innervate a specific extraocular muscle. The right and left oculomotor nuclei are located in the midbrain. The axons from the right or left nucleus leave the midbrain and come together to form the body of the right or left CN III. As the nerve enters the orbit, it splits into the superior branch of CN III and the inferior branch of CN III. The superior branch of CN III innervates the superior rectus and the levetor palpebrae superioris. The lower branch innervates the medial rectus, inferior rectus, and inferior oblique.

B.) **INTRAOCULAR MUSCLE**

The muscles of the eye are integral to its function and motion. Muscles directly associated with the eye include 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, 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 ciliary muscle and both pupillary muscles are cranial neural crest derivatives and develop from mesenchyme of the choroid.
The majority of the blood supply to the orbit is supplied by the ophthalmic artery which branches off of the internal carotid artery. A branch of the external carotid artery, the infra-orbital artery, also contributes blood supply to the orbital floor. Branches of the ophthalmic artery include the central retinal, supra-orbital, supratrochlear, lacrimal, dorsal nasal, short posterior ciliary, long posterior ciliary, posterior ethmoidal, anterior ethmoidal, and anterior ciliary (off of the muscular branches of the ophthalmic artery)

arteries. Except for the central retinal artery and the ciliary arteries, which supply intraocular structures, these branches, as well as the infra-orbital artery off of the external carotid, all contribute to the vascular supply of the extraocular muscles and structures. The superior and inferior ophthalmic veins are responsible for venous drainage of the orbit.

The existence and location of orbital and eyelid lympathic are a current area of ongoing research and debate.

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.

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