**Name: Adesoye Raheemat Olamide**

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

Blood vessels form a closed circulatory system, whereas lymphatic vessels form a one-way conduit for tissue fluid and leukocytes. In most vertebrates, the main function of lymphatic vessels is to collect excess protein-rich fluid that has extravasated from blood vessels and transport it back into the blood circulation. Lymphatic vessels have an important immune surveillance function, as they import various antigens and activated antigen-presenting cells into the lymph nodes and export immune effector cells and humoral response factors into the blood circulation. Defects in lymphatic function can lead to lymph accumulation in tissues, dampened immune responses, connective tissue and fat accumulation, and tissue swelling known as lymphedema. This review highlights the most recent developments in lymphatic biology and how the lymphatic system contributes to the pathogenesis of various diseases involving immune and inflammatory responses

The adult heart responds to tissue injury by synthesizing an ensemble of proteins that promote homeostasis, either by activating mechanisms that facilitate tissue repair or, alternatively, by upregulating mechanisms that confer cytoprotective responses within the heart. The extant literature suggests that proinflammatory cytokines serve as the downstream “effectors” of the innate immune system by facilitating tissue repair within the heart

**Effect of Corona on the body**

For most, the disease is mild, but some people die.

So how is the virus attacking the body, why are some people being killed and how is it treated?

## Incubation period

This is when the virus is establishing itself.

Viruses work by getting inside the cells your body is made of and then hijacking them.

The coronavirus, officially called Sars-CoV-2, can invade your body when you breathe it in (after someone coughs nearby) or you touch a contaminated surface and then your face.

It first infects the cells lining your throat, airways and lungs and turns them into "coronavirus factories" that spew out huge numbers of new viruses that go on to infect yet more cells.

At this early stage, you will not be sick and some people may never develop symptoms.

The incubation period, the time between infection and first symptoms appearing, varies widely, but is five days on average.

## Mild disease

This is all most people will experience.

Covid-19 is a mild infection for eight out of 10 people who get it and the core symptoms are a fever and a cough.

Body aches, sore throat and a headache are all possible, but not guaranteed.

The fever, and generally feeling gritty, is a result of your immune system responding to the infection. It has recognized the virus as a hostile invader and signals to the rest of the body something is wrong by releasing chemicals called cytokines.

These rally the immune system, but also cause the body aches, pain and fever.

The coronavirus cough is initially a dry one (you're not bringing stuff up) and this is probably down to irritation of cells as they become infected by the virus.

Some people will eventually start coughing up sputum - a thick mucus containing dead lung cells killed by the virus.

These symptoms are treated with bed rest, plenty of fluids and paracetamol. You won't need specialist hospital care.

This stage lasts about a week - at which point most recover because their immune system has fought off the virus.

However, some will develop a more serious form of Covid-19.

## Severe disease

If the disease progresses it will be due to the immune system overreacting to the virus.

Those chemical signals to the rest of the body cause inflammation, but this needs to be delicately balanced. Too much inflammation can cause collateral damage throughout the body.

"The virus is triggering an imbalance in the immune response, there's too much inflammation, how it is doing this we don't know," said Dr Nathalie MacDermott, from King's College London.

Inflammation of the lungs is called pneumonia.

If it was possible to travel through your mouth down the windpipe and through the tiny tubes in your lungs, you'd eventually end up in tiny little air sacs.

This is where oxygen moves into the blood and carbon dioxide moves out, but in pneumonia the tiny sacs start to fill with water and can eventually cause shortness of breath and difficulty breathing.

Some people will need a ventilator to help them breathe.

This stage is thought to affect around 14% of people, [**based on data from China**](https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf) .

## Critical disease

It is estimated around 6% of cases become critically ill.

By this point the body is starting to fail and there is a real chance of death.

The problem is the immune system is now spiralling out of control and causing damage throughout the body.

It can lead to septic shock when the blood pressure drops to dangerously low levels and organs stop working properly or fail completely.

Acute respiratory distress syndrome caused by widespread inflammation in the lungs stops the body getting enough oxygen it needs to survive. It can stop the kidneys from cleaning the blood and damage the lining of your intestines.

"The virus sets up such a huge degree of inflammation that you succumb... it becomes multi-organ failure," Dr Bharat Pankhania said.

And if the immune system cannot get on top of the virus, then it will eventually spread to every corner of the body where it can cause even more damage.

2. **Subsartorial canal**

The adductor canal (subsartorial or Hunter’s 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.

Importance

a. In the adductor 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.

b. Adductor Canal compression syndrome describes entrapment of the neurovascular bundle within the adductor canal. A rare condition, it is usually caused by hypertrophy of adjacent muscles such as vastus medialis. It is more 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.

3. **The extraocular muscles**

These 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 are 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 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](https://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 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

**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](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.

**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](https://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**: [Oculomotor nerve](https://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](https://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](https://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](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**

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.

Ciliary muscle.

Origin: longitudinal fibres- scleral spur; circular fibres- encircle root of iris

Insertion: longitudinal fibres- ciliary process; circular fibres- encircle root of iris

Innervation: short ciliary from oculomotor nerve through ciliary ganglion sympathetic postganglionic fibres from superior cervical ganglia

Sphincter pupillae

Origin: encircles iris

Insertion: encircles iris

Innervation: short ciliary nerves

Dilator pupillae

Origin: outer margins of iris

Insertion: inner margins of iris

Innervation: long ciliary nerves(sympathetic)