a hemispherical mass, about 3 cm. in diameter, projecting from the bone surface. It was smooth, elastic, pearly-white; and over the dome there was an irregular very thin scale of bone. The mass was removed, revealing the dura beneath, and the core was found to be the "wet-cardboard" material typical of cholesteatoma. A small channel led into the depths of the ear cavity. The edge of the hole in the squama was ringed with a thin margin of new bone at right angles to the plane of the squama. This edge was pared down to a thin wedge shape, so that on replacing the temporal muscle no dead space was left. A fresh radical mastoid operation was done, cutting through the upper root of the zygoma, and throwing the channel open. A wide plastic and a skin graft for the new radical cavity completed the operation.

To-day the patient has a perfectly dry ear, and is free from all symptoms; the skiagram taken in 1928 shows that a partial regeneration of bone has taken place.

SOCIETIES' PROCEEDINGS

ROYAL SOCIETY OF MEDICINE—SECTION OF OTOLOGY.

November 1, 1929.

President—W. M. MOLLISON, M.Ch.

A Brief Survey of the Mastoid Operation.—W. M. MOLLISON, M.Ch.—The paper is published in the *Journal of Laryngology and Otology*, Vol. xlv., p. 95, February 1930.

The Triumphs and Failures of the Mastoid Operation.—L. GRAHAM BROWN, F.R.C.S.—The paper is published in the *Journal of Laryngology and Otology*, Vol. xlv., p. 102, February 1930.

The Radical Mastoid Operation.—J. P. STEWART, M.D., F.R.C.S. Ed., and J. S. FRASER, M.B., F.R.C.S. Ed. The paper is published in the *Journal of Laryngology and Otology*, Vol. xlv., p. 111, February 1930.

DISCUSSION.

Mr G. J. JENKINS said that in 1914 he was assisting a prominent surgeon at an ordinary Schwartze operation. That surgeon accidentally removed the incus by the posterior route. On testing the patient afterwards it was found that he had practically normal hearing; the tympanic membrane had healed perfectly. That incident had led him (the speaker) to think of its possible application in more chronic conditions.

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The first of these cases he had was that of a German who was anxious to join the British Army in France. He was suffering from chronic otorrhœa. He (Mr Jenkins) made the usual incision for the radical operation, and removed the incus from behind. The wound granulated in the ordinary way, as after a Schwartze operation, and the procedure was quite successful.

After the War he took up the subject again and the operation he did at first was as follows: The usual mastoid incision, only skin deep. Skin then undercut.

He took a flap which used up the sternomastoid, which was pushed into the cavity after the incus had been removed. The object was to fill up the aditus and antrum completely, so that there would be primary union in the position indicated. Several surgeons have seen that operation being done three or four years ago at a demonstration at King's College Hospital. Since then he had modified the operation.

The incision was the same as before, or a little farther back. After undercutting the skin a periosteum and muscle flap of triangular form is cut with base to the pinna. The flap is well nourished by an artery that terminates at the apex of the flap. When the operation had been completed and the incus removed from behind, the apex of the flap was turned into the aditus and there was only a small space to be filled with blood-clot. Immediate healing occurred, and it could drain in the position indicated. Looking into the meatus afterwards one could see no change of form, and a sound healing of the membrane occurred.

The most favourable kind of case was one in which there was a small perforation entirely within the membrane.

In all these cases the incus had been partially destroyed. In some cases he enlarged the opening in the tympanic membrane so as to improve the drainage. It was a valuable operation in cases in which the radical operation had been indicated, but in which, for certain reasons, as in children, it was important not to make any surgical disturbance. The operation will be described *in extenso* elsewhere.

Mr E. WATSON-WILLIAMS said he would confine his remarks to the radical operation because the only connection between the radical and the Schwartze was that they were performed on adjacent parts of the body. The Schwartze was for drainage, and was very useful in acute cases; the radical was mainly for dealing with chronic suppurative conditions. In his experience, the majority of patients for whom one had to do the radical operation had not much hearing left, and one had the problem of a sinus leading down to carious bone. He had worked on the principle that in such a case one must not regard the ear as an ear, because ordinarily it was unlikely that one would be able to restore useful hearing when the patient had been deaf for years. The point was to get "exteriorisation" of a hole in the bone. With that object he had tried to make the bone cavity as nearly saucer-shaped as possible by removing every scrap of mucous membrane, and by cutting down the facial ridge to the limit of safety. The plastic was made very open, almost the whole of the bowl of the concha being removed. A demilune of skin was removed entirely from behind the ear, so as to draw the pinna back, and bring the opening

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well over the centre of the cavity: finally, the edge of the periosteum was sutured to the cut skin of the bowl of the concha to anchor the ear in its new position. Dressing was easier, and it had the great advantage, in hospital cases, that the cavity was easily kept clean. The trouble with most of the patients who returned after a radical operation was the accumulation of epithelial debris and wax in the depths of the cavity, and the wider open the cavity the less frequently did those things occur, and the less was the trouble when they had to be dealt with.

Taking all classes of radical mastoid together, excepting only those patients who had died of intracranial complication present before operation (but including cases which came in with meningitis or labyrinthitis and recovered), he expected to get over 80 per cent. of dry ears, ears which remained dry. He checked the cases by inspecting them or communicating about them two years afterwards. Half the remainder had a small or intermittent amount of moisture from the Eustachian tube.*

Mr J. ALDINGTON GIBB said that he could not make up his mind from the discussion whether a post-meatal flap was desirable. He did a Schwartze in acute cases, but even in an acute case, when there was considerable destruction of bone, he made a flap; the best form of flap he found, was Ballance's. Dressing was not easy in these cases, because of the tube behind the ear, but this could be modified. The patients in his wards had not suffered excessively when the wound was dressed. A drawback to Pause's flap was that if one did not look after the lower end of the flap and get good apposition, a bridge formed in the upper portion between the knot over the facial nerve, and had to be burned away. He did not think the muscle graft had advantages over the ordinary Schwartze; it would not obviate a radical mastoid operation. He only performed the radical operation when there was great destruction of the drum; he never touched the posterior wall of the middle ear if he could help it; during this operation, therefore, the stapes was always left in position. He had ceased trying to close the Eustachian tube, as the patient heard better if he did not do so. A patient who had been fairly deaf before the operation was able to take shorthand notes without difficulty; she could hear a loud whisper at a distance of five feet.

He had carried out Bondi's operation in a few cases, but he did not intend to do so again. At the end of a year or two the patient had a dry ear, perhaps too dry. Then he turned up with a middle-ear condition again. He had one with a large quantity of granulation in the middle-ear flapping over the Bondi's cavity.

Sir JAMES DUNDAS-GRANT said there must be some change in the cases seen at present as compared with those Mr Percy Jakins and he saw many years ago, in the "eighties," as many more radical operations were performed in those days, he was sure, with very great advantage and saving of life.

With regard to the plastic operation, he had shown in March 1924, before the Section, a patient upon whom he operated about forty years

* E. Watson-Williams, "Prognosis in Mastoid Disease," *Practitioner*, 1929.

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ago, when the "plastic" was in its rudimentary stage. In those days, drainage was maintained in the posterior wound. Sometimes there were advantages in keeping some drainage in the posterior wound. He had shown some years ago a girl for whom he had opened a tempero-sphenoidal abscess, doing no plastic operation at all. When he afterwards showed her to the Section the cavity was perfectly papered with a pink smooth lining.

As to the skin graft, he once had to do the radical operation first on one ear and then on the other in the same patient. On the one side the skin grafted. On the other side, however, gouty phlebitis developed in one leg, and the patient had to be kept very quiet in bed. No grafting could be done. It was on the grafted ear that the patient depended for his hearing.

In his (the speaker's) early days he encountered many large cholesteatomatous cavities lined with a homogeneous matrix, and in many of those cases he had contented himself with making a free opening and scraping out the contents, leaving the matrix behind. The results were very good. At a later meeting at Brighton, Hartmann showed this method of treating a cholesteatoma cavity. Such large cavities were seldom, if ever, seen nowadays, owing to better treatment in the early stages.

Only slight reference had been made to subperiosteal abscess, which Grüber described, but which Luc put forward as a novelty, at Boston, U.S.A. The swelling developed above the level of the auricle. The indication then was that the disease was not inside the mastoid, but on the surface; there should be a counter-opening made in the roof of the meatus, not through the mastoid.

It had been said that one indication for the radical mastoid operation was the presence of some intracranial complication. Some time ago he had the help of Mr Ormerod in a case in which there was a lateral sinus thrombosis, which they were able to treat by ligation of the jugular vein, without interfering with the middle ear at all; it was little more than was done for acute suppuration, and with complete retention of the membrane; that patient now heard well, and had a good membrane.

There was a tendency to decry the practice of ossiculectomy; he advised those who had not thought over the question to keep an open mind regarding it. He would show on a future occasion cases which would prove that there was still a place for the procedure.

He suggested a detail which had helped him to prevent discomfort from the changing of the dressing after the radical mastoid operation. Instead of plugging simply with gauze he used one of the thin rubber finger-guards; this was perforated in numerous places and pushed into the cavity by means of Killian's narrow nasal speculum, through which the plugging was done. It could be left in for several days, and the perforations allowed the exudation to escape. When the first dressing had to be removed, there was no need of an anæsthetic, as there was no pain.

Mr SYDNEY SCOTT said Mr Graham Brown's paper clearly expressed the principles of the mastoid operation, which he (the speaker) thought were likely to be followed. He agreed with the advice that a meatal flap should not be cut in acute cases. Mr Heath, who had done so much

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good work in stirring the profession to the importance of mastoid operations, was the great advocate of the meatal flap, which the speaker thought a disadvantage in acute cases.

Little had been said in this discussion about the methods of drainage. Some surgeons used gauze, some used rubber. The educated public believed the treatment after mastoid operation to be extremely painful, this impression he attributed to gauze packing. It was, no doubt, necessary to use gauze in cases of lateral sinus thrombosis, but in the ordinary uncomplicated Schwartze's operation he recommended suturing the upper part of the wound, and using several small rubber drainage tubes, without introducing any gauze into the wound. No anæsthetic was then necessary for after-dressings.

Mr HAROLD KISCH said that with regard to pain after the use of muscle graft, he had been using a temporal muscle graft for some years; had found that there was no pain after cutting the graft from the muscle; and further, the whole convalescence of the patient was painless. The only dressing used was a strip of gauze in the external auditory meatus, and the removal of that did not cause pain.

In reference to the question of obtaining sufficient muscle to fill a large cavity, there was no occasion to extend the mastoid incision, for, by pulling up the skin, one could obtain as much muscle from the temporal region as was needed to fill any cavity.

He had found that one point in the technique was not generally employed, namely, injections of novocain and adrenalin. In every case he infiltrated the skin, then the deeper tissues, under the anæsthetic and before operating. The area of operation was found to have been rendered practically bloodless, a fact of great advantage in operating in these cases. The middle ear and attic could be examined with ease.

Mr E. BROUGHTON BARNES said he used only one tube for drainage—not gauze. He always quoted the remark in this connection: "If you want to use a drain you put in a drain; if you want a cork you put in a cork."

Recenly, in cases in which the patients were not seriously ill, he removed the adenoids. He found that the mastoids healed more rapidly and the ear became dry sooner. He attended to the tonsils just before the patients left hospital.

With regard to exposure of the dura mater, he had been brought up to believe that exposure of the dura mater was a good procedure if there was a fair-sized exposure and no thin edges were left. It enabled one to get a better-shaped saucer. He regarded the saucering-out of the cavity as a very important factor in quick healing and in the avoidance of fistula. He removed the tip as a rule.

Mr F. W. WATKYN-THOMAS said that although he did not pack one ear in twenty in acute cases, in the last fortnight he had packed two cases of acute mastoid. He only did it for severe toxic mastoids, when he left the cavity widely open. His custom was to use two or three small tubes, as Mr Scott had taught, though sometimes he employed rubber tissue. The latter, however, did not seem to work well, probably because it perished.

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He was timid about removing adenoids at the time of the main operation, as it left an extra raw patch in the throat, over which pus could trickle down. He agreed that adenoids should be attended to soon afterwards.

In mastoid operations, for the more acute cases there was the question of removing the tip. A set amputation of the tip had, he thought, much to commend it, but he did not do it as a routine.

Mr E. WATSON-WILLIAMS, in further comment, said his routine was to remove adenoids in every case at the end of the Schwartze operation: almost all child patients who needed the latter operation had large adenoids.* He had been very satisfied with the results of that procedure.

Dr J. S. FRASER said that he now saw fewer instances of chronic, foul-smelling otorrhœa than at the date (1906) when he was first appointed to deal with this work: he hoped that as the time went on and acute cases were dealt with at the time they occurred, the radical mastoid operation would gradually fade into the background.

The number of radical mastoid operations which he had performed in the period 1906-1928 was 701. There was temporary facial paresis after operation in sixteen; serous labyrinthitis in thirteen, *i.e.*, giddiness and spontaneous nystagmus to the sound side, though the patient could hear through the bandages with the noise-box going in the other ear. There was purulent labyrinthitis in ten cases. Seven patients died as a result of the operation, or rather from purulent labyrinthitis and meningitis following the operation. He had thought for a long time that the mortality of the radical mastoid operation was about 1 per cent.—he was not speaking of cases which came into hospital with brain abscess, sinus thrombosis, or meningitis; if those were included the figure would be brought up to 10 per cent. Of the 701 cases, 422 reported: 178 had a dry and satisfactory cavity, while in 244 the cavity was more or less unsatisfactory, *i.e.*, either moisture was present (patent Eustachian tube) or granulation tissue could be seen. He was sorry to say that he could not get patients to keep their ears clean. If these cases were taken into hospital again for a fortnight and the ears were cleaned and washed out, a great many of them might be transferred from the unsatisfactory to the satisfactory category. Hearing was improved in 223: of the 701 cases, it was worse than before operation in only 64.

Mr GRAHAM BROWN (in reply) said that it rested with the younger school to further advance the field in this direction. Just as in the case of the accessory sinuses, he felt that there was room for more and more conservatism in regard to the mastoid. Much would be done towards this by getting the cases earlier. Indeed, the radical mastoid operation was now seldom necessary, and when it had to be performed it was in cases in which no useful hearing remained. The aim must be to conserve whatever hearing happened to be left to the patient. He thought one should in the future do a minute operation on the tympanic cavity; magnifying lenses were used, and there would probably be other appliances too.

* E. Watson-Williams, *loc. cit.*

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With regard to drainage, though he still used a half-inch gauze ribbon his method was not to employ it by plugging forcibly and so causing pain. Having practically closed the mastoid wound completely, he inserted an ordinary mastoid strip down to the antral cavity, and that was removed in forty-eight hours. After that, a sufficiently wide tunnel was formed for drainage. Afterwards there was gentle packing with half-inch ribbon gauze pushed down gently to the bottom of the sinus. Whether a tube or other form of drainage was used, the same applied.

With regard to exposure of the dura mater, it was not of great importance; he had had cases of it in which he had sewn up the wound completely, without fear of intracranial complications. One left the wound open only when one felt that the dura had been injured, in which case the extra time allowed for cicatrisation was an added security.

Concerning skin-grafting and muscle flaps, he felt that the gain was not commensurate with the degree of destruction of the meatus. There were cases in which the cavity was dry after a radical operation, without interference with the meatus to any appreciable extent—except the terminal portion. In re-operating for mastoid trouble, however, when a large cavity was essential and a large meatal flap was necessary, skin-grafting proved very satisfactory.

Three Cases of Conservative Mastoid Operation with Temporal Muscle Graft.—W. A. MILL, F.R.C.S.

(1) J. A., a boy, aged 6 years. For some years had left otorrhœa, which continued despite removal of tonsils and adenoids and treatment by drops and ionization.

Operation, 4th February 1929, by Mr Mollison.—Pus in cells, and granulations and pus in antrum; outer wall of attic and incus removed and muscle graft inserted. Result: hearing improved, no discharge.

(2) M. B., a girl, aged 10 years. For eight years had right otorrhœa, which continued despite local treatment and removal of tonsils and adenoids.

Operation, 27th May 1929, by Mr Mollison.—Pus and granulations in antrum and in a few cells at the tip of the mastoid. Schwartze's operation with muscle graft. Result: hearing better. Discharge: none noticed; on examination—a trace.

(3) A. C., a girl, aged 6 years. For some years had left otorrhœa, which continued after local treatment and removal of tonsils and adenoids.

Operation, 18th March 1929.—Pus and granulations in antrum. Many small cells containing clear fluid. Outer attic wall removed and the incus (the long process of which was missing) taken out. Muscle graft inserted. Result: hearing slightly better. Discharge used to pour out, now none runs out, but a trace appears on mopping.

I wish to thank Mr Mollison for allowing me to show these cases as they have all been under his care at Guy's Hospital.

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The procedure as adopted in two of them (1 and 3) is as follows: After a Schwartze operation has been performed, the outer wall of the aditus is removed to expose the incus. As a rule, bone has to be chipped off the postero-superior meatal wall (from the antral aspect). The incus is then removed because it is so frequently diseased (sometimes it is absent) and to allow of drainage from the region of the aditus and attic. The bridge is not removed.

The cavity is cleaned with hydrogen peroxide and then packed with gauze soaked in spirit. The muscle graft is cut in the way described by Mr Kisch at the Summer Meeting, 1928. By extending the incision about half an inch upward, and by retraction of the superficial tissues, as large a piece of temporal muscle as possible is cut and left attached anteriorly. The temporal fascia over this attachment is divided and sometimes a few fibres of the muscle—the aim being to get the cavity filled by muscle which lies easily without any tension.

The wound is then sewn up. If there has been much bleeding a small piece of rubber-glove drain is left in the upper part of the incision for twenty-four or forty-eight hours. A tight bandage is then applied to stop the formation of a hæmatoma.

Dressing is reduced to a minimum and is practically painless; it consists of mopping-out the meatus and the installation of alcohol drops. The stay in hospital has been shortened and in several cases has been as short as ten days.

Results.—The muscle graft has been used in fifteen cases of chronic suppuration. In ten cases treated in the manner described (with removal of the incus) the ear is now dry in six (three of them being adults). Of these, three hear better than before, while in two there is no change and in one no report as to the hearing. In one of the four unsuccessful cases the ear was dry for about three weeks after the patient left hospital, but now discharges freely. In another a radical operation has since been performed. In the remaining two the discharge is very much less, while the hearing is better in one case and unchanged in the other.

The only case in which the incus was left is the second case exhibited. The hearing is very much better and on mopping only a trace of moisture is found.

Of four radical cavities which have been grafted (no plastic operation having been performed on the meatus) two are dry, the hearing being better in one of the cases and unchanged in the other. In the other two cases there is still a slight discharge. The hearing is worse in one of these and there is no report about the other.

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