



OPINION ARTICLE



Note on Anatomy and Physiology of the Ear

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ARTICLE HISTORY

Received: 02-May-2022, Manuscript No. JCMEDU-22-62997;
Editor assigned: 04-May-2022, PreQC No. JCMEDU-22-62997 (PQ);
Reviewed: 18-May-2022, QC No. JCMEDU-22-62997;
Revised: 23-May-2022, Manuscript No. JCMEDU-22-62997 (R);
Published: 03-Jun-2022

Description

The ear is an organ that allows mammals to hear and balance themselves through the vestibular system. The ear in mammals is divided into three sections: the outer ear, the middle ear, and the inner ear. The pinna and ear canal make up the outer ear. Because the outer ear is the only visible part of the ear in most animals, the term “ear” is frequently used to refer to just that. The tympanic cavity and the three ossicles make up the middle ear. The semicircular canals, which permit balance and eye tracking when moving; the utricle and saccule, which provide balance when stationary; and the cochlea, which enables hearing, are all found in the bone labyrinth. The ears of vertebrates are symmetrically situated on either side of the skull, which helps with sound localization. The ear is formed by the first pharyngeal pouch and six little swellings termed otic placodes that form in the early embryo and are made of ectoderm.

Disease, infection, and severe damage to the ear can all influence it. Hearing loss, tinnitus, and balance disorders like vertigo can all be caused by ear diseases, but many of these symptoms can also be caused by injury to the brain or neuronal pathways leading from the ear. For thousands of years, the ear has been adorned with earrings and other jewellery in many cultures, and it has been subjected to surgical and cosmetic changes.

Structure of the ear

The outer ear, middle ear, and inner ear are the three sections of the human ear. The eardrum separates the outer ear's ear canal from the middle ear's air-filled tympanic chamber. The ossicles, three little bones involved in sound transmission, are housed in the middle ear, which is connected to the throat *via* the pharyngeal entrance of the Eustachian tube. The otolith organs—the utricle and saccule—as well as the vestibular system's semicircular canals and the auditory system's cochlea—all reside in the inner ear.

Outer ear

The fleshy visible pinna (also known as the auricle), the ear canal, and the outer layer of the eardrum make up the outer ear (also called the tympanic membrane). The pinna is made up of the helix, which curves outward, and the antihelix, which curves inward, and opens into the ear canal. The tragus, like the confronting antitragus, protrudes and partially obscures the ear canal. The concha is the hollow region in front of the ear canal. The ear canal is around 1 inch long (2.5 cm). The canal is enclosed by cartilage in the first section and bone in the second part near the eardrum. The auditory bulla is a bony structure created from the tympanic section of the temporal bone. Ceruminous and sebaceous glands create protective ear wax on the skin around the ear canal. The ear canal ends at the eardrum's exterior surface. The intrinsic and extrinsic muscles are the muscles that are linked with the outer ear. These muscles can change the orientation of the pinna in various mammals. These muscles have little or no effect in humans. The facial nerve, which also delivers feeling to the skin of the ear as well as the external ear chamber, supplies the ear muscles. The cervical plexus's great auricular nerve, auricular nerve, auriculotemporal nerve, and lesser and greater occipital nerves all provide feeling to sections of the outer ear and surrounding skin.

Middle ear

The middle ear is located halfway between the outer and inner ear. The three ossicles and their attached ligaments, the auditory tube, and the round and oval windows are all contained within the tympanic cavity, which is an air-filled hollow. The ossicles are a group of three small bones that receive, amplify, and transmit sound from the eardrum to the inner ear. The malleus (hammer), incus (anvil), and stapes are the ossicles (stirrup). The stapes is the body's smallest named bone. The pharyngeal aperture of the Eustachian tube connects the middle ear

to the upper neck at the nasopharynx. The three ossicles are responsible for transmitting sound from the exterior to the inner ear. The malleus absorbs vibrations from the eardrum, where it is attached by a ligament at its longest section (the manubrium or handle). It sends vibrations to the incus, which then sends vibrations to the tiny stapes bone. The stapes' wide base sits atop the oval window. Vibrations from the stapes are transferred through the oval window, generating fluid movement within the cochlea.

Inner ear

The bony labyrinth, a complicated hollow within the temporal bone, houses the inner ear. The utricle and saccule are two tiny fluid-filled recesses in the vestibule, a central area. The semicircular canals and the cochlea are connected by these. The dynamic balance is maintained by three semicircular canals that are positioned at right angles to one another. The cochlea is a spiral-shaped organ that is

responsible for hearing. The membranous labyrinth is made up of these structures. The bony labyrinth refers to the bony compartment within the temporal bone that houses the membranous labyrinth. The oval window, which receives vibrations from the middle ear's incus, is the structural start of the inner ear. Vibrations are carried into the inner ear *via* endolymph, a fluid that fills the membranous labyrinth. The endolymph is stored in the utricle and saccule vestibules and finally travels to the cochlea, a spiral-shaped structure. The vestibular duct, cochlear duct, and tympanic duct are three fluid-filled cavities in the cochlea. Hair cells in the cochlea's organ of corti are responsible for transduction—converting mechanical changes into electrical sensations.