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Editor

Drill and Middle Ear Surgery

Noise exposure is a known risk factor for hearing loss. Use of powered instruments during surgery can be a cause of hearing impairment. Hearing loss relating to powered surgical instruments can be primarily described in three perspectives: noise levels (air-conducted), vibrations (bone-conducted) and physical contact of an instrument with the ossicular chain.

Drills and surgical tools like suctions, a potential source of high frequency noise, can cause noise-induced hearing loss in the operated ear and even in the contralateral healthy ear. Drill-generated noise may impair hearing by either mechanical distortion of the inner-ear structures or through metabolic changes in the cochlear cells.

The noise level in cochlea with use of drill during mastoid surgery is calculated from vibration measurement on intact skulls of human cadavers. It showed that ipsilateral cochlea is exposed to noise level of about 84 to 117dB SPL and contralateral cochlea to 5 to 10 dB lower SPL level. During cochleostomy, noise levels ranged from 114 to 128 dB SPL when recording were made close to round window.

Various factors are thought to influence the noise generated by drilling like size of the burr, the type of the burr (diamond versus cutting burrs), speed of drill rotation and site of drilling. A 6 mm cutting burrs produces noise level of 88–108 dB while the use of a 4 mm resulted in a reduction of 1–6 dB and 2 mm resulted in 5–16 dB reduction in noise level . The mean noise levels for diamond burrs were 5–11 dB lower than the mean noise levels for cutting ones.Rotation speed had only a slight influence on the noise levels generated (0–5 dB). The noise levels around the cochlea were only slightly influenced by the site of the drilling within the ear (< 1.8 dB).

Majority of studies till date have focused on noise level induced hearing loss, which is a subcategory of sensorineural hearing loss, while vibrations, or more precisely, skull vibrations, have got much less attention . Vibrations have been attributed to cause hearing through inner ear damage . According to Seki et al. vibration brings morphological changes, specially in the permeability of capillaries of stria vascularis when the ear ossicles or mastoid are subjected to vibration.

Physical contact of an instrument with the ossicular chain results in vibrations which are directly transmitted via the ossicular chain to the cochlea. The subsequent damage to the cochlea generally results in permanent hearing loss. However, this hearing loss is attributed to surgeon error rather than use of the surgical instrument itself.

Following drilling during mastoid surgery, hearing loss occurs especially at frequencies higher than 2000 Hz which is mainly temporary and reversible. The recovery time of hearing loss in the non-operated ear is usually less than 72 hours and in operated ear it is usually more than 72 hours. The knowledge of effect of powered instruments in the

hearing impairment while operating on ears with already compromised hearing is very important especially during presurgery patient counselling. Explaining this recovery time to patients helps alleviate the anxiety after mastoidectomy procedures.

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