Editorial

MANAGEMENT OF HEARING IMPAIRED CHILDREN

Deafness is a disabling malady in life, more so when it occurs in a child. Such a child often fails to develop speech and language, which is essential for human communication. Population studies pertaining to deafness in children in India are few. The most common cause of hearing loss in children is reported to be middle ear infection which occurs in 5-15% according to the available reports(1-4). Congenital and genetic hearing loss occurs in less than 1% in the population although hospital studies show a higher percentage.

Chronic middle ear infection causes perforation of the ear drum and damage to the ossicles, resulting in hearing loss of varying degrees with its attendant disability. Cholesteatoma occurs in children causing risk to life because of the serious complications that can involve the brain. Early diagnosis and adequate surgical treatment is the only way to manage cholesteatoma. Safe perforation without cholesteatoma can be controlled medically and in cases of bilateral disease in a child, assistance must be provided in the form of hearing aid before surgical correction is made. Microsurgery of the ear has evolved to a reasonable standard in our country and the middle ear can be operated upon with successful hearing improvement in children.

It is believed that the most important factor of middle ear infection including cholesteatoma is repeated sinonasal infection in childhood. It also follows repeated sore throat including tonsillitis and adenoids. The pediatricians can, therefore, play a great role in preventing middle ear problems that result from nasal or throat infection. These need adequate care and complete treatment at its initial stages including antibiotics although most episodes of upper respiratory infection may be viral. Middle ear effusion or suppuration that occurs in a child or neonate must be subjected to an impedance audiometry besides clinical and otomicroscopic evaluation for presence of fluid(5,6). Often a myringotomy to let out the effusion or suppuration is warranted. For chronic cases, the grommet, a ventilating and drainage tube becomes necessary, usually on both sides. Insertion of the tubes help prevent cholesteatoma and adhesive otitis media by arresting further progress of the disease and deafness. Otoscopic evaluation and even doing an impedance audiometry should be incorporated in the postgraduate training programme of pediatrics.

Cytomegalovirus is an important cause of hearing loss in children and in fact many unknown causes would be revealed if it is tested for. Ninety per cent of cytomegalovirus affected children may remain subclinical for a significant period after birth(7). On suspicion, culture of urine sample must be ordered within first week of life. Serological test for rising titre of IgG antibody or presence of cytomegalovirus specific IgM usually confirms the diagnosis. With the development of intrauterine intervention procedures like chorionic villi sampling and cord blood sampling(8), one can confirm the diagnosis antenatally. Since the hearing loss due to cytomegalovirus is usually very severe or profound, on confirmation an abortion is desirable.

Similarly, toxoplasmosis can also be screened for after birth as well as antenatally. Other causes that can be mentioned are congenital syphilis, herpes simplex, ototoxic drugs affecting the fetal cochlea and maternal diabetes affecting the fetus(7), besides genetic deafness, which the pediatricians are very familar with.

Perinatal hypoxia, placental insufficiency and hyperbilirubinemia today must be controlled by the obstetrician before birth. Proper monitoring and fetal blood transfusion can save many a child today from being deaf(8). Hyperbilirubinemia after birth can adequately be controlled by exchange transfusion and hearing loss in such cases, significantly reduced. Pre-term labor and low birth weight again is an area where obstetricians during the pregnancy and delivery and pediatricians after birth can play a major role in preventing hearing loss or other disability.

If there is parental suscipicion about the hearing function or failure to develop speech and language by 2 or 3 years of age, the child must be subjected to conventional evaluation tests(9) and auditory brainstem evoked response (ABR) audiometry to establish the hearing thereshold. ABR is a very sensitive and reliable tool today in the high risk newborn screening and it is often done in all neonates of neonatal intensive care unit(10,11).

Rubella is the commonest cause of sensorineural deafness in children. Throat swab, stool, and urine for culture and IgG antibody or rubella specific IgM are employed for diagnosis.

A vaccine programme must be evolved, which may prevent a significant number of congenital deafness. Besides antenatal care of pregnant women, a programme of vaccination to girls and women must be done in our country too. Today cord-blood testing is also possible during fetal life for rubella.

Sensorineural hearing loss whether it is due to congenital or acqired causes, needs early detection. Its early recognition and threshold establishment is the key to success of rehabilitation programme. Ninety per cent children with hearing impairment are not diagnosed at the age of 1 year and only 50% are diagnosed by 3 years of age. So, there is a need to develop strategies for early diagnosis(9).

Following are the usual ways of hearing loss being discovered in children: (*i*) Child has a known risk factor (*Table I*). (*ii*) Parental suspicion; (*iii*) Child fails to pass a screening test; and (*iv*) Child fails to develop speech and language in the normal way.

Management

Once the hearing loss in a child is established and its threshold is ascertained, the maintstay of management is twofold: (*a*) appropriate hearing aid selection and fitting, and (*b*) promotion of development of language and communication skills.

Table I–*Common Risk Factors for Hearing Impairment*

1.	Presence of hereditary deafness in the family.
2.	History of exposure to rubella or other non-bacterial intrauterine infections, *e.g.,* cytomegalovirus, toxoplasmosis, herpes, *etc.*
3.	Congenital ear anomaly, cleft palate or lip, etc.
4.	Hyperbilirubinemia due to isoimmunization.
5.	Low birth weight and preterm delivery.
6.	Hydrocephaly.
7.	Microcephaly with other skull anomaly.

There are, however, two main problems in hearing aid fitting in children: (*i*) there is often limited information about the extent of child's hearing loss, and (*ii*) young children cannot say which aid or settings in the aid, they prefer. It is important to estimate the dynamic range of the residual hearing. To achieve this, impedence audiometry with reflex assessment and free field-distraction test stimuli and ABR should be done.

Hearing Aid Programme: Hearing aid selection is a difficult task(12,13). The prescription method of hearing aid selection is usually preferred in children. Great motivation for continuous use of the aid by the child is needed. Parents need proper counselling about the problems and also some elementary training in fitting the aid and in speech therapy. As the child grows older, the hearing aid or the setting of its controls may be changed, based on more information about the hearing function that may be then available. Often bilateral aids can be fitted to effect better results as it can help in (*a*) improved localization of the sound, (*b*) improved hearing in background noise, and (*c*) getting a binaural summation effect giving better amplification. Behind-the-ear type of hearing aid is preferred to bodily worne ones, although younger child may still use the latter. The behind-the-ear type provides amplification at the ear level and distortions are less. It is also easy to fix it to the ear. It is important that parents or teachers in school check the child's aid daily for its proper functioning.

Cochlear Implants: It is an electronic device to directly stimulate the auditory nerve for use in a patient with bilateral profound deafness to help develop speech and lip-reading better. Post-lingually deafened persons are reported to have benefitted more than those being deaf before acquiring speech in children(14). It is, therefore, not yet a satisfactory device to be recommended for children especially in India. However, it has been reported to be useful in acquiring some speech and helping communication in many children abroad.

Education of the Hearing Impaired: With hearing aid, normal speech and language development and schooling can be possible. A child's ability to acquire normal or intelligible speech depends on several factors such as: (*a*) onset of hearing loss, (*b*) extent of hearing loss, (*c*) child's personality and motivation, (*d*) child's ability to use the residual hearing, and (*e*) sufficient exposure to communication system by parents/teachers. The communication methods for educating the deaf child include (*a*) oralism, *i.e.*, lip reading (*b*) finger spelling, (*c*) cue speech, (*d*) signing systems, and (*e*) total communication. While educating the hearing impaired children, computers have been fruitfully used in recent times abroad and I believe this technology would help in a bigger way in India too.

There are many problems in managing a deaf child. What is essential is to know about the child's hearing and brain function and its implication in the selection of hearing aid and other assistive devices and its success depends on the training programme offered to the child. All efforts must be made to develop speech in a deaf child before total communication using signing, gesture, *etc.* is offered. The parents must play the central role in educating a deaf child.

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