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CLINICAL ANATOMY
EYE ANATOMY BONES OF THE ORBIT ,EYELID ANATOMY, LACRIMAL GLAND ,EYE MUSCLES, EYEBALL SOURCES

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Abstract:
Clinical anatomy of the anterior part of the face: structure, blood supply and innervation of the eye area, eyelids and eyeball. Eyeball: walls, cavity, bulbar and retrobulbar parts. Structure and clinical anatomy of tear apparatus. Clinical and anatomical basis of opening and drainage of phlegmons of the eye area.

Keywords: cornea, Aqueous humor, conjunctiva, iris, pupil, Ciliary body, Crystalline lens, Retina, Optic nerve, Macula, Sclera, Choroid, nerve damage

Introduction

The eyes are essential for our daily experience, since about 70% of information we gather is by seeing. They are placed within the orbits, two cavities in the upper face, in the anterior surface of the head.

Besides the eyes, the orbits host several structures that support the eyeballs, including muscles, vessels, nerves and a gland. The orbits are specifically designed to allow these neurovascular structures to pass through its walls, from the cranium on their way to the face.

Bones of the orbit

The bony orbit is made out of seven bones, which include the maxilla, zygomatic bone, frontal bone, ethmoid bone, lacrimal bone, sphenoid bone and palatine bone. The orbit appears as a pyramid, with its base opening anteriorly onto the face, while the apex is pointed posteromedially. The orbit hosts the eyeballs, extraocular muscles, optic nerve, lacrimal apparatus, fat tissue, fascia and vessels that supply these structures.

The walls of the orbit contain several fissures, openings and fossae which are important for housing the orbital structures, and for neurovascular communication

of the orbital content with the central nervous system. Some of the most important openings are the superior orbital fissure and its downstairs neighbour, the inferior orbital fissure. More about them and all the other landmarks of the orbital bones can be found in the following article and quizzes. Eyelid anatomy

The eyelids are soft tissue structures that cover and protect the anterior surface of the eyeball. The anatomy of the eyelid may seem complex, but if we dissolve its multi-layered structure it is actually quite simple:

Skin

Subcutaneous tissue

Muscle - orbital part of the orbicularis oculi muscle

Orbital septum - extensions of the periosteum from the orbital margin, that extends through both eyelids and supports them;

Tarsus - plates of the dense connective tissue present in both eyelids. Superior tarsus is associated with muscles that raise the upper eyelid.

Conjunctiva - thin membrane that covers the posterior surface of the eyelid and reflects onto the anterior surface of the eyeball.

Our eyes are the precious and important part of our health that work non stop. The eyeball is a bilateral and spherical organ, responsible for vision. Eyeball lies in a bony cavity within the facial skeleton, known as bony orbit. In this blog, we discuss The Human Eye Anatomy.

The dimension of the adult eyeball

Anteroposterior diameter — 24mm

Horizontal diameter — 23.5mm

Vertical diameter — 23mm

Circumference — 75mm

Volume — 6.5ml

Weight — 7gm

Eyeball is divided into two segments, Anterior and posterior segment. Here in this blog post, we are explaining different parts or structures of eyes.

Different parts of eyes

Cornea

The front clear, transparent portion of the eye which transmits and focuses the light rays that enter the eye. This structure does not contain any blood vessels, unlike other tissues in the human body.

It also contributes to preventing foreign bodies from entering the eye. Tears and aqueous humor provides nutrients to the cornea.

Aqueous humor

It is a clear, thin, transparent fluid that is found inside the front portion of the eye which is similar to plasma. This fluid constitutes 99.9% water and other 0.1% of sugar, vitamins, proteins, and others.

It is produced by the ciliary body. So as to work properly, the production must be balanced by drainage at an equal rate. Aqueous humor helps to nourish the cornea and lens as well as it helps to maintain Intraocular pressure(IOP).

Conjunctiva

Conjunctiva is a thin, transparent membrane that covers the white portion of the eye(sclera) and the inner surface of eyelids. It secretes mucus which contributes to the protection and lubrication of our eyes.

It has two portions. Bulbar and palpebral conjunctiva. Bulbar conjunctiva covers the anterior portion of sclera (does not cover cornea), whereas palpebral covers inner surface of both upper and lower eyelids. Protects our eyes from dust and infection causing agents.

Iris

Thin, annular structure, colored portion of the eye which helps to regulate the amount of light entering the eye. It controls the diameter and size of the pupil in various lighting conditions.

In bright light conditions, the iris closes the pupil to send less amount of light while in lower light condition, the iris opens up the pupil to let more light in eyes.

Pupil

The dark aperture or hole which is present in the center of the iris is a pupil. It ranges from 3–7 mm in diameter.It contributes in regulating the amount of light that enters the eye.

Ciliary body

The ciliary body is a circular structure present behind the iris and is made up of ciliary muscles and ciliary processes that are attached to the crystalline lens via zonular fibers.

The ciliary body produces fluid known as aqueous humor. It does contain ciliary muscles which help in accommodation. Changes the shape of the lens while focusing objects at different distances.

Crystalline lens

The transparent bi-convex structure located behind the iris and pupil which helps to refract and bend light rays so as to focus the image on the retina. Lens shape can be altered by the relaxation and contraction of ciliary muscles which helps to focus objects at various distances.

Clouding or opacity of lens is Cataract, which occurs as we age. Cataract interferes with vision and is corrected with surgery and replaced with artificial lenses.

Vitreous Humor

Vitreous is a clear, colorless gel-like substance that fills the space between the lens and the retina of the eye. It comprises a large portion of the eyeball which consists of water, sugar, salt, collagen, and hyaluronic acid.

In children, it is milky and has gel like structure but as we grow older, it becomes clear. Hence light passes and allows us to see. It also contributes in maintaining the shape of the eye.

Retina

The retina is a thin, light-sensitive layer of tissue of the eye lining the back wall inside the eye. It receives the light and converts it into signals, thus transferring those signals to the brain and we can see. There are 10 layers of the retina.

Optic nerve

The optic nerve is also known as the second cranial nerve or simply CN II transmits visual information from the retina to the brain. It is actually a part of both the eye and brain. It transfers impulses formed by the retina to the brain, which interprets them as images.

Macula

The macula is a small central area present in the retina which contains special light-sensitive cells and allows us to see any objects in fine detail. As we age, we can develop macular degeneration which causes vision issues or often leads to vision loss.

Sclera

The white outer portion of the eye is the sclera. It acts as a supporting wall of the eyeball. The sclera, along with the IOP of the eye, maintains the shape of the eyeball. It is continuous with the cornea, the junction between sclera and cornea is limbus.

Basically, sclera forms more than 80% of the surface area of the eyeball, extending from cornea to optic nerve(back of the eye). Tough and fibrous nature of sclera helps to protect eyes from serious conditions like laceration, rupture and so on. It also helps to provide strong attachments for extraocular muscles. These muscles help to control the eyes movement.

Choroid

A vascular layer of the eye present in between the sclera and retina is choroid. It is filled with blood vessels that supply oxygen and nutrients to the eye.

Choroid contributes in maintaining the temperature and volume of the eye. Also supplies the outer retina with nutrients.

The Eye-Brain Connection

The connection between your eyes and brain has significant implications for two other domains related to vision: perception and prediction.

Perception:The eyes and the brain depend on each other to make sight possible. This connection means that vision is not an objective sense. When you look at an object, you do not necessarily see what it really is. Rather, you see what your brain interprets it to be.

Optical illusions are an example of this phenomenon. These images are carefully crafted to trick your brain into thinking it is seeing something that is not actually there. Many people have difficulty perceiving these images objectively even when they know the trick behind the illusion. They cannot alter their brain's interpretation of the image, so they cannot see the real image.

Prediction:The eye-brain connection also helps you to better interpret your environment in poorly lit, busy, or cluttered conditions. When your eyes do not receive enough visual information to form a clear picture of your surroundings, your brain may fill in the gap with predictions based on context and what it has seen before.

The eye's predictive function helps you to draw meaningful conclusions about your environment. For instance, if you see the front wheel of a tricycle peeking out from behind a nearby car, your brain quickly concludes that there is likely an entire tricycle behind the car. Your eyes do not have to see the tricycle for you to know it is there.

Conclusion: In conclusion, During the writing of this article, I realized that doctors and students working in any medical field need to study their field in depth, this is important for them to become an experienced and advanced specialist in their field.

Extraocular Muscles

Table quiz

Superior rectus Origin - superior part of common tendinous ring (anulus of Zinn)
Insertion - anterior half of eyeball superiorly
Innervation - oculomotor nerve (CN III)
Function - elevation, adduction, internal rotation of eyeball

Inferior rectus Origin - inferior part of common tendinous ring (anulus of Zinn)
Insertion - anterior half of eyeball inferiorly
Innervation - oculomotor nerve (CN III)
Function - depression, adduction, external rotation of eyeball
Medial rectus Origin - medial part of common tendinous ring (anulus of Zinn)
Insertion - anterior half of eyeball medially
Innervation - oculomotor nerve (CN III)
Function - adduction of eyeball
Lateral rectus Origin - lateral part of common tendinous ring (anulus of Zinn)
Insertion - anterior half of eyeball laterally
Innervation - abducens nerve (CN VI)
Function - abduction of eyeball
Superior oblique Origin - body of sphenoid bone
Insertion - superolateral aspect of eyeball (deep to rectus superior, via trochlea orbitae)
Innervation - trochlear nerve (CN IV)
Function - depression, abduction, internal rotation of eyeball
Inferior oblique Origin - orbital surface of maxilla
Insertion - inferolateral aspect of eyeball (deep to lateral rectus muscle)
Innervation - oculomotor nerve (CN III)
Function - elevation, abduction, external rotation of eyeball
Levator palpebrae superioris Origin - lesser wing of sphenoid bone
Insertion - anterior surface of tarsus, skin of upper eyelid
Innervation - oculomotor nerve (CN III)
Function - elevation of upper eyelid

Blood supply of the eye

The eye is supplied by branches of the ophthalmic artery: these are the short posterior ciliary, long posterior ciliary, anterior ciliary and the central retinal arteries. Venous blood is conveyed by the four vorticose veins that drain into the ophthalmic vein.

Nerves of the eye

The main function of the eye is sight, and the nerve that enables sight is the optic nerve (CN II). Nerves that innervate the extraocular muscles are called bulbomotors and they are the oculomotor (CN III), trochlear (CN IV) and abducens (CN VI) nerves. The oculomotor nerve also innervates the intrinsic ocular muscles and thus regulates accommodation. The lower eyelid is innervated by the infraorbital nerve, a branch of the maxillary nerve (V3), that passes through the infraorbital foramen.

The upper eyelid is supplied by the oculomotor nerve. Take a look at this video tutorial in order to enhance your knowledge about the nerves of the orbit.

Become a master of the eye anatomy with this specially designed quiz which covers bones and muscles of the orbit and eye anatomy (including neurovasculature)!

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