Routine speech discrimination tests

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THE main function of hearing in the day-to-day lives of most of us is in relation to communication. While the ability to hear noises is very important, the ability to discriminate speech is more important still and therefore any routine test of hearing ought to include assessment of speech discrimination.

The speech discrimination curves, plotting the word score against the intensity of the sound, frequently carried out in the investigation of sensorineural deafness, are time-consuming procedures, where up to five or even six lists of twenty-five words are used for each ear. This test has value in the investigation of certain types of deafness but is unnecessarily complicated in testing the ability to discriminate speech in the average patient with a hearing problem.

We feel therefore that a routine test of the speech discrimination which is straightforward, quick and reasonably reliable, should be part of the routine investigation of anyone complaining of deafness. Such a test is common practice in most centres in the U.S.A., but tends to be looked upon with suspicion in Britain. As illustrated in the case reports below, the ability to discriminate speech cannot be predicted accurately in every case from the pure tone audiogram, but at the same time, neither is a full speech discrimination curve necessary to determine such ability.

Speech discrimination tests

The test that we use as a routine consists of a list of 25 phonetically balanced monosyllables. With the non-test ear adequately masked, these are presented to the test ear at an intensity of 40–45 decibels above the average air conduction thresholds for 500, 1,000 and 2,000 cycles per second. The number of words repeated correctly is expressed as a percentage and referred to as the speech discrimination score.

While we feel that this test should be routine in anyone who has any complaints regarding his hearing, there are three particular situations where it is of especial value.

1. *In relation to surgery*

Many patients about to undergo middle ear surgery have an associated sensorineural hearing loss, the extent of which may vary from a few decibels to 40–50 decibels. It is unlikely that even the most enthusiastic

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neuro-otologist would suggest detailed investigation of the sensorineural element in each one of these cases. Nonetheless, the ability to discriminate speech is not equal in all of them and before consideration of surgery some form of routine test for speech discrimination is advised in patients with either chronic suppurative otitis media or otosclerosis. Guilford (1966) has reported patients with poor speech discrimination on whom he carried out stapedectomy operations. They had excellent results in terms of air-bone gap closure but were so distressed by the meaningless sounds that they requested removal of the piston to reduce their hearing again.

Treading more gently, we come to the question of spurious audiometry. Fortunately, with the present state of audiology in this country, it is rare for grossly inaccurate audiograms to be presented to the otologist. Nonetheless, masking of bone conduction is a difficult procedure and there are few clinics that would not admit to 'dead' ears presenting as shadow curves from time to time, even if this happens only on the day when the student audiologist is standing in because the more senior technician is ill. While masking for pure tones can present problems, especially with bone conduction tests, masking for speech discrimination testing is quite simple and a speech discrimination test therefore will show immediately that an inner ear is without useful function (Figs. 1*a* and 1*b*). We have seen cases where the Weber was lateralized with the 256 c.p.s. tuning fork to the diseased ear, despite the absence of useful inner ear function.

Postoperatively the desired result of surgery is not only an improvement of pure tone hearing but also a maintenance, or possibly improvement, of speech discrimination. For this reason in the assessment of surgical results the measurement of postoperative speech discrimination is important (Fig. 2).

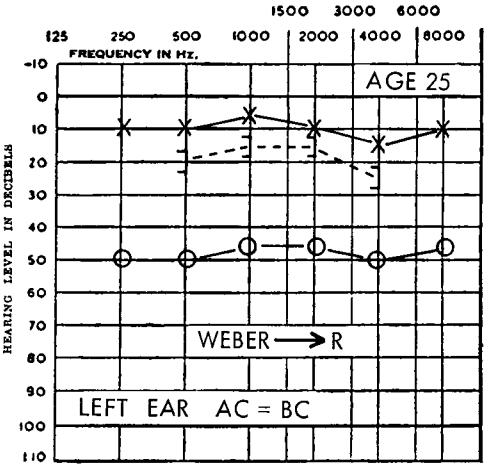


FIG. 1*a*.

A good case for surgery?

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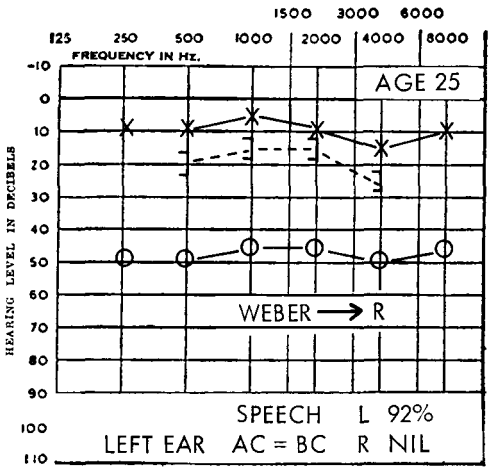


FIG. 1*b*.

Not to improve the hearing! The bone and air conduction curves on the right are simply shadows of those on the left, due to inadequate masking. Despite the lateralization of the Weber to the right side, there is no useful inner ear function.

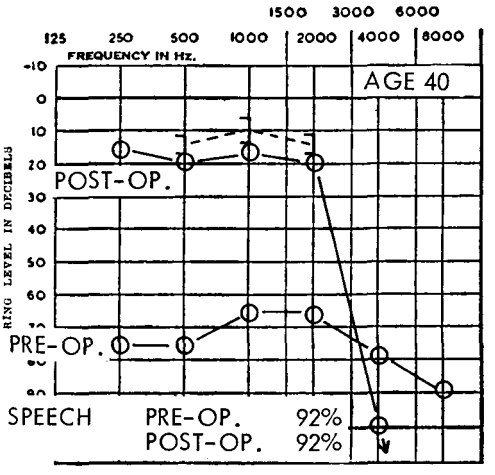


FIG. 2.

The preoperative and postoperative scores in a difficult stapedectomy. Without the knowledge of the speech score, considerable doubt could be cast on the success of the operation. Despite almost complete loss of high tone hearing the patient was delighted with the outcome.

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2. Fluctuating deafness

It is widely recognized that the deafness of Ménière's disease and congenital syphilitic labyrinthitis is of a fluctuating type. In the early stages this fluctuation applies largely to the low frequencies, but when the disease becomes more advanced the pure tone threshold tends to be depressed across the whole frequency range and the fluctuation lies more in the ability to discriminate speech than in the pure tone threshold. This is illustrated in the following cases (Figs. 3, 4, 5):

Mr. S. (Figs. 3*a* and *b*). When seen in October 1969 this 48-year-old patient had a relatively stable hearing loss in his left ear as a result of Ménière's disease. In early summer 1970 he again became aware of fluctuation. The hearing test in June 1970 shows that, while his pure tone audiogram had altered very little, there was a marked fall in his speech discrimination. He was aware that the problem was in discrimination rather than in sensation level. In August 1970 he had a further small fall in pure tone sensation level but was unable to discriminate words at all. In effect, his left ear had gone from serviceable in October 1969 to useless in August 1970, with a fall in pure tone hearing averaging only 20 decibels across the frequency range (Fig. 3*a*). Thus to express his hearing in terms of pure tone loss would be quite meaningless.

Following repeated stellate ganglion blocks and high doses of vasodilating drugs, there was a small improvement in pure tone hearing but a good improvement in speech discrimination (Fig. 3*b*).

Mrs. B. (Fig. 4). This patient with progressive, although fluctuating, deafness due to congenital syphilitic labyrinthitis was treated with massive doses of ampicillin in October 1967 (Kerr *et al.*, 1970). While there has been minimal change in her pure tone thresholds there has been an excellent improvement in speech discrimination. The speech audiograms correlate well with her subjective impression of improved hearing.

Mrs. D. (Fig. 5). This patient has an otological diagnosis of syphilitic labyrinthitis (congenital, or possibly, acquired), but because serological tests have been equivocal and family and personal histories negative, the venereologists are reluctant to accept such a diagnosis. At present she is receiving ACTH 40 units intramuscularly twice weekly and her speech discrimination on the right side is being maintained. She is totally deaf on the left side. When ACTH had been withheld (Fig. 5—lower curve), a small fall in pure tone hearing occurred, but accompanied by a disproportionate fall in speech discrimination so that she was totally isolated. The upper curve shows the hearing one week later, following further ACTH injections, with a small change in pure tone hearing but a dramatic improvement in speech discrimination, and, from her point of view, the ability to 'hear' again.

It is our experience that in these cases of advanced sensorineural hearing loss, especially with congenital syphilitic labyrinthitis, *the speech*

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discrimination scores which we obtain by our standard test correlate exceedingly well with the patient's subjective assessment of his hearing. Reports of hearing levels in advanced Ménière's disease or congenital syphilitic labyrinthitis are meaningless without some record of speech discrimination ability as pure tone levels do not of themselves indicate useful hearing.

3. Assessment for hearing aids

Not all cases of sensorineural deafness or of presbycusis have difficulty in discriminating speech. Certain patients with sensorineural deafness

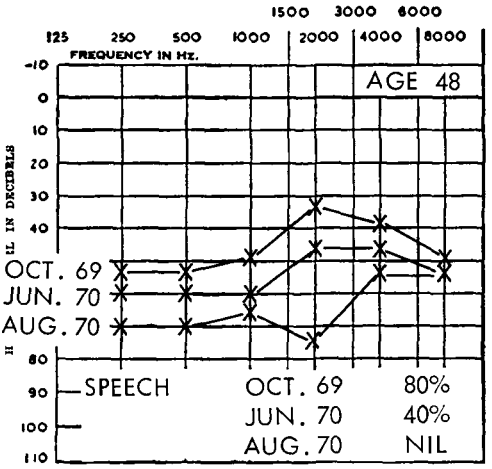


FIG. 3a.

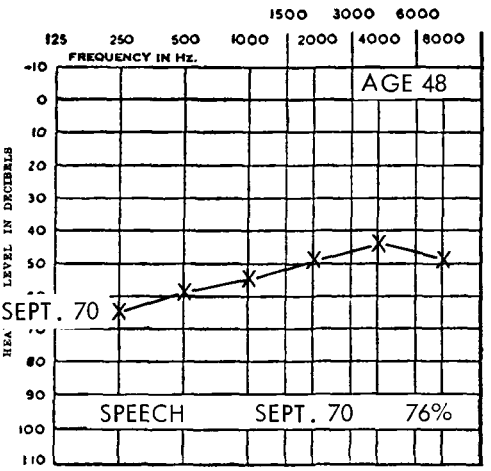


FIG. 3b.

Fluctuating hearing loss in Ménière's disease (*see text*).

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predictably get satisfaction from hearing-aids, while there are others, where it can be predicted equally confidently, who do not get satisfactory results from amplification. The factors influencing such a result include:

(i) the slope of the audiogram;

(ii) the presence or absence of recruitment; and

(iii) the number of functioning nerve fibres remaining in the auditory nerve.

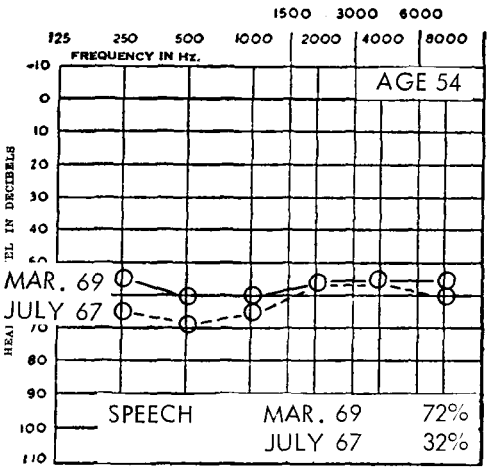


FIG. 4a.

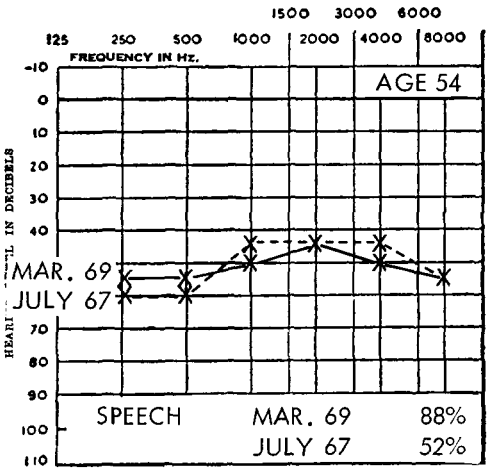


FIG. 4b.

Fluctuating hearing loss in congenital syphilitic labyrinthitis (*see text*).

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Routine speech discrimination tests

Figs. 6 and 7 show the audiograms of patients whose pure tone hearing is quite similar but where there is a marked difference in the speech discrimination levels. The patient in Fig. 6 got an excellent result from a hearing-aid, whereas the patient in Fig. 7 obtained very little benefit. Frequently, when patients first fit hearing-aids, they have difficulty in adapting to them, but in such a patient as shown in Fig. 6 one can give

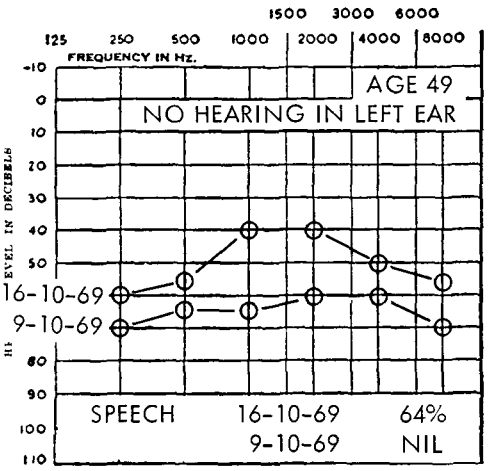


FIG. 5.

Fluctuating hearing loss in ? syphilitic labyrinthitis (*see text*).

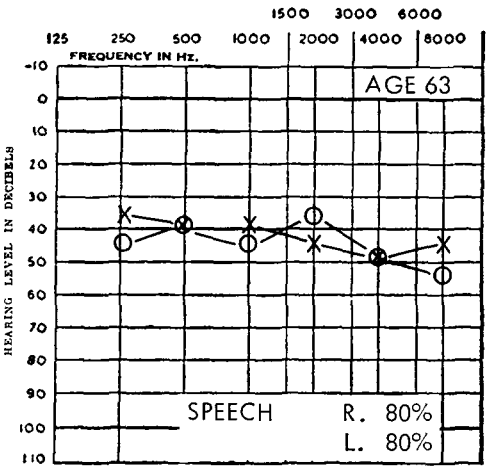


FIG. 6.

The probable underlying pathology is atrophy of the stria vascularis. This patient obtained a good result from a hearing-aid because of his good speech discrimination.

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considerable encouragement and exhortation to persist with the wearing of the aid, as it is extremely likely that once he has adapted to it he will get a good result. Similarly, with other types of deafness a prediction can be made as to the outcome of the use of a hearing-aid.

Discussion

The provision of equipment for routine testing of speech discrimination is not expensive in the terms of present-day audiological equipment. Most audiometers can easily be adapted so that by the use of a standard tape recorder, a word list is presented through the audiometer ear phones at a

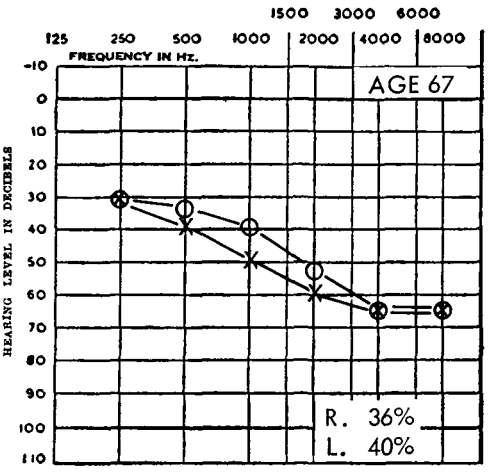


FIG. 7.

The probable underlying pathology is degeneration of the auditory nerve. This patient predictably failed to get a good response to a hearing-aid, despite the reasonably flat pure tone audiogram.

known sound intensity. Nonetheless, there must be some situations where this provision cannot be made available, but even here the ability to discriminate speech can readily be tested. Using a Barany noise box to mask the non-test ear and reading off from a card a phonetically balanced word list, the otologist can assess there and then, if only in general terms, the patient's ability to discriminate speech.

It is our contention that an ear has not been examined fully until some assessment of speech discrimination has been made.

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REFERENCES

GUILFORD, F. R. (1966) Personal communication.
KERR, A. G., SMYTH, G. D. L., and LANDAU, H. D. (1970) *Archives of Otolaryngology*, **91**, 474.

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