SOCIETIES' PROCEEDINGS.

ROYAL SOCIETY OF MEDICINE—OTOLOGICAL SECTION.

H. J. MARRIAGE, *President of the Section, in the Chair.*

MEETING on War Injuries and Neuroses of Otological Interest. For introductory papers, *see* JOURNAL OF LARYNGOLOGY, RHINOLOGY, AND OTOLOGY, June, 1917, p. 177, by H. J. Marriage, *and* November and December, 1917, pp. 340 and 369, by J. S. Fraser and Capt. J. Fraser.

Colonel BIRKETT, C.B.

I cannot offer any suggestions on the discussion which has been opened by yourself, but I think that perhaps Dr. Gordon Wilson, who has been making a special study of this work, may have a great deal more to say on the subject than I can. The number of ear cases in our hospital, which contains 2000 beds, is very great: I have a ward of seventy-five beds set apart specially for eye, ear, nose and throat cases. The class of ear cases which presents itself there is very largely the chronic suppurative variety. We do see a large number of cases of rupture of the tympanic membrane following high explosives. As to the situation of these ruptures, it has not seemed to me that there is any particular predominance of any one site. What we have noticed, and what we have tried to impress on the authorities there, is that interference with the ears, in the first place, should not be carried out at the Front. The patients nearly always come down with a history of having had the ears syringed. Last July, when we had these cases early, they came to us without having had this interference. We could then take care of them from the first, and we treated them as you suggested, Sir, and the result has been a satisfactory healing in the majority of cases. Where the rupture has been of considerable duration I found that nitrate of silver, 25 gr. to the ounce, applied to the edges of the rupture, stimulates the healing of it, so that in from six to eight weeks there has been complete closure, with marked restoration of hearing.

As to the psychical cases, they are, perhaps, the most pathetic we have to deal with. These men are broken in spirit, and their nerves are entirely shattered, and this condition is nearly always associated with mutism. It is, therefore, impossible to get any accurate results from our tests. We begin by encouraging these men to hear and speak. Often, however, those methods do not succeed, and then we try to shame the men out of their disability before their companions-in-arms. Sometimes those means are successful. One method was letting off an alarm apparatus suddenly: this shook one man so much that he eventually heard. I have nothing new to say about the subject, or anything to add to the pathology.

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Dr. Gordon Wilson.

It has been my good fortune, during the last six months, to be associated with the Canadian Hospital at Folkestone, and I have had many cases of deafness associated with labyrinthine troubles; I have records of over 100 cases of nerve-deafness. Recently I was sent to France to see recent cases of concussion-deafness there. I have not yet had time to examine my specimens, but I hope to do so when I get back.

We divided our cases into three groups: (1) Nerve-deafness; (2) cases of men with what we call a fixed idea that they cannot hear; (3) malingerers. Rupture of the drum may take place at any part of it; I have seen several cases involving the membrana flaccida: in one case it was driven in against the promontory, with complete rupture of the drum. In France it was curious to note how many of the men had no hæmorrhage from the ear, because, it was said, the injury had been so slight. While I was at the Ypres salient and on the Somme I probably saw 250 cases of shell-shock. Only fifty of those complained of deafness, and of those fifty only seventeen had actual nerve-deafness—a very small proportion. But at that time things were quiet on the Somme—at the end of December and in the month of January.

With regard to the cases with a fixed idea, rapid recovery occurred under hypnotism. Some of the cases recover if cold water is run into the ear. We never use the electric current, because if we do the result is an irritation of the vestibular nerve, and the production of intense vertigo.

With regard to the treatment of our cases, we ascertain whether the labyrinth has any activity in those in which there is complete deafness on one side or both. In all the cases we had at Westcliffe there was none in which mutism was not present, and all of them had been under otologists for periods ranging from two to twelve months, and had been sent to us at the end, particularly Canadians. We first run cold water into the ear, and get a caloric reaction. If we do not get that we do not trouble. If we do we proceed, always using tuning-forks. If we use the C or the C_1 fork against the ear, we may not get a reaction, but by using both, and thus having a summation of stimuli, we get it. In totally deaf cases we proceed to use resonators. We get tubes like speaking-tubes in the ear. All this will be published in full later.

One thing which has interested us very much I would like to mention. We have had cases of wounds of the cerebellum, and the question has arisen in connection with the differential diagnosis of labyrinthine disease from cerebellar tumour. It has been our good fortune to keep some of our cases under observation for several months, and we have been able to show that pure cerebellar injury results in a form of nystagmus which is different from that found in association with labyrinth cases. I need not proceed to tell you how that is the case. I was very pleased to see Col. Gordon Holmes when I was in France, and to learn that he had a large number of ward cases which bore on that fact. There is nothing more important in connection with the ear than to be asked the question: Is that a cerebellar case or is it the beginning of a labyrinthine case? I think the war records will show that some of our most difficult cases of cure have been those in which a missile has cut the facial nerve outside the ear, or in which there was complete deafness which we could not touch at all. When I was in Paris I was much interested in noticing that the same thing may be said of the war experience in France. I wonder whether anyone has noticed, in the deaf cases following trauma,

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a peripheral limitation of the field of vision as well as a peripheral limitation of hearing.

Mr. C. E. West.

I have found exactly the same thing as the last speaker just mentioned—namely, that the auditory field is contracted at both ends in these cases, and more or less symmetrically. I do not know whether in many cases the speaker found contracted visual fields as well. [Dr. Wilson: Yes.] The analogy of the two struck me so much that I use it as a metaphor in teaching.

I have seen comparatively few cases of direct injury of the ear while doing my war work, and that has surprised me. There have been a certain number of injuries of the pinna, cicatricial contraction, and so on, but they have been of no particular importance. Generally the collateral injuries are so much more important that one has to relegate the question of the ear to a secondary place.

One group of cases has struck me particularly—namely, glancing wounds of the temporal region about the ear without fracture, apparently a scalp wound only, but with the pericranium involved. In each one of those cases there was gross labyrinthine deafness. I saw this afternoon a gentleman who, years ago, had been shot at by a Dacoit in India, and received an exactly similar wound, and had just the same deafness on one side—in each case the same side as the injury, the other ear not being affected at all. How far it is permanent we do not know, because we have not the opportunity of following out indefinitely the cases which occur in the war, but the deafness is prolonged.

And we come across a large number of people who are said to be suffering from explosion deafness, and who, manifestly, are suffering from continued old chronic middle-ear suppuration without labyrinthine deafness or symptoms, or who have discovered, as the result of their own overhauling, after being blown up, that they have middle-ear deafness and are attributing it to shell-shock. A large proportion of the cases I have seen have been of that sort.

Another interesting thing is that there is a fashion in shell-shock effects. In the earlier days of the war there were a large number of cases of pseudo-labyrinthine deafness — people who recovered spontaneously or under some form of suggestion. Recently, at the First London General Hospital, these have been practically absent, and in their place there has been a stream of aphonics. I think these are largely due to suggestion: if a man thinks he will be rendered voiceless by being blown up, he is found to be so if he encounters that accident. With regard to people who, apparently, have true labyrinthine deafness, I do not know whether other surgeons succeed better, but I am hopelessly in the dark in regard to prognosis in these cases. A large number appear to recover almost completely, and the majority seem to get back useful hearing, slowly and gradually. A certain proportion of them seem to make no recovery. If anyone can tell me any bases for prognosis I shall be very grateful.

Dr. Dundas Grant.

Like Mr. West, I have been surprised that we do not see more cases of clear-cut labyrinthine injury. A large number of them consist of very ordinary cases of chronic suppuration or chronic catarrh, down to

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mere impacted cerumen. But there are many about which certain generalities may be stated.

My experience has been the same as that of our President and others: that where the membrane has been ruptured the involvement of the labyrinth, as a rule, has been very slight; in some cases the labyrinth has even escaped, though one of Mr. Fraser's sections seems to disprove that. That case appears to be an exceptional one.

I should like to know whether many members have seen what I should call an "in-driven" membrane. I have seen a few in which the membrane has been driven in and so closely related to the ossicles that the appearance was as if the ossicles were sculptured out, just as in an extreme case of relaxed membrane. In these cases the margin of the tympanum has been well defined.

With regard to the question whether a perforation with suppuration is recent or of old standing, or whether it is a recent traumatic rupture with subsequent suppuration, I think the best guide is the condition of the Eustachian tube. If it is quite patent, it is reasonable to think a traumatic injury of the drum is a recent one. If the suppuration has continued a long time and the Eustachian tubes are not very patent, it is impossible to say from this whether it is a chronic case or a traumatic rupture.

With regard to prognosis, of course when the caloric test is negative, the prognosis is probably at its worst. Another point is the upper range of audition, for when that is considerably lowered, the prognosis, as a rule, is bad. When that upper range is fairly well preserved, the prospects are good. I have gathered some statistics from thirty-one cases in which it has been tested. It was normal in twenty-five of them, there was slight lowering in three, and very considerable lowering in the remainder. In those in which it was preserved, the improvement was marked or very considerable. But in one case, at all events, in spite of that upper limit being preserved, there was no improvement, and it was found that there was a slow reaction to the caloric test. There were four cases in which the upper limit was preserved and there was no improvement.

With regard to the cases of deafness, a number of them came with the complaint of "deafness"; some of them had nerve-deafness, and the question arose as to whether there was nasal obstruction. I thought I should find it in a large number. Of fifty cases there was marked deflection of the septum in eleven, but thirty-one had nothing of the sort. Four had adenoids. Not all the cases of deflected septum caused any considerable obstruction.

With regard to the caloric tests, I would remind you of the apparatus for producing cold in the ear which I have before exhibited to the Section, and which has apparently been taken up by the Army otologists in France as a regular official test. It is a tube of copper, covered with a little cotton moistened with ethyl chloride. A current of air is driven through it, and as soon as it is at its coldest, as tested on one's own cheek, the patient's head is thrown back at an angle of 60° and he is told to turn his eyes to the opposite side, when nystagmus should be produced in from twenty-eight to thirty seconds. This obviates the dangerous practice of injecting cold water into the ear, in which a perforation may already exist. It has also been taken up by Moure in Bordeaux. The point through which the air enters the tube should be very small, otherwise the current is jerky. Dr. Paterson, of Cardiff, said it would be a good thing if we had an equally portable apparatus for making the hot

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test. I show you an apparatus which will do this very quickly. Mr. Clayton Fox has helped me in testing many cases, and we find we get nystagmus to the same side in about fifteen seconds. Some members may devise an improvement upon it. Perhaps the bottle might contain a saturated solution of sulphate of soda, which is heated, and allowed to solidify again, and heat thus generated. In cases in which you wish to get nystagmus to the same side rather than to the opposite side—there being one in that direction already—this solves what has hitherto been a problem.

With regard to the cases of psychical deafness, much can be accomplished by re-education. You get them to hear a simple vowel, but you must not worry them too much, or you will throw them back into their nervous state. I do not think Col. Birkett drew a line of demarcation between psychical deafness and simulated deafness. No doubt the reason he has not done so is that there is no hard-and-fast line: there are so many cases which blend both. I had the case of an officer who said he was quite deaf. We tried the noise machine, and he rose to it at once. That might be called simulated, but I think it is psychic, because he had not been a neuropathic, but had been so shaken up that he was reduced to the extremity of exaggerating his complaint, which he had only in a mild form, and which probably existed when he was "buried." It passed off. I think the majority of the psychical cases have no simulation about them. A test which helps us is the pupil reaction. We know that any sensory stimulus will cause dilatation of the pupil; for instance, while the pupil is carefully observed, we blow a whistle, or, in an extreme case, a motor-car hooter behind the patient, and watch for dilatation of the pupil. But though a man may rise to that, it does not necessarily follow that he is shamming. To test it with success, we must have the pupil contracted by light, and see whether it dilates on the sound being produced.

I should like to put two questions, which I do not feel equal to answering myself: (1) What is the degree of deafness which justifies us in looking upon a man as being ineligible for general service? We see how one man who cannot hear the watch makes progress, while another may be very stupid. Is there any standard? I am thinking of listening-posts. The second question is, what are we to do with those who have suppuration of the middle ear? Must we send them to the Front or not? My friend Mr. Kisch, who was in Boulogne for a long time, said that no man who had even had a radical mastoid operation should be sent to the Front. But I think that is carrying it too far. I showed a case, about sixteen years ago, in which I had preserved a cholesteatomous membrane. The patient disappeared until last year, when he came back as a stalwart sergeant, who had been all through the war, and it was only discovered that he was deaf in one ear when he got injured in the other. Another case was that of a boy whom I showed here, who had suppuration of the middle ear. I opened a cerebellar abscess and the bulk of the jugular vein. He had been eighteen months in the war as a driver of the R.F.A.

I have spoken at this length about these things because there are some cases about which I feel a difficulty, and I shall be glad if other members can help me.

[Major SHUTER: Was the upper limit of audition taken by Dr. Grant by air conduction, or by bone conduction? And with what instrument?]

Dr. DUNDAS GRANT: I take it with as good a specimen of Galton's whistle as I can get—the original whistle. It does not go as high as the

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monochord. I exclude as far as possible the function of the opposite ear. It indicates the hearing for a closed pipe of so many millimetres in length, and if the hearing is 1·5, 1·8 or 2, I pass the case as one of good preservation. I think that whistle is sufficient for all clinical purposes.

Dr. Jones-Phillipson.

Dr. Jones-Phillipson's contribution will be published later in the Journal of Laryngology, Rhinology, and Otology as a separate paper.

Major Shuter.

I would like to make a few remarks on one aspect of the subject. My experience has been with cases of ear injury some months after it has been inflicted—*i. e.* in the Australian troops who came from Gallipoli, and from the English hospitals.

I shall not speak of direct traumatism. I am in accord with most of what has been said, but I wish to speak of what is termed "concussion injury," and what a second speaker referred to as nerve-deafness. I have seen a large number of such cases, but my work has not enabled me to go so thoroughly into the matter as the last speaker has gone: mine is a roving commission. I differentiate, however, between machine-gunner's and concussion-deafness; in the former there are islands of deafness. I have seen a large number of cases which show the following combination of signs: They frequently occur in those who have a very patent meatus, and, contrary to Lermoyez's opinion, I found them more frequent in those with pre-existing middle-ear disease. Mr. Scott asked: "How do you know they have had pre-existing middle-ear disease?" In these cases the obvious signs of middle-ear disease are so frequent that, when one considers the number of normal middle ears compared with diseased middle ears, it is a reasonable opinion to state. They are due, not to sound waves, but to the wind waves caused by a shell explosion. I have seen them also in a case in which a German mine was exploded in a confined space; I have seen them in trench cases and after bomb explosions, in which the patient has been rendered unconscious and deaf for forty-eight hours. They present themselves some months afterwards with this combination of signs: marked diminution of bone-conduction, tinnitus, paracusis, hearing better in a quiet room, and hearing lower tones by air-conduction proportionately better than higher.[1] Yet apparently they have a very complete range of hearing. I should like to hear from some present why we assume that diminished bone-conduction and diminished air-conduction for the higher forks means nerve disease. I do not know where the statement originated, or on what reasoning it is based. One can physiologically alter the bone-conduction by putting the finger in the ear, or by inflating the ear, or by the Gelle test. It is altered very much by middle-ear disease, and a very pertinent fact is that it is greatly increased in cases where there is fixation of the stapes. I think in the cases I refer to there is some alteration in the conducting apparatus—it may be the ossicles, it may be the foot-plate of the stapes, or an alteration in the accommodating mechanism of the opposing action of the stapedius muscle and the tensor tympani. However, the matter has puzzled me, and I should like to know whether others have noted this combination of signs. I should welcome any expression of opinion.

[1] The range of hearing was taken by a monochord, which shows perception of pitch up to an average of 25 cm. by air-conduction, and 18 to 20 cm. by bone-conduction. This is only a little lower in my experience than a normal ear.

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Mr. Sydney Scott.

It is highly significant that the Dominion Governments should have sent representatives of otology to investigate the ear cases among their Forces in the Army. Our methods of practice in otology in civil life singularly well prepare us for investigating cases we meet with in warfare. After a little experience of the actual conditions near the fighting line, at the Base, and in England, I am convinced there is much for otologists to do. Certain cases of injury require considerable time to ascertain the true state of affairs. It is not sufficient merely to look at the drum and see how far a watch can be heard! Some cases will take an hour or more to examine. We need not only to apply tuning-fork and other hearing tests, but frequently have to investigate the vestibular functions, to say nothing of the examination of the nose, pharynx, and Eustachian tubes. And the results are well worth the same care we take in civil life. With regard to the hearing tests, there are three features I think we should consider. The first is the determination of the "tone-range," the second of "tone-acuity," and the third, "tone-analysis." The first is measured by forks and the monochord, which is far superior to Galton's whistle.[1] "Tone-acuity," for a given tone or group of tones of known intensity, is recorded by the distance-limit of hearing a watch or acoumeter. Under "tone-analysis" will come the faculty of hearing the voice as whisper or in conversation. We have met with patients who have a short tone-range, *e. g.* 16 d.v. to about 1000 d.v. or less, who can hear conversation at two or three metres. Others, whose hearing became defective after being buried by shell-fire, may retain normal tone-range and have very defective tone-analysis—that is, they exhibit great difficulty in distinguishing words of speech, especially in a noise. We meet with similar conditions in civil life, but they have been classed under senile or nerve deafness of doubtful cause.

The importance of considering the vestibular system is self-evident to those familiar with the manifestations which injury to the ear frequently evokes. But it hardly seems sufficient merely to say that the caloric test was done with hot or cold water, without observing precisely what the posture of the head was during the application of the test; for otherwise we may obtain normal reactions on both sides, with the head in certain positions, though a unilateral lesion actually exists. As an example, in a man suspected of malingering, I found by setting his head in requisite positions that one of his semicircular canals did not react to the caloric tests, whereas all the other five canals reacted normally. The results of "caloric" and "rotation" tests tallied with each other. The man had no appreciation for the short monochord in the affected ear (*i. e.* high limit was below 5000 d.v.), but he could hear my long monochord. The low tone limit was raised on both sides. He had active naso-pharyngeal catarrh at the time, and catheterisation definitely improved his hearing for low tones, bringing him back to the 16 d.v. limit, though it did not, of course, affect the high tone loss. Nevertheless the hearing became good and useful, both as regards tone-acuity and tone-analysis.

We all greatly appreciate the very fine work Mr. Fraser has sent us to-night. We see there one end of the story in the pathological findings in fatal cases subjected to the effects of high-explosive violence, but we have yet to see the concurrent clinical manifestations recorded side by side with such pathological findings. In the specimens which I showed

[1] "Discussion on Value and Significance of Hearing Tests," *Proc. Roy. Soc. Med.*, v (Sect. Otol.), pp. 113, 131.

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last year[1] from the soldier who was wounded in the vertex of the skull, there was free hæmorrhage in the tympana, without fracture or rupture of the drum or any other injury such as we see in some of Mr. Fraser's cases, and although, fortunately, it was possible to test my case during life, the records were incomplete because suitable instruments were not available at the time. We hope this gap in our knowledge will soon be filled, as the result of such work as it is now possible to carry out. I think, Sir, we might commend to the War Office the appointment of more otologists to investigate and report upon the various forms of injury to the ear due to the war, in the way that that is being done in the Canadian hospitals for the sake both of the individual and State.

Capt. E. A. Peters, R.A.M.C.[2]

Deafness due to gunshot wound and high-explosive concussion falls into three groups:

(1) (*a*) The membrana tympani may be ruptured by gunshot wound or high-explosive concussion; (*b*) the auditory meatus obstructed by a fragment of metal; (*c*) the middle ear may be filled with blood. The smaller extravasations are absorbed, but others break down into abscesses. The condition may occur as the result of the regional disturbance or high-explosive concussion.

(2) Labyrinthine deafness. This is probably due to hæmorrhage or vasomotor change. It is a very common form of war deafness, and the prognosis does not seem to be good. I have not been able to observe the microscopical condition, but that such a condition exists may be assumed (*a*) from the œdematous, congested state of the larynx observed after gunshot wounds in the proximity; (*b*) the hæmorrhage common in the brain with intact dura mater consequent on gunshot-wound fractures in the vicinity. It results from direct blows or high-explosive air-conducted concussion. The following is a typical case:

M——. Buried by a shell fourteen days previously; he was hit by a fragment behind the right ear.

0·		S. watch		$\frac{24}{30}$
−15 seconds	...	c mastoid	...	Normal
18,000	...	Monochord	...	30,000
T. F. 64	...	Lower limit	...	T.F. 64

Rotation for external semicircular canal, clockwise: exaggerated nystagmus; anticlock, normal.

There was some evidence of fatigue, but no giddiness.

The patient is usually concussed, and the ear exposed to the fuller force is more affected. The semicircular canal system and cochlea may be affected in different degrees; the cochlea does not recover so quickly as the semicircular canals. Both ends of the register are affected, but the higher notes more regularly.

(3) Psychical or central deafness is comparatively rare. It is symmetrical and usually absolute deafness, and is often associated with mutism or stuttering speech. This form of deafness is dealt with by Major Hurst.

These three forms of deafness may co-exist, and contribute a factor in different proportions in a given case.

[1] "Histological Preparation of the Labyrinths and Tympana of a Soldier suffering from Deafness due to a Bullet Wound of the Vertex of the Skull," *Proceedings*, 1916, ix (Sect. Otol.), p. 28.

[2] Otologist to Royal Victoria Hospital, Netley.

(*To be continued.*)

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