

SOCIETIES' PROCEEDINGS

ROYAL SOCIETY OF MEDICINE—SECTION OF OTOLOGY

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President—F. J. CLEMINSON, M.Chir.

The Operative Treatment of Chronic Mastoid Disease

The opening paper read by Mr. Somerville Hastings is published in this issue of the *Journal of Laryngology and Otology*, Vol. LIII, No. 4, pp. 246-255.

DISCUSSION

DR. GAVIN YOUNG : The principal object in operating is the removal of the potential danger to life. Secondary only to this potential danger is the deterioration, progressive even if slow, in the hearing and the operation is undertaken to prevent further deterioration ; sometimes, happily, it results in improvement in the hearing. Other reasons for operating are discharge which may be copious or malodorous or both, the incidence of facial paralysis in a chronic case, or vertigo. The patient may give a history of periodical bouts of mastoid pain or of homolateral headache, and these are often synchronous with either a temporary lessening or marked increase in the discharge.

Personally I was taught that the completed mastoid operation, in the chronic case, of course, should leave the whole area—middle ear, aditus, and mastoid cavity—under the eye of the aurist, capable of direct inspection for the rest of the patient's life, and that only so could safety be assured. After trial and, as I think, error, I see no reason for departing from the essentials of this early teaching, and accordingly I now confine my surgical procedure to two types of operation, the radical, and the anomalously-named "modified radical". The latter term means the technique by which the mastoid cavity is exenterated, the bridge very carefully broken down (the last part of the breaking-down being done from within the aditus outwards by a sharp spoon) and the posterior part of the external attic wall being removed, the utmost care being taken to preserve intact *all* the normal intratympanic structures. From time to time, reference is made in the literature of mastoid surgery, to the fairly casual removal of the incus. The

Societies' Proceedings

incus has been removed accidentally in two of my cases, in clearing a choked aditus, in cortical mastoid operations, but I have been unable to assure myself that the hearing acuity was not considerably lessened by the accident.

The main factor in deciding between the two types of operation is the patient's hearing, not merely in the affected ear, but also in the other ear. When the hearing of the other ear is under normal, with the possibility of progressive deterioration, every care must be taken to conserve the hearing in the operated ear.

Consider the factors which affect sound-conduction in a damaged ear. The state of the tympanic membrane is of little importance. The absence of most of the membrana tensa, as in some post-scarlatinal cases, is not incompatible with the hearing of whispered speech up to twelve or fifteen feet, or more. On the other hand, the hearing may be very poor indeed in a case with a small perforation in Shrapnell's membrane. To carry the argument further, we may have, as in otosclerosis, an entirely normal drumhead, with extreme deafness.

Some years ago, a member of this Section drew attention to the interesting clinical fact, which I myself had already recognized, that marked deafness in a case of acute suppurative otitis media, with negative Rinne, is strongly suggestive of serious mastoid involvement. If this be accepted, why does the filling-up of the mastoid air-spaces so greatly increase the dullness of hearing? Is it because of the loss of the cavity as a resonating chamber? It is certainly true that chronic adhesive process and otosclerosis are usually accompanied by sclerosis of the mastoid process. On the other hand it is also true that the hearing after an uncomplicated cortical operation is usually practically perfect, that is, of course, in an acute case, and the mastoid process may have become rather a defective resonating chamber, being broken up by dense layers of fibrous tissue and deposits of new bone. It is, however, still a resonating chamber.

The other factor of importance is, of course, the integrity of the ossicular chain. We must ask ourselves whether it is essential that this chain be maintained intact at all costs, to preserve the hearing. In many cases, however, the chain has been broken before operation, and these cases need not be considered further. Members have already been reminded of the type of case in which most of the membrana tensa has been destroyed and yet the patient has surprisingly good hearing. Similarly, after the radical operation, in some cases, the patient may hear whispered speech up to fifteen feet or more. The integrity of the ossicular chain is not essential to reasonably good hearing. What *is* necessary, in my opinion, is the mobility of the stapes, and it must be the duty of the surgeon to clear this area of granulations, as far as possible, and to protect

Royal Society of Medicine

it for the future. This is best secured by exercising care, in lowering the facial ridge, not removing any more of the ridge than is consistent with providing a roomy aditus and not leaving too high a partition between the middle ear and the mastoid cavity. Other things being equal, the lower the bridge, the worse the hearing.

Every case should be examined radiographically, before operation. In many cases, of course, one learns little, the common report being that the mastoid process is sclerosed and is evidently the seat of chronic disease. If we could be sure that the sclerosis extended right up to the aditus, as it sometimes does, we might be able to avoid the mastoid operation, by repeated use of the intratympanic syringe, and ossiculectomy in the case of ossicular caries. I would be glad to learn of any means of differentiating radiographically between cholesteatoma and sclerosis.

An attic perforation which usually indicates caries of an ossicle or of attic cholesteatoma, is an indication for the radical technique, unless the aurist is prepared to attend the patient periodically with intratympanic syringing for the rest of his life. The speaker has come to the conclusion that unless certain exceptional circumstances exist, the presence of cholesteatoma demands as radical an operation as is possible.

The presence of a polypus is not, *per se*, an indication for the mastoid operation. In a very fair proportion of these cases, careful removal of the polypus, with cauterization of the stump by silver nitrate, is followed by drying-up of the discharge. Recurrence of the polyp, however, or continuance of the discharge, calls for operation which may be either radical or modified according to the findings. Care is taken to preserve the polypus intact in the meatus until the mastoid cavity is cleared, the posterior meatal wall broken down and the flap cut, when the point of origin of the polypus may be discerned. This is usually in the region of the tympanic ring, and not, in my experience, so often in the neighbourhood of the promontory as some statistics have indicated. The posterior wall is a common site. One often finds adhesions between the pedicle and the meatal wall.

When vertigo is present, whether or not spontaneous nystagmus is present, the labyrinthine functional tests should be carried out. In a fair proportion of such cases, without nystagmus, no labyrinthine lesion is discernible, and especially in the elderly, the vertigo may be due to labyrinthine vascular changes. The operation undertaken would depend upon the disorganization in the labyrinth. The speaker inclines to be conservative in dealing with the labyrinth.

In a case of chronic otorrhœa with facial paralysis, the type of operation will depend upon the site of the lesion in the nerve. In a sclerosed mastoid, without cholesteatoma, the lesion is likely to be intratympanic, and the radical operation is required.

Societies' Proceedings

Unless one is dealing with a cholesteatoma, or a case in which the labyrinth is dead, one sets out to perform the modified operation. The findings in the middle ear, after the flap has been cut, determine the final type of operation. In the Western Infirmary, during the two years 1934 and 1935, 150 cases of chronic mastoiditis were operated upon—117 by the radical method, and thirty-three by the modified. In thirty-nine of the 117, cholesteatoma was present. On the whole our experience is that the hearing is not often deteriorated by the radical operation, and is quite commonly improved.

Mr. WALTER HOWARTH said that in the paper which Mr. Bateman and he had written they merely recorded their results during the last few years in order to discover, for their own benefit, what was the relative value of these operations. He did not intend to repeat those results now ; but he wished to ask whether members of the Section could come to some conclusion as to nomenclature. What Mr. Hastings and he himself called the modified radical others called attico-antrotomy, and it would be helpful if some definite name was agreed upon for this and for other operations.

He also wished to ask those members who had had a large experience of the conservative mastoid operation, and who used it in a variety of cases, such as Mr. Mollison, whether they had been disappointed, as his colleague and himself had been, to find occasional cases, not selected cases, coming with symptoms six months after that operation and, when the operation cavity was reopened, to discover the serious condition of a little pocket beneath the dura in the roof of the attic.

Mr. L. GRAHAM BROWN said that in a paper published six years ago (*B.M.J.*, 1932, i, 470) he had described his own technique of a modified radical mastoid operation, and at the December meeting of the Section in the same year he had shown a series of six such cases, in which the operation had been successful, both from the point of view of dryness of the ear and that of the preservation of hearing.

When he decided to operate in cases of chronic suppuration of the middle ear and mastoid he confined himself to three types of operation : (1) Simple mastoidectomy (or the Schwartze operation). (2) Modified radical mastoidectomy. (3) Complete radical mastoidectomy. The modified radical operation could be further explained as the transmastoid antro-atticotomy, because one approached the diseased area by way of the mastoid, first entering the antrum and thence proceeding into the attic. Removal of the ossicles might also be included in this type. If the incus was diseased he took it away, and then—for better drainage—he also removed the head of the malleus. One point in the operation which was perhaps not clear was with regard to the membranous meatus and tympanum.

Royal Society of Medicine

In selected cases, particularly those in which the greater part of the tympanic membrane remained, and which might include not only cases of attic perforations—in which the hearing was usually still very good—but also cases of postero-superior or postero-inferior marginal perforations, he interfered as little as possible with the membranous meatus and its attachment to the tympanic membrane. He made no flap but carefully separated the lining membrane from the posterior bony wall of the meatus as far as its attachment with the tympanic membrane at the annulus tympanicus. He then chiselled down the posterior bony wall of the meatus, opened up the aditus, and removed the posterior portion of the outer attic wall. With the aid of a pair of spectacles (magnifying $1\frac{1}{2}$ times) one could view the region of the attic, see the incus and the head of the malleus, and deal with any disease present, whether in the form of necrosed ossicles, débris, or granulations.

The complete radical operation he called the transmastoid antro-attico-tympanotomy. Here he made the smallest flap possible—namely the small triangular portion of the membranous meatus that covered the posterior bony wall of the meatus before its removal. He closed the wound posteriorly, and drained through the meatus with a large tube. In this way the size of the resulting middle-ear cavity was reduced and almost the original calibre of the membrano-cartilaginous meatus was maintained.

The simple, or Schwartze operation was, he found, often sufficient in the case of young children, in whom for obvious reasons the radical operation should be avoided as often as possible. Even in adults he very rarely had to perform the radical operation. He reserved it for cases of labyrinthitis and for certain cases of petrositis, extensive cholesteatoma, and middle-ear disease, especially when the hearing was already greatly reduced. The whole result of a mastoid operation depended on the post-operative treatment, and this should be carried out by the operator himself, or under his direct supervision. With regard to post-operative drainage he would emphasize the value of Southey's tubes. The posterior wound could be completely closed and the cavity kept periodically irrigated with eusol through a pair of fine rubber tubes leading into it.

He suggested that some of the cases in which suppuration persisted after a most careful mastoid operation might be examples of chronic petrositis.

Mr. A. J. WRIGHT said that the tympanum, if one excluded the attic, had very great powers of recovery, and should be handled gently. To secure the healing of a diseased mastoid cavity and attic one must drain and ventilate them, and for this purpose the meatus should always be enlarged. His own greatest difficulty was

Societies' Proceedings

in preventing meatal contraction. He had tried various flap methods, but had not hitherto consistently used tubes.

It was a great mistake to try to obliterate cavities. That mistake was made many years ago in dealing with the frontal sinus, and it was a long time before it was appreciated that it was attempting not only the impossible, but the undesirable.

In many of the cases operated upon the wrong part of the body received attention. It was seldom in cases with an inferior perforation that surgery was needed on the mastoid process; in nearly all of these, attention to the other end of the Eustachian tube would result in the clearing up of the infection in the ear, and what was most often neglected was attention to the mouth. The surgeon's outlook was so often focused upon the nasopharynx and nose that he forgot that infection in the teeth might perpetuate infection in the middle ear.

These impressions were based, broadly, on nine years' experience, during which time he had not performed the radical mastoid operation.

Mr. A. G. WELLS said that he had performed about 2,000 mastoid operations of all kinds on children. His results with muscle-grafts had varied considerably. Some had necessitated reopening, in spite of the fact that the greatest care had been taken in opening up the cells. Skin-grafting had been generally successful. It was best after operation on children to use a fine rubber glove with holes in, packed with wool. The greatest success he had had in children had been with the conservative operation. Between 1919 and 1920 he had performed over 200 operations of the conservative type; in 1919 his successes were between 80 per cent. and 90 per cent.; in 1920 there were over 90 per cent. He had carried out all the after-treatment himself, and that had made a great difference. This was shown in subsequent years, when circumstances were such as to make it impossible for him to undertake the after-treatment, and then the percentage of successes showed a material fall. He used a flap whenever possible; in all the conservative cases he had made a flap.

Mr. F. W. WATKYN-THOMAS said that the radical mastoid was not always needed for cases of fistula, especially when the fistula was into the external canal. Sometimes all that was necessary was attico-antrotomy, or even an extended Schwartze operation. His experience of the flapless operation had been discouraging. Some years ago he did a series with no flap, and it was nearly always necessary to convert them afterwards into the radical, or to do a plastic operation in order to open up a pocket. In the last ten years he had never done radical operations in children, except in cases of suppurative labyrinthitis, when it was necessary to reach

Royal Society of Medicine

the promontory. It was as easy to do an attico-antrotomy in a child as in an adult, for the tympanic structures were nearly as large. In a certain number of cases one could close the Eustachian tube if there was no recurrent infection in the nasopharynx, but in these cases there was no need to do so. If there was recurrent tubal infection he did not believe that closure was possible.

Mr. MICHAEL VLASTO said that the operation of flap-cutting after a radical mastoid was rather irksome. He asked how Mr. Graham Brown obtained sufficient pressure on his small deep flap without including the cartilage in his incision. He drew attention to a treatment much in vogue on the Continent for post-mastoid sepsis, that of douching the suppurating area with ozone.

Mr. GRAHAM BROWN (in reply) said that he dealt only with the membranous portion, not with the cartilaginous meatus. He made a slit upwards with a small knife, and another outwards to form a triangular flap. A little tongue of membrane which could be pushed backwards into the region of the antral cavity was formed. In the adult, one could use a tube almost the size of the little finger. The tube had to be inserted in a particular way, namely over a pair of artery forceps which gripped and narrowed the end that was being inserted, and were used to force the tube down as far as the antral cavity. He removed the tube at the end of forty-eight hours, and used ribbon gauze packing instead.

Mr. W. S. THACKER NEVILLE asked what was the late sequel of cases of simple mastoid operation. Poor patients relapsed at times, and returned to hospital; well-to-do patients either did not relapse, or went to other surgeons. Malnutrition probably accounted for the relapses in the hospital patients. When such patients returned, the mastoid was found sometimes to consist of one large cell full of pus, covered by a scale of bone. How could that condition be avoided?

He himself had begun by treating the cavities with bipp, and closing the wound. He then rejected that method, and used two-hourly irrigation through a fine rubber tube—as in Dakin's treatment—for wounds during the Great War. He finally rejected that method also and reverted to packing the wound with a bipp plug which was removed a week later under anæsthesia. The cavity was painted with mercurochrome, 5 per cent. in 50 per cent. alcohol, and exposed to the ultra-violet rays, or treated by daily zinc ionization. Two weeks later a pedicled muscle flap was used to fill the wound, and a week afterwards the wound was sutured and the patient was discharged. Thus the whole treatment lasted four weeks. Nowadays he practically never performed a radical mastoid operation.

Societies' Proceedings

Dr. EWART MARTIN said he thought that the conservative mastoid operation should be the choice in acute cases, or in cases which were becoming subchronic. In chronic cases, in which there was cholesteatoma or a mixed bacterial flora, proper drainage and ventilation must be obtained by a radical mastoid or an attic-antrotomy. A radical mastoid operation would rarely be necessary in a child if care was taken with regard to the original otitis.

Dr. E. E. BURNIER said that since he used skin-grafting he had had little difficulty with mastoid operations. He made a cast of the mastoid cavity by using a layer of "tulle gras" (Lumière) tightly packed in with gauze. The cast is carefully lifted from the cavity, placed on a sterile towel, papered over with the skin-graft, and replaced, the end of the gauze coming out of the meatus and holding down the flap. On the fifth day the gauze and the "tulle gras" were removed. No other treatment was needed except daily swabbing and dusting with iodized-boracic powder.

Mr. WILLIAM STEWART said that he performed only two types of operation for mastoid infection—the cortical and the modified radical. He agreed that the only perforation of the drum calling for a mastoid operation was a postero-superior one. He cut flaps and packed them in position with iodoform gauze. Three days later this gauze was removed under nitrous-oxide anæsthesia. No further packing was done, indeed the ear was not even examined for two weeks. Packing, with the insertion of drainage tubes, was quite unnecessary and inflicted needless pain on the patient. Packing and even swabbing out the cavity interfered with healing and stimulated the deposition of fibrous tissue.

ILLUSTRATIVE CASES

Four Cases of Radical Mastoid Operation followed by Gradual Improvement in Hearing.—TERENCE CAWTHORNE.

I.—Mr. N. R.

31.10.32: Right radical mastoid for acute flare-up of long-standing chronic otitis, with subperiosteal abscess. Full of cholesteatoma. Wound left open at operation and closed three weeks later. No skin-graft. Cavity dry in four months. Since then seen twice a year for removal of débris. Occasional moisture from Eustachian tube.

<i>Hearing—</i>	Voice.	Whisper.
Before operation ..	6 inches	Not heard
15.9.33	8 feet	3 feet
14.10.37	25 feet	18 feet

Royal Society of Medicine

II.—Mrs. L. C.

10.9.32: Right radical mastoid for acute flare-up of long-standing chronic otitis. Acellular bone with cholesteatoma. No skin-graft. Cavity dry in three months. Occasional moisture since then.

Hearing—	Voice.	Whisper.
Before operation ..		Very deaf
16.2.34	13 feet	6 feet
23.3.37	16 feet	10 feet
28.9.37	20 feet	18 feet

III.—Mr. J. L.

1.8.34: Right radical mastoid for long-standing chronic suppuration with cholesteatoma and granulations. Skin-graft two weeks later. Ear dry in one month.

Hearing—	Voice.	Whisper.
Before operation ..	6 inches	6 inches
2.10.34	4 feet	2 feet
8.2.35	18 feet	4 feet
24.9.37	18 feet	10 feet

IV.—Miss G. N.

Right radical mastoid fifteen years previously. First seen seven years ago when cavity was full of débris and there were granulations on the inner tympanic wall. Cavity dry in three weeks. Return of discharge, *May*, 1937. Responded to treatment in five weeks.

Hearing—	Voice.	Whisper.
Before operation ..		No record available
21.5.32	8 feet	2 feet
2.12.37	20 feet	12 feet

These four cases are shown to demonstrate that gradual improvement of hearing actually may occur after a radical mastoid operation. In only one was a skin-graft applied to the cavity, and in that case the piece of graft over the inner tympanic wall did not take. In no case is there a skin-graft on the inner tympanic wall. It may be that rapid healing with a minimum of fibrous tissue around the foramen ovale contributes not a little to the good hearing in these cases, which, although unusual, are not the only cases in my experience.

Bilateral Chronic Suppurative Otitis Media. Acute Serous Labyrinthitis of Right Ear. Radical Mastoid Operation in Quiescent Stage. Modified Radical Operation Left Ear.—L. GRAHAM BROWN.

Male, aged 32, first seen *July 13th*, 1934, complaining of discharge from both ears since the age of 5 years, following

Societies' Proceedings

scarlet fever. Five weeks previously he had had symptoms of acute labyrinthitis which compelled him to remain in bed three or four weeks.

On examination the right ear showed chronic suppurative otitis media with gross destruction of the tympanic membrane and granulations present in the middle ear. Slight spontaneous nystagmus could still be elicited on looking towards the left. The deafness of the right ear was nearly total.

The left ear also showed chronic suppurative otitis media with a marginal perforation in the infero-posterior segment. The hearing in this ear was good.

In view of the definite labyrinthine attack of the right ear a complete radical operation on this ear was performed on *August 14th, 1934.*

On *March 3rd, 1936*, the patient came again for advice, this time regarding his left ear. On examination, discharge was still present and there were signs of retention of pus in the antral region. A modified radical operation was advised (antro-atticotomy) and carried out on *June 29th, 1936*. The incus was necrosed and hence removed, as also was the head of the malleus. Hearing in this ear remains good.

Chronic Suppurative Otitis Media. Modified Radical Operation.—L. GRAHAM BROWN.

Female, aged 25, seen *November 1st, 1937*, complaining of discharge from the left ear for four years. Five weeks previously she had had an attack of vertigo and vomiting accompanied by fever. On examination, the left ear showed chronic suppurative otitis media, with granulations at the site of a postero-inferior marginal perforation.

The left labyrinth was active to the cold caloric test and the hearing in the left ear was good.

*Operation (November 10th, 1937).—*Transmastoid antro-atticotomy. The ossicles, being found intact, were left in place. The patient was discharged from hospital *November 29th, 1937*, with the wound healed, the middle ear dry, and the hearing very good.

Mr. GRAHAM BROWN said that in the first of these two cases, operated upon radically, he used, for right ear, the method he had described, passing a tube in through the meatus. He had not interfered at all with the cartilaginous meatus; had he done so there would certainly be cicatrization, which would lead to stenosis of the meatus.

In the other case the ossicles, being healthy, were left in position. The result was that the patient still had acute hearing. He looked upon the tympanic membrane and the chain of ossicles with their muscular attachments as an accommodating mechanism whereby optimum

Abstracts

conditions could be created for the transmission of sound vibrations through the labyrinth to the organ of Corti. Therefore the aim of his operation was to restore anatomically as far as possible—and, consistently with the removal of disease—normal conditions to the tympanic cavity.

ABSTRACTS

EAR

Fractures of the Petrous Pyramid and Loss of Function. A. RAINER.
(*Hals-, u.s.w. Arzt.*, 1938, xxix, 37-42.)

In the great majority of cases of transverse fractures of the petrous bone the fracture line goes across the bony labyrinth, more often through the cochlea than through the vestibule. It is generally assumed that the changes in the labyrinth following such fractures always result in total deafness and total loss of vestibular function. The author has reviewed all the cases treated at the Würzburg Clinic during the last four years, picking out those in which a transverse fracture of the petrous bone was definitely proved by X-ray photographs (see illustrations).

Altogether twenty cases were available for study. In seven of these (35 per cent.) the vestibular sense could still be stimulated by the caloric test, although the hearing function was completely lost. Ulrich had maintained that a fracture of the petrous bone which resulted in damage to the cochlea without loss of vestibular function was extremely rare. The author has proved that this view is no longer tenable.

J. A. KEEN.

Neuritis of the VIIIth Cranial Nerve in Food Poisoning. H. LEICHER.
(*Hals-, u.s.w. Arzt.*, 1938, xxix, 104-7.)

In ptomaine poisoning, botulism, and in the groups of acute illnesses due to the paratyphoid and Gärtner bacilli, the chief symptoms are vomiting, diarrhoea and abdominal pain. But these patients frequently complain also of vertigo and deafness, and these symptoms must not be neglected. The author discusses five typical cases of gastroenteritis with disturbances of hearing and equilibrium, the symptoms occurring during the acute stage of the illness. The vestibular symptoms cleared up in all the five cases, but in two of them a unilateral deafness persisted.

J. A. KEEN.