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Anatomy of the distal incus and lenticular process in the human

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Purpose: The distal incus is the site of coupling to the stapes, and is also the site of bone erosion in middle-ear disease. Yet, little attention has been given to its anatomy.

Material and Methods: Histological sections from 103 normal temporal bones ranging from infants to age 100 years were examined. Measurements were made of various morphometric parameters of the distal incus and lenticular process. Three- dimensional reconstructions of this region were created for selected specimens.

Results: The anatomy of the incus differs from descriptions in standard texts. The lenticular process has two distinct components- a proximal narrow "stem" (mean diameter 216 microns) and a distal expanded "cap" (mean diameter 710 microns). The capsule of the incudo-stapedial joint is unusual in that it attaches to a narrow area along the rim of the stapes head, expands considerably at the level of the stem, and attaches to the stem and cap over a broad surface area. Dimensions of the distal incus and lenticular process do not change with age. However, a significant decrease in number of osteocytes occurs with advancing age. The vascular supply to the distal incus and lenticular process comes from several nutrient vessels within the bone as well as from the mucosa.

Conclusions: The special anatomy of the distal incus and lenticular process may have functional significance in sound transmission. We (and others: Funnell et al. JARO 2005; 6:9-18) hypothesize that the stem bends, serving to isolate the stapes from movements of the incus in certain directions while favoring motions along the long axis of the stapes. The ample vascular supply from nutrient vessels within the bone makes it unlikely that incus "necrosis" (e.g. after stapedectomy) is caused by a lack of blood supply. The slender stem of the lenticular process in combination with loss of osteocytes may serve to increase the vulnerability of the stem to bone resorption in chronic otitis media. [Supported by the National Institute on Deafness and Other Communication Disorders, National Institutes of Health, USA]