Gross Anatomy Assignment

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1. THE EXTRAOCULAR AND INTRAOCULAR MUSCLES

**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 which include; 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:

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

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](https://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.

The extraocular muscles and their nerve supply.

1. **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 fibers known as the superior tarsal muscle. In contrast to the LPS, the superior tarsal muscle is innervated by the sympathetic nervous system.

**Innervation**: The levator palpebrae superioris is innervated by the [**oculomotor nerve**](https://teachmeanatomy.info/head/cranial-nerves/oculomotor/)**(CN III).** The superior tarsal muscle (located within the LPS) is innervated by the sympathetic nervous system.

1. **Superior Rectus**: This muscle is in control of the eyeball itself.
* **Innervation: Oculomotor nerve (CN III).**
1. **Inferior Rectus**: This is one of the recti muscles which controls the eyeball itself.
* **Innervation: Oculomotor nerve (CN III).**
1. **Medial Rectus.**
* **Innervation: Oculomotor nerve (CN III).**

### 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](https://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**](https://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**](https://teachmeanatomy.info/head/cranial-nerves/oculomotor/)**(CN III).**

**Intraocular muscles:**

These muscles are responsible for pupil accommodation and reaction to light; and the protractor and retractors of the eyelids. 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, optimizing 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. They include;

1. Vertical: rotation here causes adduction (medial movement), or abduction (lateral movement).
2. Transverse: Rotation here causes elevation or depression.
3. Anteroposterior: This movement allows the eye to adjust to tilting of the head.

**Nerve supply**:

The extraocular muscles are innervated by nerves that enter the orbit through the superior orbital fissure. The oculomotor nerve (CN III) divides into superior and inferior branches and innervates the superior, medial, and inferior recti, the levator palpebrae superioris, and the inferior oblique. It also carries presynaptic parasympathetic fibers to the ciliary ganglion. Sympathetic fibers of CN III contribute to upper eyelid retraction by innervation of the superior tarsal muscle (Müller's muscle). The trochlear nerve (CN IV) innervates the superior oblique, and the lateral rectus is innervated by the abduces nerve (CN VI). The orbicularis oculi is innervated by the temporal and zygomatic branches of the facial nerve (CN VII).

The ophthalmic nerve (CN V: VI) 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.

1. **Importance of the Sub sartorial canal to the Lower limb**:

The sub sartorial canal (adductor canal, Hunter’s canal) is a narrow conical tunnel located in the thigh. It is approximately 15cm long, extending from the apex of the [femoral triangle](https://teachmeanatomy.info/lower-limb/areas/the-femoral-triangle/) to the adductor hiatus of the adductor magnus. The adductor canal is a narrow fascial tunnel in the thigh, providing an intramuscular passage through which the [femoral artery and vein](https://www.sciencedirect.com/topics/medicine-and-dentistry/femoral-vein) pass into the popliteal fossa of the knee. As the femoral artery and vein exit the canal, they are called the **popliteal artery** and **vein** respectively. The popliteal artery provides numerous branches of blood supply to the structures of the knee and the lower extremities. Since this artery supplies knee down to the toe, it is very necessary for the lower extremities to keep functioning as it should. If long term pressure is applied on the popliteal artery, it can cause it to narrow causing pain and cramping. In severe cases, the nerves and the muscles in the leg become damaged. This shows that the sub sartorial canal (adductor canal) is an important area of the lower limb because without this area, there wouldn’t be any passage for the femoral artery and vein.

1. The Importance of Vasculature in relation to immune system and out-break of pandemic COVID-19 on human body.

People being infected with COVID-19 can have different experiences. Some show only symptoms of mild cold. The immune system plays a critical role in whether you recover from the virus or die from it. Most coronavirus deaths are due to the immune system going haywire in its response, not damage caused by the virus itself. When you first become infected, your body launches its standard innate immune defense like it would for any virus. This involves the release of proteins called interferons that interfere with the virus’s ability to replicate inside the body’s cells. The goal of the innate immune defense is to contain the virus and prevent it from replicating too widely so that the second wave of the immune system: the adaptive, or virus-specific response, has enough time to kick in before things get out of hand. The adaptive immune response consists of virus-specific antibodies and T cells that the body develops that can recognize and more quickly destroy the virus. These antibodies are also what provide immunity and protect people from becoming re-infected with the virus after they’ve already had it. The blood plasma houses antibodies. Antibodies are proteins that the body’s white blood cell produces to fight an infection. They bind to a virus preventing it from infecting a cell. This is really important in fighting COVID 19.