THE ART OF OSSICULOPLASTY

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Whenever there is a conductive hearing loss greater than 40 dB, whether the tympanic membrane is intact or perforated, the possibility of ossicular chain pathology should always be considered. The ossicular chain, despite being the smallest bony articulation in the human body, performs one of the most sophisticated biomechanical functions: efficient transmission of acoustic energy from the tympanic membrane to the cochlea. Any disruption in this delicate mechanism can significantly impair sound conduction.

Ossicular chain abnormalities may present in various forms, including fixation, discontinuity, disarticulation, or destruction of the ossicles. These pathologies may result from congenital anomalies, trauma, chronic middle ear infections, tympanosclerosis, or cholesteatoma. Fixation is particularly common around the stapes footplate due to otosclerosis, which appears to be relatively more prevalent in the Terai belt of Nepal.

Disorders of the ossicular chain directly affect hearing and thereby exert a profound impact on communication, education, social interaction, and occupational performance. In many patients, prolonged hearing impairment may also contribute to psychological distress, social isolation, and deterioration in overall quality of life. Therefore, timely diagnosis and appropriate reconstruction of the ossicular chain remain essential components of modern otologic surgery.

Hearing restoration has always occupied a unique place in otologic surgery. Among the many procedures performed in middle ear reconstruction, ossiculoplasty remains one of the most delicate and intellectually satisfying operations. It is a surgery where science meets craftsmanship, and where millimeters determine whether sound once again becomes meaningful to the patient. Various reconstructive options are available depending upon the type and extent of ossicular pathology; therefore, surgical experience, technical skill, and sound knowledge of middle ear mechanics are equally essential for achieving successful outcomes.

Among the ossicles, the incus is most commonly affected because of its delicate structure and relatively vulnerable blood supply. In cases of eroded incus with intact malleus and stapes (Austin-Kartush type A ossicular chain defect), several reconstructive options are available, including autologous ossicle interposition, homograft ossicles, ossicular replacement prostheses, and malleus relocation techniques. When there is only a small gap between the long process of the incus and the stapes head, the use of dental cements such as hydroxyapatite bone cement or glass ionomer cement has emerged as an effective alternative. Studies have shown that these materials may outperform incus interposition and provide audiological outcomes comparable to partial ossicular replacement prostheses (PORP).[1] In the absence of the stapes superstructure, reconstruction may be performed using an autologous ossicle, sculpted cartilage graft, or a commercially available total ossicular replacement prosthesis (TORP), depending upon the middle ear status, surgeon preference, and availability of materials.

The field of ossiculoplasty has evolved considerably over recent decades. In 2018, the International Otology Outcome Group (IOOG) proposed the SAMEO-ATO framework for categorization of tympanomastoid surgery.[2] This classification system also incorporates various ossicular pathologies and reconstructive procedures, thereby facilitating standardization in reporting surgical techniques and outcomes.

Despite continuous technological advances, ossiculoplasty continues to challenge even experienced otologists. Hearing outcomes remain variable, revision surgeries are not uncommon, and long-term stability is influenced by numerous biological and mechanical factors.[3] Successful ossiculoplasty depends not only on the choice of prosthesis or surgical technique, but also on eradication of disease, preservation of middle ear mucosa, Eustachian tube function, and long-term middle ear ventilation.

At the end, the success of ossiculoplasty is measured not merely by closure of the air-bone gap, but also by the smile of a patient who hears clearly once again. That is the true art of ossiculoplasty.

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