

Current Practice

SPECIAL SENSES

Perceptive Deafness in Adults

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Perceptive or sensorineural deafness occurs as the result of disorders of the cochlea or auditory nerve. The development of perceptive deafness during adult life can create many problems for both the sufferers and their families. At work it may seriously impair efficiency or even make a change of occupation necessary. Social and domestic life are also affected to a varying degree. Many severely affected individuals become withdrawn, no longer making the effort to communicate with others. This is only in part due to the difficulty they experience in taking part in a conversation; to some measure it is due to the lack of patience and understanding shown to them by the hearing public.

Not all patients consult their doctors specifically about their hearing loss. In some instances it is the associated tinnitus or less frequently vertigo which makes them seek advice. Quite often it is the family which is more concerned, the patient barely recognizing that there is a problem.

Assessment

Patients' disabilities can to a large measure be assessed from the history of the condition and how they cope with the different aspects of their life. Information on ability to hear in different situations such as the theatre, cinema, church or at meetings, hearing the telephone, and whether the patients raise the volume of the television set to an intolerable level for the rest of the family is all relevant to the final assessment.

Before any tests are applied all wax and debris must be cleared from the external auditory meati and the state of the tympanic membranes observed. Simple tests of hearing using the voice and tuning forks will then largely establish the type and degree of hearing loss. Normally in quiet surroundings a conversational voice can be heard at 18 ft. (6 m.) or more. With a slight deafness the conversational voice is not heard beyond 12 ft. (4 m.). A moderate loss is considered to be present if the voice cannot be heard over 3 ft. (1 m.) and a severe loss if the raised voice is heard only when close to the ear.

The most valuable of the tuning fork tests are the Rinne and Weber tests. In the Rinne test the ability to hear a 512 tuning fork by air conduction at the meatal entrance and by bone conduction over the mastoid process are compared. In the normal the air conducted sound is the louder, and this persists in perceptive deafness. The Weber test is performed by placing the base of the fork on the centre of the forehead when the note will be heard in the better ear in perceptive deafness.

The complete assessment of a patient with a perceptive hearing loss will also entail pure tone and speech audiometry and sometimes more complex tests of acoustic function such as Békésy audiometry and recruitment tests. These tests not only provide a more accurate picture of the type and degree of deafness but also provide a permanent record for follow up purposes.

Aetiology of Sensorineural Deafness

The conditions which may cause perceptive deafness in adult life are numerous but may be broadly classified as follows:

- Traumatic—Acoustic trauma
 - Head injury
- Infective—Viral: mumps, influenza, etc.
 - Syphilis (congenital)
- Toxic—Aspirin, quinine
 - Antibiotics
 - Tobacco, alcohol
- Degenerative—Presbycusis
 - Hereditary

This list is by no means exhaustive, but includes the more important causes of bilateral hearing loss in adults.

Acoustic Trauma

It has long been known that deafness can occur as a result of prolonged exposure to noise such as gunfire and in certain noisy occupations, for example boiler makers' and blacksmiths' deafness. The possibilities of harmful noise exposure are far greater in our modern industrialized society that at any time in the past, and in many industries workers are exposed to potentially damaging noise levels. In Britain noise deafness is not at present recognized as an industrial disease under the National Insurance (Industrial Injuries) Act, but this is under consideration.

Prolonged exposure to noise of an intensity greater than 85 db. is now generally accepted as hazardous, but susceptibility to noise damage varies from individual to individual. It would be useful in industry if the more noise-sensitive subjects could be identified and excluded from hazardous employment. There may be some correlation between sensitivity and the degree of temporary threshold shift after short periods of noise exposure under test conditions, but it is not sufficiently certain to be used as a method of screening.

For the moment pre-employment testing could be used to exclude only those whose hearing tests show a sensorineural impairment. During exposure the onset of tinnitus may be an early indication of damage, but regular testing is the only certain way of detecting the condition.

Clearly more will have to be done in the future to protect people from noise and to reduce the amount of noise produced. However difficult this may be it could no doubt be achieved if its importance was generally accepted. It is even possible that the noise level to which all city dwellers are exposed every day may have some harmful effect on hearing. Studies which have compared the hearing of adults in industrial cities with that of a similar age group in rural areas have indicated an earlier onset of degenerative deafness in the former, suggesting that perhaps the noisy environment of a city is a contributory factor in the degenerative deafness seen in many older adults. Pop music has been shown to have a definite adverse effect on the hearing of the present younger generation.

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Acoustic trauma usually results in a deafness which is most marked at 4,000 c.p.s. (See Fig. 1) and is associated with hair cell degeneration in the basal turn of the cochlea. The deafness increases with continued exposure developing into a severe high frequency loss, but it is not progressive if the subject is excluded from a noisy environment.

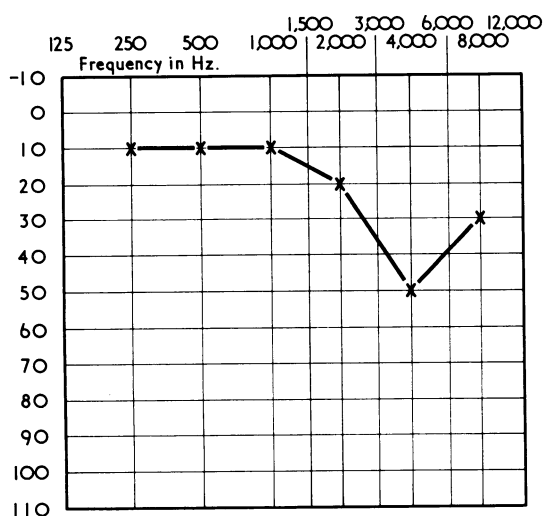


FIG. 1.—Deafness from acoustic trauma.

Perceptive Deafness of Infective Origin

Perceptive deafness occurs as a complication of some infectious diseases; mumps deafness is probably the best known. It is usually unilateral but can affect both ears, resulting in a severe or total deafness.

Rarely, similar changes can occur in influenza, and deafness is a recognized complication of typhoid and typhus fevers.

Syphilitic deafness in adults is usually a late congenital manifestation. The development of a progressive perceptive deafness in a young adult should always bring this possibility to mind, and the appropriate serological tests should be performed. Penicillin therapy seems to have little effect on the deafness of congenital syphilis, but steroid therapy will sometimes produce an improvement in the hearing of these patients and may also be helpful in controlling the vertigo, which is often very troublesome.

Toxic Deafness

A variety of drugs and chemical agents are known to be ototoxic. These include certain antibiotics, salicylates, and quinine. The antibiotics which are known to be ototoxic are streptomycin, dihydrostreptomycin, neomycin, kanamycin, vancomycin, viomycin, ristocetin, framycetin, polymixin B, and gentamicin. Of these framycetin and polymixin B are never used systemically.

Streptomycin in ordinary dosage rarely causes deafness, being far more toxic to the vestibular apparatus. Dihydrostreptomycin, however, is particularly toxic to the cochlea. Toxic changes in the cochlea are more likely to occur in the presence of renal damage when neomycin, vancomycin, and kanamycin are administered systemically, but this is by no means essential.

Neomycin deafness has also been reported after intrapleural injection, prolonged wound irrigation, and the inhalation of aerosols. More recently cases of neomycin deafness have occurred after prolonged oral administration of the drug in patients with liver failure.

The intratympanic injection of neomycin in guinea pigs has been shown to produce cochlear degeneration. Neomycin, framycetin, and gentamicin are all used in ear drops, and

though the dosage is very small and there is no evidence that this is a harmful practice, we should perhaps exercise more caution in the prescribing of ototoxic antibiotics for topical application to the ear.

After systemic administration of ototoxic antibiotics deafness usually develops after some days of treatment—even after the course has been completed—and then progresses to a severe loss in spite of the withdrawal of the drug.

The administration of salicylates in high dosage may induce deafness, but unlike other deafness from drugs the hearing usually recovers when the drug is withdrawn.

Degenerative Deafness

Presbycusis.—There is a tendency for the hearing to deteriorate with advancing age. In many individuals this becomes sufficiently marked to be a handicap. The age of onset varies a great deal but is rarely before the age of fifty. The hearing loss is typically bilateral and symmetrical and mainly affects the high frequencies (Fig. 2).

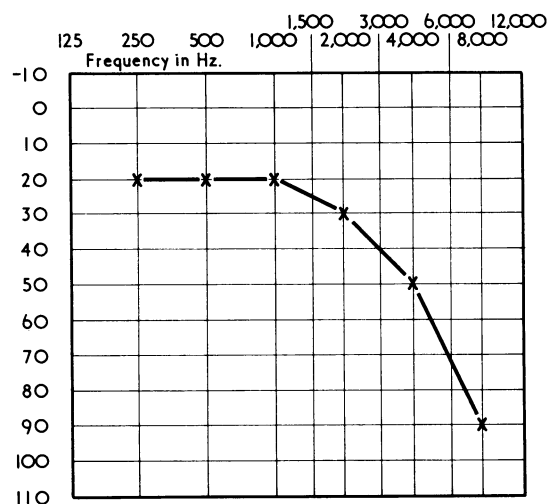


FIG. 2.—Deafness from presbycusis.

Though possibly a little commoner in men than in women, there is no marked sex difference. There does seem to be an increased incidence in some families. It is possible that the high level of everyday noise in industrial countries plays some part in the development of presbycusis. No direct association with arteriosclerosis has been demonstrated.

Two main types of lesion have been described in presbycusis. One is a degeneration and atrophy of the organ of Corti, and the other a degeneration of neurones supplying the cochlea. In both types the changes are most marked in the basal turn of the cochlea, which is the part concerned with the reception of high frequency sound. The degeneration of hair cells in the organ of Corti is associated with an intolerance of amplified sound, a relatively small increase in volume giving a disproportionate sensation of increased noise. This is the phenomenon of recruitment. The loss of neurones affects the discrimination of sounds, resulting in reduced intelligibility of speech.

Both recruitment and loss of discrimination may be present to varying degrees in any individual case and may present considerable difficulties in the use of hearing aids.

Presenile Degenerative Deafness.—Progressive perceptive deafness may be seen in young and middle-aged adults. Many of these cases have a hereditary basis, both dominant and recessive types occurring. However, not all cases can be ascribed to a definite cause. There is still a great deal to be learned about the causation of adult perceptive deafness.

Unilateral Perceptive Deafness

Unilateral deafness, though causing less disability, presents important problems of diagnosis. When of sudden onset it may be due to a virus infection, as in the case of mumps deafness, but the majority of cases are probably vascular in origin. On this basis early treatment with vasodilators or stellate ganglion block have been recommended. Results are disappointing, and as some degree of recovery may occur even without treatment it is difficult to assess the value of this therapy.

Progressive unilateral perceptive deafness of gradual onset always raises the possibility of an acoustic neuroma; deafness is the earliest symptom in the majority of patients with this condition. The investigation of unilateral deafness is largely aimed at the exclusion of acoustic neuroma, for though uncommon it is by far the most important differential diagnosis. In particular, it must be differentiated from Ménière's disease, where tinnitus and paroxysmal vertigo are prominent features and the deafness is of cochlear type. Audiometric tests designed to distinguish between cochlear and neural deafness—such as recruitment and Békésy audiometry—are useful in this respect, but unfortunately they may not be diagnostic. Complete investigation also includes caloric tests and radiological examination of the internal auditory meati.

Treatment of Deafness

At various times a wide variety of drugs have been advocated as being of possible value in the treatment of perceptive deafness—in particular numerous vitamin preparations have been tried. There is no evidence that any drug can improve the level of hearing or arrest the progress of the deafness.

A hearing aid is indicated when the hearing loss is great enough to produce a social disability; that is, when ordinary

conversation cannot be clearly understood. The aid should be of the air conduction type. It may be worn on the body with a wire connected to the ear insert, as in the N.H.S. Medresco aid, or behind the ear with a short tube passing to the ear piece. The ear level aid has the advantages of being small and inconspicuous and not being subjected to clothing noise. For adults this latter type of aid is available only commercially.

In practice the value of an aid for any patient can be assessed only by trying the instrument. Many find it difficult to wear an aid at first, being troubled by the background noise. With encouragement and perseverance the majority of sufferers obtain considerable benefit from their instruments.

The increased sensitivity to noise caused by recruitment is experienced by many patients and is a potential source of difficulty in the use of an aid. A relatively small increase in volume may produce an intolerable sensation of noise accompanied by distortion. In most modern hearing aids this is to some extent overcome by the incorporation of an automatic volume control which limits the output of the aid after a certain level of amplification is reached.

In cases of severe hearing loss an aid may be of little use, and greater reliance must be placed on lip reading. With a slowly progressive deafness some skill in lip reading may be acquired unconsciously, but lip reading instruction is indicated for the majority of patients with a very severe deafness. Lip reading is more easily acquired by younger patients, and it may present considerable difficulties for the elderly.

A great deal is said and written about the problems of communication. In this respect the deaf are at the greatest disadvantage, and though much can be done by the provision of hearing aids and lip reading classes, it is equally important to understand their difficulties and give them every encouragement to play a full and useful part in society.

TODAY'S DRUGS

With the help of expert contributors we print in this section notes on drugs in current use.

Narcotic Analgesics—I

The use of the potentially addictive analgesics should be virtually restricted to the treatment of acute, severe pain and the chronic distressing pain of advanced malignant disease. Nearly 200 preparations and formulations of about 25 drugs are currently available.^{1,2} The clinician's choice is not made any easier by the often conflicting claims. However, since none of the other drugs eliminates the main drawbacks of morphine, improvement in one respect being balanced by some disadvantage in another, morphine probably still remains the principal analgesic in the addictive group while the others are used where morphine has clear disadvantages. Nevertheless some differences exist which are therapeutically useful, particularly differences in central effects, in individual sensitivity, and in absorption from the gastrointestinal tract.

Systemic analgesics act by modifying the appreciation of the painful stimulus and the reaction to it without causing unconsciousness; the pain may still be felt but the patient feels detached from it. It is perhaps not surprising to find that drugs that do not specifically block pain also commonly cause cerebral side-effects such as drowsiness, euphoria, and mental clouding—sometimes judged to be advantageous and sometimes not.

In Surgery

Narcotic analgesics are widely used for preoperative medication. Morphine (or papaveretum) is still the most commonly used drug, though unwanted side-effects probably outweigh advantages.^{3,4} This preference is partly based on tradition and partly on a wish to relieve pain during recovery from the operation. The wider choice of sedative drugs and use of recovery rooms with specially trained nurses may change habits.

Postoperatively analgesics are sometimes prescribed so as to be administered entirely at the discretion of the nursing staff; the dose may be mistimed and sometimes miscalculated, being insufficient for some, and too much for others. It is preferable that the first dose should be slightly less than that calculated as optimum for the patient, the maximum effect then observed, and further doses prescribed according to individual response. Only exceptionally need narcotics be used for more than a day or two, after which less powerful analgesics can be substituted.

In Obstetrics

Analgesics are used when labour has become established, and pethidine is the most popular choice, though there has been remarkably little to substantiate this preference. However, the respiratory centre of the newborn infant appears to