particularly the orbicularis palpebrarum, were observed. The arms and legs were poor in tone and power, the tendon reflexes generally were diminished, and flexor plantar responses were obtained. There was analgesia of the distal parts of the limbs.

Mental State.—The patient appeared vacant and dull, and was confused in manner and conversation. She was listless, her reaction to questions was poor, her memory defective, and she was partly disorientated. Her judgement and reasoning powers were impaired, and she showed no insight into her condition. During the course of the illness she was generally euphoric, and would often reply when questioned as to how she felt, "I feel splendid." She was rather facile and emotionally unstable, and appeared to be somewhat retarded mentally.

A diagnosis of septic endocarditis was made, and her further progress was as follows. During the week following admission her general condition was more or less unchanged. She was running a remittent temperature ranging between 99.2° and 103°. She was markedly asthenic and often incontinent of urine, and fresh crops of purpuric rash were noted. She complained of headache at times, but was, for the most part, dull, listless, and confused. However, the degree of confusion varied greatly; at times she appeared semi-stuporose, at other times she was restless, talkative, and emotional.

On the morning of the eleventh day after admission there was an alarming collapse. She had just taken some fluid nourishment when she suddenly became semi-comatose. The pupils were small, reacting freely to light, and the corneal reflex was present. Some twitching of the right facial muscles was observed, the limbs were flaccid and paretic, diminished tendon reflexes were obtained, and a double extensor plantar response was present. There was marked albuminuria, but no other abnormality was observed in the urine.

Later the same day she regained consciousness, and again declared that she felt "splendid." She passed a comfortable night, and the following day appeared slightly improved, although still confused and disorientated. In the evening, however, she complained of severe occipital pain; nausea and retching were present, and she lapsed quickly into a comatose condition and died.

Post-mortem Findings

The lungs both showed marked oedema and congestion.

The heart was considerably enlarged, weighing 630 grams. The right auricle and ventricle were both dilated, the tricuspid and pulmonary valves thin and atrophic, and the myocardium pale, fatty, and rather friable. The left ventricle was considerably hypertrophied; the mitral valves were shrunken and scarred, and were the seat of crumbling vegetations, extending to the adjacent endocardium of the left auricle, which, over an area of almost two square inches, was ulcerated and eroded by haemorrhagic friable vegetations. There were numerous small haemorrhagic infarcted areas in the walls of the small intestine.

The kidneys were both very much enlarged, and were pitted and lobulated. The capsules were thin and stripped fairly easily, and many small white infarcts were present.

The spleen was rather larger than normal, and was very soft and almost diffuent. A number of small infarcts were present.

The Brain.—There was extensive subdural haemorrhage over the occipital region of the brain, and the pia-arachnoid was very congested. In each occipital lobe there was an area of haemorrhages about the size of a walnut and extending back to the posterior pole of the hemisphere, and, in the case of the left side, the haemorrhage showed some early organization and an attempt at encapsulation. There was, further, a small haemorrhagic area in the right lobe of the cerebellum.

My thanks are due to the medical superintendent and Dr. Sidney Nix for permission to publish this case.

E. De Lauro (*Il Morgagni*, February 10th, 1935, p. 147), as the result of experiments on guinea-pigs, found that quinine injected subcutaneously in the form of the bichloride has an elective affinity for the internal ear, and in a lesser degree for the external ear, whereas the middle ear does not absorb the drug at all. Quinine was also found in more or less abundance in the nervous system, liver, and spleen.

AIDS FOR THE DEAF*

BY

PHYLLIS M. TOOKEY KERRIDGE,

M.Sc., Ph.D.LOND., M.R.C.S., L.R.C.P.

DEMONSTRATOR IN APPLIED PHYSIOLOGY, LONDON SCHOOL OF HYGIENE
AND TROPICAL MEDICINE; LECTURER IN DEPARTMENT OF
PHYSIOLOGY AND BIOCHEMISTRY, UNIVERSITY
COLLEGE, LONDON

I propose to consider in this paper what practical advice a general practitioner can give to help those deaf patients who are left with a permanent disability after the best has been done for them on medical and surgical lines. The resources that are available do not seem to be known widely or clearly enough.

Measurement of Deafness

A patient will measure his own deafness as it affects his work or home life. Many do not consult a doctor until they have considerable difficulty in hearing ordinary conversation. Few come in the early stages, when they do not hear when they are tired, or when they are not paying attention, or in general conversation, or in the theatre. Some come when they can only hear speech shouted in their ear, or cannot hear it at all, having already spent much money and energy on so-called remedies and aids. The patient's estimate is almost as valuable as any rough hearing test done quickly on a single occasion on a nervous patient. For deafness nearly always varies from time to time with changing physiological and psychological conditions. It is worth while doing some test, however, as the patient's idea may be influenced by lip-reading, which may be learned and practised unconsciously. I have heard a lady declare that her kind of deafness was such that she could only hear in the light! Tests with voice, watch, or ordinary tuning-fork gave comparative results of value to anyone performing them in a standard manner. If apparatus and facilities are available, a test can be made of the patient's hearing by air and by bone conduction over seven or eight octaves, using calibrated tuning-forks or a pure tone audiometer. In this way a very clear and accurate picture of the disability can be obtained and progress watched. This is a valuable help to the doctor, but not yet an essential one (except in the case of children too deaf to acquire speech naturally), for reasons which will be apparent.

Many of the troubles of the deaf are, strictly speaking, outside the province of the medical adviser. Self-conscious and afraid of admitting that there is anything wrong, they generally tend to blame the faulty diction of the present generation, or the acoustical properties of the theatre. They feel more out of contact with their fellows than the blind, losing the points of all the jokes, and noticing the omission of the words of endearment, which nobody likes shouting. Their families tend to get irritated at their requests for repetition, and say or imply that they always hear when they want to and pay attention. This is probably a true accusation in the early stages, and is indeed an early symptom of deafness. It should also be remembered that the extra mental effort required by the slightly deaf is tiring, and that fatigue increases deafness, so that a vicious circle results. I have read recently an excellent book written by a deaf lady for the deaf and their friends, called *Breaking out of Prison*, by Margaret Munro (Methuen). It is simple, sincere, and full of practical advice worked out from personal experience. It is well worth recommending to any patient whose chief disability resulting from deafness is a thwarted and repressed outlook.

Aids

Any young deaf person should be advised to learn to lip-read, irrespective of whether or not an instrumental aid is advocated. It is an invaluable accomplishment,

* Based on a lecture given to the Paddington Medical Society, May 14th, 1935

which will stand the person in good stead however deaf he may become. It is learned more easily when the patient is slightly deaf, and can be used more and more if the deafness increases. Some learn to lip-read unconsciously, as has been already shown; others find it difficult even after a course of good lessons and much effort. It seems to be an art rather than a science, and self-discipline in order to acquire the habit of watching the face is an important factor. Certainly it is not the most intellectual who make the best lip-readers.

There are good facilities available for learning lip-reading. There are five London County Council schools for partially deaf children, as well as afternoon and evening classes for adults, at nominal fees. The National Institute for the Deaf (Secretary: A. J. Story, Esq., 2, Bloomsbury Street, W.C.1) and the National College of Teachers of the Deaf (Secretary: N. S. Follwell, Esq., The Mount, Stoke-on-Trent) both keep lists of private teachers of lip-reading with addresses throughout the country.

The subject of instrumental aids for the deaf is one which has caused great interest and greater confusion. Most of both is due to exaggerated and even fraudulent commercial advertisement. Much of the trouble would be avoided if the medical profession could advise their patients more precisely on the subject, but there is no source of information readily obtainable, either in textbook or in hospital teaching. I propose to outline briefly the types of instrument that are available. It must be emphasized that the following classification is based on the nature of the instrument, and not on the character or the extent of the deafness for which it is suitable.

Instrumental Aids to Hearing

These fall into three groups: (1) collectors and resonators, (2) microtelephones, and (3) valve amplifiers.

The first group are non-electrical, and include horns, auricles, trumpets, and speaking tubes. These have been in use for hundreds of years, and are still of great service. They are as powerful as some electrical instruments, are cheaper to buy, and entail no expense of upkeep. They give the most natural quality of reproduction. Moreover, they bring the sound right to the ear, and magnify it by resonance, just as the vibrating body of a violin increases the loudness of the note of the bowed string. As violins vary in tone and volume with shape, size, and other factors, so do auricles and horns. The disadvantage of the instruments is that they are conspicuous, although auricles can be worn elegantly by moderately deaf women with long hair (as in Fig. 1) with great satisfaction to themselves and to their friends.

FIG. 1.

The second, microtelephonic, group is the one which is the most frequently advertised, under innumerable names. I have not been able to discover any correlation between efficiency and price, which varies in different parts of London by 500 per cent. There are distinctions in detail between one make and another which cause considerable differences in comfort and serviceability, but the underlying telephonic principle is the same in all.

Although the telephone has been developed and exploited almost entirely for the use of those who hear normally, it was originally invented for the benefit of the deaf by Alexander Graham Bell, who was a professional teacher of the deaf, and had a deaf mother and a deaf wife.

The microtelephonic deaf aids consist essentially of a microphone, an earpiece, a battery, and a switch, suitably connected together with flex. The carbon microphone may be single or multiple, the largest type having four units joined in parallel. The earpiece may fit in, on, or behind the ear. The last arrangement makes it one of the much-vaunted bone-conduction aids. The battery is of the ordinary dry cell pattern, usually of 3 volts potential, but the contacts are frequently placed so that cheap refills cannot easily be substituted. A useful accessory, which is not on every make, is a variable resistance, which enables the loudness to be regulated within the

limits of the instrument. These aids can be carried in a handbag, or on the person, as shown in Fig. 2.

The microphones will work through any ordinary cloth, and are usually worn inside a man's coat or a woman's blouse. The battery can be put in any convenient place, such as the pocket, but the regulator, if attached to it, must be easily accessible, so that a deaf person conversing comfortably with a friend some feet away is not embarrassed by his friend leaning forward and telling him something important at a few inches distance. This type of deaf aid is much less conspicuous than the collectors and resonators. With care as to the disposal of the parts, and the colour and texture of the flex, it can be scarcely noticeable.

FIG. 2.

FIG. 3.

The third group, comprising the valve amplifiers, magnify the sound by the suitable use of radio valves, and are the latest arrivals in the hearing-aid world. The smallest of this class is bigger than the largest of the other types, and is carried about in a little attaché case, as in Fig. 3. The largest of them is for the use of groups of deaf people, as in church, cinema, or school.

Choice of Instrumental Aids

I will now discuss how the groups of instruments fit in with the types of deafness. Auricles help those who have moderate difficulty in hearing conversation, and a speaking tube can be used by the very deaf. Further than this, it is unprofitable to consider the first group on scientific grounds, as decisions for and against non-electrical aids are invariably made for personal reasons. Some people favour this kind as they are temperamentally incapable of dealing with a battery—for example, switching it off when not in use, or keeping a spare one handy. A few cannot afford batteries, or battery charging. Others avoid this kind of aid, as they would rather not hear at all than be seen with a conspicuous instrument.

Ideally it should be possible to prescribe a hearing aid according to each patient's requirements. With modern methods of testing deafness accurately this end is perhaps within sight, but it is premature to say that it can yet be done except in unusual cases. There are few available data on the sound-magnifying power of the electrical types. There is no fundamental reason why this should not be measured and published, and doctors should inquire for information of this kind when discussing the merits of instruments with commercial agents. Ask to what extent the instrument magnifies sound, and at what part of the auditory scale. Such figures as I have been able to obtain are easily correlated with those found from accurate testing of the patient's deafness. It appears to be quite unnecessary for the instrument to compensate completely for the hearing defect; it is sufficient merely to bring the total loudness of speech up to that of ordinary conversation. To achieve this perfectly one does not want to magnify sound uniformly, or in the

form most natural to a given type of instrument, but in an inverse form to the deafness.

It is rare to find anyone uniformly deaf. Many deaf people, especially the elderly ones, are much deafer for high notes than they are for low. They therefore require the high notes magnified more than the low, if they are not to complain that with an instrument they can hear loudly but not intelligibly. The microtelephones magnify most in the middle of the auditory scale, and only minor adjustments of response can be made by changing the nature of the diaphragm in microphone or earpiece. They are therefore not usually liked by the high-tone-deaf folk. Some use them, probably because they are not very critical of quality of reproduction, and are not so very much deafer for the high notes than the rest, or have become so so gradually that they make a mental adjustment for the distortion. But the great use of this type of instrument is for other classes of deafness. The small single microtelephone instruments are not more powerful than auricles, but are portable and less conspicuous, especially on men. The large quadruple microtelephones can reach some who have become too deaf to hear conversation at all unaided, and even some of those who have been born too deaf to acquire natural speech.

Bone-conduction earpieces are popular because they are less conspicuous than the others, but their useful field is a limited one. In a normal person hearing through the bone is far less acute than through the air, and air-conducted hearing must be diminished very greatly before it is profitable to use even undamaged bone conduction. Moreover, it is uncommon to find undamaged bone conduction in cases of severe deafness, even among those starting from middle-ear disease.

Something more like adjusting the instrument to individual requirements can be done with the valve amplifier aids. The details of design can be altered to magnify different parts of the scale in different degrees, and in the large sets considerable refinement can be introduced. The high-tone-deaf patient almost invariably likes this type of instrument far better than any other. But when it comes to a question of everyday use of the portable models the advantages may be literally outweighed. The batteries which are required for this type are comparatively heavy and bulky, and progress in portable valve sets is retarded on this account more often than on any other at the present time. Amateur wireless constructors have often designed very satisfactory circuits for themselves or their relatives by the method of trial and error. The commercial sets arrange for individual adjustment by various devices, such as a tone control transformer and potentiometer, the use of sound filters, or of headphones of varying response characteristics. There is still room for improvement in the degree and ease of differential magnification, but as much power is available as is required. There is a level of loudness at which the sensation produced is not hearing, but pain, and that level can be reached with some of the instruments at their maximum output.

Some Practical Illustrations

I will give a few examples to show how the choice of a hearing aid depends on the amount and nature of the deafness, together with the temperament and the circumstances of the patient. The initial cause of the deafness, even when known, seems to help very little in the considerations, so that full clinical histories will not be given. This apparent lack of correlation between pathological process and physical result may be due to the inadequacies of present-day knowledge, or to the frequent occurrence of mixed lesions of both conduction and reception with various diseases.

1. A lady in her sixties had become "hard of hearing." She disliked the idea of hiding a battery about her person, and preferred not to hear than to be seen wearing an auricle or horn. She decided to go on asking people to repeat what they said, and to go to better seats at the theatre. There is, in fact, no satisfactory mechanical aid for slightly deaf people, especially for theatre use, when distant sounds are required to be magnified very much more than near ones.

2. A young schoolmaster was deaf enough for it to be a professional handicap. He wanted to avoid at all

costs anything conspicuous which the boys might make fun of. He disliked the quality of the microtelephones, and was not deaf enough to consider a valve amplifier. He decided to learn lip-reading, and the relatively fixed positions of teacher and class made this particularly suitable.

3. An elderly lady living alone took pleasure in going to the pictures and playing bridge. The "talkies" sounded so distorted that she could not understand them, unless she paid for a seat to which a group hearing aid had been attached. She found that at bridge parties she sometimes "budded in" on other people's conversation as she had not heard it. She did not want to bother about anything very much, and was rather alarmed by a battery and wires. She decided to use a trumpet, as all her talking was at close range, but wished it was small enough to be hidden in her ear.

4. A laboratory assistant is so deaf that unaided he could not hear conversation at all. He has a quadruple microtelephone instrument, and wears the microphone hidden under his overall. With this help conversation is possible, and he is able to take instructions and keep his job. He uses one battery a week, and finds that the old ones will light his bicycle lamp after they are no good for the hearing aid. He has adapted the contacts of his instruments so that he can use standard cheap batteries. He can hear more easily and pleasantly with a valve amplifier, but this is not suitable to carry round in his job, and the commercial ones are beyond his means. He and a friend are constructing one for his use at home.

5. A young dressmaker was so deaf that she could not hear conversation unaided at two to three feet. She had had a single microtelephone given her, and with it close conversation was just possible. A quadruple microtelephone increased this distance, but as only individual conversation was still possible it was of no great advantage. Neither her work nor her circumstances justified a valve amplifier. She decided to learn to lip-read and to continue with the small instrument.

6. A professional man is too deaf to hear conversation unaided. He is an amateur wireless constructor, and has made himself a valve amplifier set, incorporating a tone control, with which he can hear conversation quite easily. He keeps two sets in working order by him, as he is quite incapacitated without one. He finds the tone control satisfactory for clear understanding, and a further advantage in that he can tune out the unpleasant qualities of voices which he disliked in his hearing days. He finds the instrument a nuisance to carry about, as one hand is permanently employed, and is thinking of making his next one in two halves attached to a belt.

7. A lady in her forties has become increasingly deaf for many years, until now unaided conversation is very difficult. She has household duties which involve a considerable amount of entertaining, and she is determined that neither she nor her family shall suffer because she is deaf if she can help it. She has had lip-reading lessons, and has worn auricles for some years with satisfaction, but recently these have not been sufficient. She now uses the latter only in the mornings in the house. She has a double microtelephone, suitably hidden on her person, for use when shopping and for individual

FIG. 4.—Circuit for a portable valve amplifier hearing aid (by H. Hartridge). Microphones (two): transmitter inset No. 10, mark 235; Siemens Bros. and Co., S.E.18. Valves: Osram Midget H.11. Valve holders: Wright and Weare Ltd., 740, High Road, N.17. Batteries: Ever-Ready, two "grid batteries" for H.T.; No. 800 for L.T. Voltmeter: Bulgin miniature. Replace anode resistances by chokes when available.

conversations. She has a home-made portable valve amplifier, which she likes very much, for dinners, lectures, and concerts. The circuit was devised for her a year ago by Professor H. Hartridge, M.D., F.R.S., and particulars are, with his kind permission, reproduced in Fig. 4. The set-up is such that it can easily be altered with advances in radio-technique, and dry batteries which can be bought anywhere are employed. The box in which it is contained is 10 by 4 by 5 inches, and the total weight is 5½ lb. She also has a wireless set at home which has a pair of headphones

attached, through which the broadcast programme comes to her specially amplified, and the same instrument can, by turning a switch, be made to amplify the conversation in the room for her benefit through the same phones.

8. A lady in her sixties has been deaf since her teens, and had not heard conversation for many years. She had led an active life, using fair lip-reading, writing, and some finger-spelling. She "heard" only with the most powerful valve amplifier available at its maximum, when she could not discriminate the words, and the sensation was painful. Obviously no instrument was an aid in her case.

Purchase of an Instrumental Aid

The National Institute for the Deaf performs a valuable service in keeping an approved list of hearing-aid dealers, a copy of which can be obtained by anyone sending a stamped addressed envelope to the secretary. Dealers on this list agree to several important points regarding commercial ethics, and also arrange that a deaf person can have any instrument for a three weeks' trial at home before purchase. A small fixed fee is charged if the instrument is not kept. Some firms supply instruments through hospitals at reduced rates.

The following advice may be helpful to patients who go to a dealer to try a hearing aid.

1. Take a friend with you, and listen to a voice you know as well as to that of the demonstrator.
2. Move about with the instrument on.
3. Switch the battery on—if it is an electrical aid—and listen when nobody is speaking, both when you are sitting down and moving.
4. Try more than one make of instrument of the type you favour.
5. See that the earpiece fits really comfortably. They can easily be adjusted to individual requirements.
6. Try a large earpiece as well as a small one.
7. Insist on a home trial without obligation to purchase.
8. When at home listen to general as well as to individual conversation.
9. See how long the battery (if any) lasts you, and calculate the cost of upkeep.
10. Do not wear a new instrument for too long at first. You will probably make your ears tired, and therefore seem more deaf.
11. If, after trial of an instrument, you can hear satisfactorily with it and procure one, and subsequently cease to be able to hear with it, or if adventitious noises develop, do not conclude that you are getting deafer or that the instrument is no good. Send it to be overhauled. A simple repair or renewal is probably all that is necessary.

Conclusion

I hope it will be clear from what I have shown that, although there are many factors to consider when giving advice about hearing aids, there is nothing occult about the instruments, and that no advanced technical knowledge is essential to understand their use; and finally, that an appropriate instrument may be a very real aid to a deaf person.

J. H. L. Cumston (*Bull. Off. Internat. d'Hyg. Publique*, April, 1935, p. 678) records an outbreak of forty cases of infectious jaundice with three deaths among the sugar-cane workers in Ingham, a town in North Queensland, from July to November, 1933. The clinical symptoms and post-mortem findings were suggestive of Weil's disease, but the examination of the patient's blood and urine as well as of the local rodents was negative. No further cases occurred between November, 1933, and June, 1934, but between July and August, 1934, there was a further outbreak of about 130 cases with four deaths. The first laboratory examinations were negative, but subsequently leptospirae were found in guinea-pigs inoculated with the patients' blood as well as in the patients' urine, and in the kidneys of rats from different localities in the district. Active measures were taken for destroying the rats, which were very numerous in the sugar-cane fields.

Clinical Memoranda

Intrauterine Pituitary Extract in Post-partum Haemorrhage

In performing Caesarean section most operators, when they are about to suture the uterus, inject pituitary extract, either hypodermically, intramuscularly, or into the uterus itself. It is not generally known—at least, I do not see any mention of it in the textbooks—that it is quite easy to inject the fundus uteri, *through the abdominal wall*, with an ordinary hypodermic needle, after the placenta has been expelled, provided the bladder is empty, or nearly so. To do this the uterus must be compressed bimanually, a fist being in the anterior fornix and the external hand behind the organ, pressing it forwards and upwards, whilst the patient lies upon her back.

Recently, after having delivered a monster from a woman in a case of extensive hydramnion of over fifteen pints, I could not get the womb to retract and contract, although 10 units of pituitary extract had been given hypodermically. Haemorrhage was alarming. I had been controlling the uterus bimanually for a quarter of an hour when the idea occurred to me to ask the nurse to inject another 10 units of pituitary extract, this time into the fundus, whilst I kept it in good position. The result was highly satisfactory, the organ hardening almost immediately, without any further relaxation of any moment. I believe that this simple procedure in all probability saved the woman's life.

Bradford. W. F. RAWSON, F.R.C.S.ED., M.C.O.G.

Foreign Body in Abdomen

The case recorded below appears to present several points of interest.

On January 13th, 1935, I was called to the Southport Infirmary to see a female patient, who gave the history of having fallen backwards downstairs when cleaning and had landed on her buttocks on the hearth brush which she was using. She stated that the handle had broken off at the bristles, and she experienced the sensation of "something shooting up inside her as if it was going up to her brain." She was afraid that the handle was still inside, but "most of her pain now was better, except for the sore feeling."

When I examined her I found a wound about one and a quarter inches long in her buttock, in the region of her right ischio-rectal fossa, which penetrated through the anterior and posterior walls of the rectum about one and a half inches from the anus into the vagina. She had some very slight lower abdominal tenderness.

Doubting that the handle of the brush could be inside, I decided to investigate, and took her to the theatre. Under a general anaesthetic I discovered that she also had a very large tear in the left lateral fornix, by the side of the bladder, into the peritoneal cavity. Having carefully cleaned out the vagina I tried to reach the foreign body from below, but was unable to palpate anything. I next sutured the wound in the buttock, and both in the vagina, but made no attempt to reach the trouble in the rectum. As the patient was rather shocked, and I was still disinclined to believe that a foreign body of such a nature could be inside the abdomen without giving rise to more symptoms, I decided to send her back to bed.

Next morning x rays revealed nothing, but she was very tender over the entire abdomen, and her pulse rate and