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Discussion on scope and application of current audiometric tests

By Dr. J. D. Hood (London)

Dr. Hood said that there could be no doubt that future progress in audiology must depend upon the continuous development and evaluation of new audiometric test procedures of the kind which Prof. Lidén and Mr. Wilmot had given such an able and valuable account. Nevertheless from the practical point of view he cautioned against over indulgence in the use of these tests. Some had a high reliability and others a low reliability.

If a diagnosis were to be based on the results of a battery of tests then it was inevitable that the latter would debase the former and the end result would be less reliable than would have been obtained from the application of a single test procedure. The alternate binaural loudness balance test for loudness recruitment was a case in point. Dix and Hallpike (1958) and others had shown it to be 100 per cent accurate in predicting end organ lesions and 90 per cent accurate in predicting nerve fibre lesions. This was a simple test to administer but it was absolutely vital that proper attention be given to a variety of small but important points in the technique. If these were adhered to then there was no single audiological test procedure that was its equal in the diagnosis of nerve fibre lesions. Surely it was better to take the time and trouble to carry out a few well chosen tests well, than a variety of tests badly.

By way of illustration Dr. Hood described a case seen recently by Mr. Spencer Harrison at the National Hospital, Queen Square. This was a lady who originally presented some $2\frac{1}{2}$ years ago with repeated attacks of vertigo and some slight deafness of the left ear. Although she had been originally diagnosed as Ménières disease an early acoustic neuroma could not be excluded and she was accordingly referred to a surgeon in America. Extensive audiological tests were carried out there and the report was as follows: Audiological studies showed 33 db. average loss in her left ear, with 88 per cent discrimination and a type II Békésy with a type IV in the discreet frequencies. She had no evidence of recruitment by S.I.S.I. scores. Presumably the apparent absence of recruitment and the Békésy type audiogram aroused the surgeon's suspicions and she was then subjected to further X-rays, polytomography, colloidal gold studies, electrophoretic studies and air studies the results of which were all minimal or negative. Despite this and again presumably in view of the apparent absence of recruitment the surgeon came to the conclusion that the patient had either multiple sclerosis or a brain tumour and told her so. Dr. Hood suggested that it was unlikely that the patient received this information with

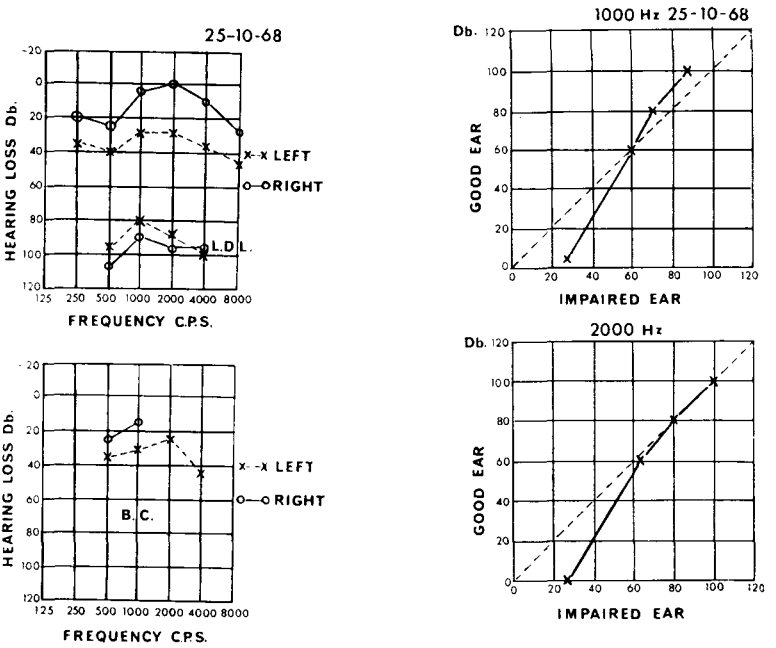
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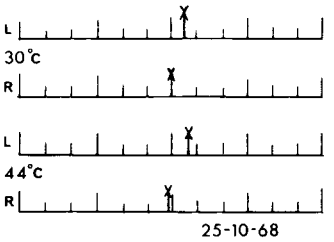
equanimity. In any event she returned home and since then despite repeated neurological examinations which failed to reveal anything, her condition worsened and eventually she was referred for psychiatric opinion. Last month she was seen by Mr. Spencer Harrison. She was in a state of considerable distress and unable to walk unaided. His findings are shown below. His diagnosis based for the most part on the one test that did not appear to have been carried out in America namely the loudness balance test, was an end organ lesion probably Ménières disease. The psychiatrist's opinion was that this patient's profound disability was largely functional in nature, originating in the labyrinthine disturbance and aggravated by the uncertainty in her mind about the cause of the trouble. She was reassured on this point and after brief psychiatric treatment was discharged almost symptom free. It could of course be claimed that Mr. Spencer Harrison was being wise after the event but one could not help wondering if this patient's unhappy history over the last 2 years would not have been very different if the American surgeon had been in possession of the one vital piece of information that would have taken only 10 minutes to obtain namely that loudness recruitment was present and complete.

The moral of this tale needed no emphasis. With the introduction of such a bewildering variety of audiological test procedures Dr. Hood thought that the time had come for us to get our priorities in the right order. Both speakers had referred to tests of pathological adaptation either in the form of the Békésy audiogram or of tone decay tests. He thought that the Otological Research Unit at Queen Square could take some credit for having pioneered this subject (Dix, Hallpike and Hood, 1949; Dix and Hood, 1953; Hallpike and Hood, 1951; Hood, 1950, 1953, 1955 and 1956). In fact it was reported upon to the section of otology first in 1950 and again in 1953. At the time we were enthusiastic about these tests because the occurrence of pathological adaptation in end organ lesions and in nerve fibre lesions appeared to be so dramatic. In the years that followed we learned as others were now beginning to learn that it did not have the diagnostic significance we first thought, since, although in general it could be said that pathological adaptation was greater in nerve fibre lesions than in end organ lesions, this was an inconstant finding. We still used these tests but only in exceptional cases where they were likely to provide additional information. Brain stem lesions were a case in point and Dr. Hood suggested to Prof Lyden and Mr. Wilmot that it was in this field that they were likely to have their most useful application. Speech tests had their greatest value in their demonstration of a patient's social disability. Debasement of speech recognition, however, as had been shown (Hood, 1968), could be correlated with the degree of disorder of the loudness function either in terms of loudness recruitment or of loudness reversal. In other words it was to some extent a rather poor measure of disordered loudness function and from the diagnostic point of view it would seem preferable to make direct measurements of this function itself either by means of the loudness balance test or the loudness discomfort level test.

In the experience at Queen Square speech tests had their greatest diagnostic value in the investigation of patients with little or no hearing loss in whom a retrocochlear lesion was suspected.

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All these tests did have some value but the burden of Dr. Hood's remarks was that they should be used sparingly and with discrimination and never at the expense of the basic audiological tests of air and bone conduction audiometry and loudness recruitment tests. These latter tests were within the range of any otologist and if he used them correctly Dr. Hood suggested that he would be at no great disadvantage to those in possession of more elaborate and expensive equipment.

It was necessary to add, however, that although the technique of these tests was simple, the principles underlying them were by no means simple. In a busy clinic few otologists could spare the time to carry out the tests themselves. What was needed, and needed urgently, was highly-trained personnel,

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skilled in carrying out these tests and fully conversant with basic audiological principles.

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BERNARD H. COLMAN (Oxford) said that it had long been recognized that unilateral sensorineural deafness was not a finding which could be lightly dismissed. Indeed the main endeavour in audiology at the present time was perhaps towards aiding the differentiation of sensory from neural lesions and much of Dr. Lidén's paper had emphasized this.

It was also becoming increasingly recognized that the early diagnosis of cerebello-pontine angle lesions and VIIIth nerve tumours depended on adequate evaluation of apparently trivial symptoms, and it was only by utilizing tests such as those Dr. Lidén had described that this could be accomplished.

Mr. Colman's own experience was that the use of multiple tests was sometimes confusing and that results could be conflicting. Accordingly it was most necessary to take an overall view of all investigations together with the patient's whole problem.

He felt that the conflicting nature of test results could arise from various causes. Firstly nearly all the tests available were subjective ones and quite difficult for the patient to perform. The stapedial reflex method of detecting recruitment was a notable exception to this situation in being an objective examination. Secondly the complexity of the tests left plenty of room for observer error which could only be eliminated by the acquisition of faultless technique. Thirdly, it was necessary to remember that sensory and neural deafness sometimes co-existed, or both could result from the disease process present. As an example he quoted the cochlear changes which histo-pathological studies had shown to be present with acoustic neuromas and he suggested that such combined abnormalities not only accounted for the phenomenon of partial recruitment, as was now generally accepted, but also explained the discrepancies which sometimes occurred between the other tests.

Although many complex tests were now available he submitted that the binaural test of loudness balance still remained of prime importance. It was highly reliable especially when the opposite ear was normal or still retained a normal threshold for one frequency, was rapid and easy to perform, and needed

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only basic audiometric equipment. It was a well-established test, the value of which should not be obscured by the emergence of newer investigations.

R. R. A. COLES (Southampton) said that he would like to ask a number of detailed questions and make one or two general observations. Would Professor Lidén comment on how frequently he found the W-shaped tympanogram in cases of ossicular discontinuity or thinly-scarred hypermobile tympanic membrane? Usually, using a Madsen acoustic impedance meter, a very steep and deep V-shaped notch seemed to be the most common pattern of response. Would he also comment on the minimum degree of conductive deafness at which the stapedius reflex response failed to result in a measurable change in impedance? At Southampton, reflexes had sometimes been observed in ears with up to about 15 db. of conductive deafness. Finally, what was the explanation of the speech audiometric figures that he showed whereby the S.R.T. could be about 40 db. whilst the discrimination score was 0 per cent? If no words could be heard, how was the S.R.T. measured?

In the case of acoustic neuroma illustrated by Mr. Wilmot the stapedius muscle reflex was recorded as present, yet the loudness balance test for recruitment had been negative. Was this a non-acoustic reflex and, if so, what stimulus had been used? If an acoustic reflex, what was his explanation for this occurrence?

In Dr. Coles's own current research, patients were being subjected to batteries of tests to find out which gave the most useful results and would be most worthwhile for adoption into general otological practice. On the basis of this experience, the discussant wished to express his complete agreement with Dr. Hood that the loudness balance test for monaural cases and the loudness discomfort level test for binaural cases were the most useful single tests available. However, in spite of recent discussion with Dr. Hood on this subject, he felt that these two tests could not be relied upon with quite the degree of reliability shown in the various published National Hospital series when applied to the full range of clinical cases showing perceptive or mixed deafness of all degrees and diagnostic categories. With this limitation in mind, he was glad to hear Mr. Wilmot differentiate between tests of recruitment for diagnosis of cochlear deafness, and tests of tone decay, speech discrimination, etc. for diagnosis of auditory nerve lesions. It would seem that the interests of many patients would best be served by carrying out at least one test for cochlear disorder and at least one for nerve lesion.

IAN ROBIN (London) said that in view of the fact that, some time in the future, otologists in Britain would be asked to assess the degrees of disablement due to noise-induced deafness, for compensation purposes, could the openers indicate briefly whether it was possible to gain an assessment by a simple decibel scale, which would be fair to both the worker and the authorities?

KENNETH MCLAY (Edinburgh) said that while agreeing with Dr. Hood that Fowler's Loudness Balance Test is the most reliable test for recruitment

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in those cases where it can be performed, there are many cases of sensory neural loss where it is not possible. Bilateral cases of sensory neural loss are much commoner than unilateral cases and it is necessary for a detailed assessment of alternative tests, as has been described by Professor Lidén, to be carried out both to evaluate these tests and to increase our understanding of sensory neural deafness.

STUART MAWSON (London) said that while batteries of audiometric tests were very interesting and stimulating to further advances, it had to be remembered that, for the busy otologist practising in the average E.N.T. clinics in this country, there were three facts which always had to be borne in mind:

1. the expense of the equipment which national economy at present did not favour;

2. the chronic shortage of audiometricians which made it impracticable in most places to carry out any but the most indispensable tests;

3. the time-consuming aspect of the tests which are particularly disadvantageous in the case of children who quickly fatigue and who had to be examined again and again even with simple tests before a true assessment of their hearing could be made.

DAVID BAWTREE (Guildford) said that: 'If I were a young otologist coming to one of these meetings for the first time, I would feel that none of the pathological conditions discussed could ever be diagnosed without the patient being subjected to such a potent battery of complex tests.

'I would like to make a plea for some reference at least, to be made to "The History, The Whole History, and in some cases, Nothing But The History" in the establishment of diagnosis of certain of these difficult cases, such as Ménières Disease.'

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