ISSN 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

Available online at: http://www.iajps.com *Review Article*

ROLE OF EYE – A CRUCIAL PATH IN HUMAN LIFE

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Abstract:
The human eye is the one of the most important part which can do major actions and having a control all over the body by sending visual impulses to brain. It is very sensitive and if we should not take care of it, results in exposure to variety of diseases. Gathering of information from the environment is the major task for our response and this can be done by the eye only. Even the mechanism of camera that we are using now a day was based on the eye only. Both the eye and camera gathers light and transforms that light into picture. Both also have lenses to focus the incoming light. Just as a camera focuses the light onto the film to create a picture, the eye focuses light onto a specialized layer of cells, called the retina to produce an image. In this review article, a neat depiction was given about the anatomy and physiology of eye.

Keywords: *Human eye, Sense organ, visual impulses, anatomy of eye.*

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Please cite this article in press as Divya Jonnala et al, ***Role of Eye – A Crucial Path in Human Life,*** *Indo American J of Pharm Sci, 2015;2(5):926-929.*

INTRODUCTION

The human eye is the organ which gives us the sense of sight, allowing us to observe and learn more about the surrounding world than we do with any of the other four senses. We use our eye in almost every activity we perform, whether reading, working, watching television, writing a letter, driving a car, and in countless other ways. Most people probably would agree that sight is the sense they value more than all the rest. The eye allows us to see and interpret the shapes, colours, and dimensions of objects in the world by processing the light they reflect or emit. The eye is able to detect bright light or dim light, but it cannot sense objects when lights are absent [1].

Close your eyes and imagine you have seen ever since the world and yourself. You will not have an idea with what it looks like when you only feed it. Eyes are very important for human body. It helps the human body to do its tasks with coordination. Without it, a man won't be able to see the beauty of its wonderful world. Eyes are the windows of the soul. Without eyes, the five basic senses would not be complete. So, it should be present. Eyes are the parts of our body that perceive light. They allow us to see the world and to understand how objects relate to each other. We can distinguish far objects from close ones and determine their colour and shape [2, 3].

Interaction of eyes with other parts of the body

The brain processes the raw data from the eyes to make senses of what you see compared to your knowledge of the world around you. The brain interprets what it receives from the eyes. You do not directly "see". A clear example of this can be seen from experiments where subjects wear glasses that invert the view (turn it upside down). After a while the brain will adjust and turn the scene back up the right way because that agrees with other more reliable information you are receiving.

Similarly the brain adjusts changes in colour and light levels to better match how the objects should appear. It also combines the two slightly different views from your left and right eyes to work out the distance of objects from you. Your right eye will show a little more of an object's right side and the left eye will show more of an objects left side. This is called stereoscopic vision [4]. The difference between the views from each eye becomes less the further the object is away from you[2]. Our perceptions are not perfect and can lead to misinterpretations of what we see. These are called as optical illusions. However even though the brain's processing can be inaccurate, at most times we perceive a faithful reconstruction of the real world. Only optical illusions remind us that there is at times a difference between perception and the true state of affairs. Without our eyes and the complex processing of visual information by our brains we would not be able to make sense of writing, art or photos, nor understand as much as we do from limited visual information.

Basic anatomy and physiology of eye

The eye is the organ of sight (vision). A person has 2 eyes located below the forehead and eyebrows at the front of the face, within the eye socket area of the skull. One eye is located on either side of the bridge of the nose. Only about one-sixth of the eyeball can be seen – the rest is protected by bone and surrounding tissue of the eye socket (orbit).

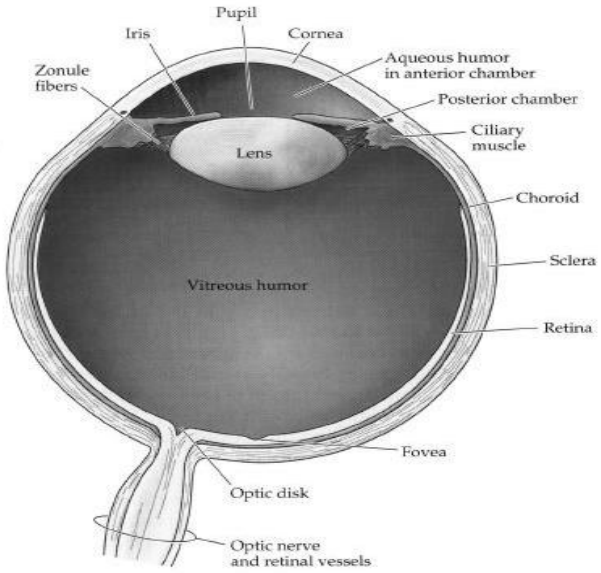

Fig 1: Anatomy of Human eye

Structure

The eye is made up of 3 main parts:

- Eyeball
- Orbit (eye socket)
- Accessory (adnexal) structures

The eyeball

The main part of the eye is the eyeball (also called the globe). Each eye is sphere-shaped and is about 2.5 cm (1 inch) in diameter. The eyeball is rich in blood vessels. The inside of the eyeball is filled mostly with a clear, jelly-like fluid called vitreous humor. Vitreous humor fills the back (posterior) part of the eye. It helps support the internal structures and maintain the shape of the eye.

The outer part of the eyeball is called the wall of the eye. It can be divided into 3 layers (or tunics): an outer, middle and inner layer (from the outside

to the inside of the eye). The outermost layer or covering of the wall of the eye is made up of the sclera and cornea and is called the fibrous tunic [5].

A) Outer layer

Sclera – The sclera is the tough, white connective tissue that covers most of the outside of the eyeball. The sclera is seen as the white portion of the eye and serves as the protective covering. The optic nerve and blood vessels pass through the sclera in the back of the eye. Muscles that control the movement of the eye attach to the sclera.

Cornea – The cornea is the clear, dome-shaped covering at the front of the eye that lets in light. The cornea covers the pupil and the iris. It does not contain any blood vessels.

B) Middle layer

The middle layer of the wall of the eye is called the uvea or vascular tunic. The uvea has 3 main parts:

Iris – The iris is the thin, muscular, coloured part of the eye. It is located at the front (anterior) of the eye, between the cornea and the lens.

The iris opens and closes the pupil (the small central opening) to change the amount of light entering the eye.

Choroid – The choroid is a thin layer of tissue that contains many tiny blood vessels that supply oxygen and nutrients to the retina.

The choroid contains many pigment-producing cells called melanocytes. These cells help absorb any excess light and minimize reflections within the eye.

Ciliary body – The ciliary body lies just behind the iris and extends forward from the choroid.

It is the muscular ring of tissue that helps the eye focus. It changes the shape of the lens so it can focus on near or far objects. The ciliary body contains cells that make aqueous humor, which is the clear fluid in the front of the eye between the cornea and lens.

Inner layer

The innermost layer of the wall of the eye is made up of the retina or neural tunic. The retina is the thin layer of cells at the back of the eyeball and works like the film of a camera. It is made up of nerve cells that are sensitive to light. These cells are connected to the brain by the optic nerve, which sends information from the eye to the brain and allows us to see.

Lens

The lens is a transparent structure in the inner part of the eye, which lies directly behind the cornea and iris. The lens changes shape to allow the eye to focus on objects. The lens focuses light rays on the retina [6].

Orbit

The orbit (eye socket) is a bowl-shaped cavity made up of bone formed from the skull that contains the eyeball and the connective tissues surrounding the eyeball. The bone and connective tissues cushion and protect the eye. Muscles attached to the eyeball make it move in different directions. These small muscles attach to the sclera near the front of the eye and to the bones of the orbit at the back. The orbit also contains nerves, fat, blood vessels and a variety of connective tissues.

Accessory structures

The accessory (adnexal) structures of the eye include the eyelids, conjunctiva, caruncle and lacrimal (tear) glands.

Eyelids

The eyelids (palpebrae) are folds of skin that cover and protect the eye. Muscles raise and close the eyelids. The eyelids contain glands, which produce an oily secretion that covers the tear layer and prevents tears from evaporating and the eyelids from sticking together. The eyelid is described as having an anterior (front) and a posterior (back) lamella. The anterior lamella consists of skin, a layer of fatty connective tissue and a layer of muscle fibres [7]. It helps protect the eye and regulate the amount of light that reaches the eye. The posterior lamella consists of a layer of muscle, the palpebral conjunctiva and the tarsal plates. The tarsal plates are 2 thick plates of dense connective tissue found inside each eyelid (upper and lower) that help form and support the eyelid. Eyelashes grow from the edges of the eyelids. They help protect the eye from dust and debris.

Conjunctiva

The conjunctiva is a clear mucous membrane that lines the inner surface of the eyelids and the outer surface of the eye. The conjunctiva secretes mucus to lubricate the eyeball and keep it moist.

Bulbar conjunctiva is the part of the conjunctiva that covers the front, outer surface of the eyeball.

Forniceal conjunctiva is the loose fold that connects the conjunctival membrane that lines the inside of the eyelid with the conjunctival membrane that covers the eyeball.

Palpebral (or tarsal) conjunctiva is part of the conjunctiva that covers the inner surface of the eyelids.

The plica is a small fold of conjunctival tissue next to the caruncle in the inside corner of the eye.

Caruncle
The caruncle is the small, pinkish portion of the innermost corner of the eye (or inner canthus) that contains oil and sweat (sebaceous) glands and conjunctival tissue.

Lacrimal gland
The lacrimal gland (tear gland) is the almond-shaped gland located at the upper, outer corner of each eye. The lacrimal gland secretes tears to help keep the surface of the eye and lining of the eyelids moist and lubricated. Tears help reduce friction, remove dust and debris from the eye and prevent infection. Small lacrimal ducts (lacrimal canaliculi) drain tears from the lacrimal gland through very tiny, openings (lacrimal punctum) inside the inner corner of each eyelid.

Function
The eye is the organ that works with the brain to provide us with the sense of sight. It works much like a camera. The main function of the eye is to collect light and turn it into electric signals, which are sent to the brain. The brain then turns those signals into a visual image or picture for us to see. We have 2 eyes, so 2 pictures are usually created. If we lose the vision in one eye, we continue to see most of what we could see before.
When light enters the eye, it first passes through the cornea. The light then passes through the pupil, where the iris adjusts the amount of light entering the eye. The light then passes through the lens of the eye. The lens focuses light rays onto the retina, where it is changed into a signal that is transmitted to the brain by the optic nerve. The signal is received and interpreted by the brain as a visual image.

Working of Human Eye
In a number of ways, the human eye works much like a digital camera:
1. Light is focused primarily by the cornea — the clear front surface of the eye, which acts like a camera lens.
2. The iris of the eye functions like the diaphragm of a camera, controlling the amount of light reaching the back of the eye by automatically adjusting the size of the pupil (aperture).
3. The eye's crystalline lens is located directly behind the pupil and further focuses light. Through a process called accommodation, this lens helps the eye automatically focus on near and approaching objects, like an autofocus camera lens.
4. Light focused by the cornea and crystalline lens (and limited by the iris and pupil) then reaches the retina — the light-sensitive inner lining of the back of the eye.
5. The retina acts like an electronic image sensor of a digital camera, converting optical images into electronic signals. The optic nerve then transmits these signals to the visual cortex — the part of the brain that controls our sense of sight.

Table 1: Different Parts and Functions of Eye

S. No	Human eye parts	Function
1	Pupil	Open and closes in order to regulate and control the amount of light
2	Iris	Control light level similar to the aperture of camera
3	Sclera	Protective outer coat
4	Cornea	Thin membrane which provides 67% of the eyes focusing power
5	Crystalline lens	Helps to focus light into retina
6	Conjunctiva	Covers the outer surface (visual part) of the eye
7	Aueous humour	Provides power to the cornea
8	Vitreous humour	Provides the eye its form and shape
9	Retina	Captures the light rays focussed by the lens and sends impulses to the brain via optic nerve.
10	Optic nerve	Transmits the electrical signals to the brain
11	Ciliary muscles	Contracts and extends in order to change the lens shape for focusing.

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