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Phonetics and Audiology

Perspective

History and Functions of Ear Ossicle

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DESCRIPTION

The three ossicles, also known as auditory ossicles, are some of the tiniest bones in the human body and are located in either middle ear. They function to transport noises from the surrounding environment to the fluid-filled labyrinth (cochlea). Hearing loss ranging from moderate to severe would result from the lack of the auditory ossicles. Ossicle literally translates as "little bone." Although the phrase can be used to describe any little bone in the body, it usually refers to the middle ear's malleus, incus, and stapes (also known as the "hammer," "anvil," and "stirrup").

Function

Tympanic membrane (eardrum) vibration causes the malleus, the nearest ossicle to which it is linked, to move in response. The stapes then relays the vibrations to the membrane of the fenestra ovalis (oval window), the entry to the vestibule of the inner ear, from the malleus *via* the incus.

Only around 1/30 of the sound energy going through the air would be transmitted into the liquid when it made contact with a liquid medium; rest of the sound passing through the air is reflected. When the head is immersed underwater, sound abruptly stops, allowing this to be witnessed. This is because a liquid's relative incompressibility acts as a barrier against the force of sound waves as they move through the air. Through lever action and a decrease in the region of force distribution, the ossicles give the eardrum a mechanical advantage; the ensuing vibrations are stronger but don't go as far.

Compared to when sound waves were sent directly from the outer ear to the oval window, this enables more effective coupling. This decrease in the force application area enables a significant enough rise in pressure to transmit the majority of the sound energy into the liquid. The fluid in the cochlea will be compressed by the increased pressure and convey the stimulation. As a result, the ossicles' lever action modifies vibrations to increase sound transmission and reception, which is a type of impedance matching.

History

The discovery of the auditory ossicles has been attributed to a number of anatomists from the early 16th century, with the two earliest being Alessandro Achillini and Jacopo Berengario da Carpi. The anatomist and philosopher Achillini is credited with discovering the malleus and incus in a number of sources, including Eustachi and Casseri.The malleus and incus were originally described in writing by Berengario da Carpi in his Commentaria super anatomia Mundini (1521). Despite the fact that he just provided a brief description of two bones, he made note of their potential connection to sound transmission. The same bones were briefly described and compared to little hammers in Niccolo Massa's Liber introductorius anatomiae. The first two ossicles were then described in considerably greater length in Andreas Vesalius' De humani corporis fabrica, which included a chapter on them. Vesalius was the first to relate the second ossicular piece to an anvil, though he also suggested the molar as a possible alternative. Although Giovanni Filippo In grassia had previously described the stapes in public lectures at the University of Naples as early as 1546, Pedro Jimeno's Dialogus de re medica (1549) was the first work to do so. The word "ossicle" comes from the diminutive of "bone," ossiculum (Latin: os; genitive ossis). The names of the bones are derived from Latin: the malleus, which means "hammer," the incus, which means "anvil," from the verb incudere, which means "to forge with a hammer," and the stapes, which means "stirrup" in Modern Latin. The names of the bones are derived from Late Latin: the stapia, which is related to the verb stare, which means "to stand."

CONCLUSION

However, two muscles linked to the ossicles regulate (and restrict) the degree of their movements (the tensor tympani and the stapedius). In order to protect the inner ear from extremely loud noise, it is thought that these muscles can contract to decrease the vibration of the ossicles. They are also thought to improve frequency resolution at higher frequencies by limiting the transmission of low frequencies (see acoustic reflex). In bats, these muscles are more fully developed.

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