SOCIETIES' PROCEEDINGS

ROYAL SOCIETY OF MEDICINE—SECTION OF LARYNGOLOGY AND SECTION OF OTOLOGY

(COMBINED MEETING HELD IN LONDON, JUNE 4TH AND 5TH, 1936)

OTOLOGICAL SESSION

Chairman—HAROLD KISCH, F.R.C.S. (President of the Section of Otology)

CASES

Facial Paralysis. Ballance-Duel Nerve Graft.—D. J. COLLIER.

C.C., female, aged 24.

Left mastoid operation at age of 14 and again at age of 22. Facial paralysis reported after second operation.

25.9.34.—Seen in consultation with Sir Charles Ballance and Dr. Duel; left facial paralysis complete. No response to faradism, but all facial muscles responded to galvanism. Loss of taste on corresponding half of tongue.

Operation (Dr. Duel) 26.9.34.—Left middle cutaneous nerve of thigh cut and allowed to degenerate.

Operation (Dr. Duel) 8.10.34.—Facial nerve in Fallopian canal exposed and found to have been destroyed for about 6 mm. in the descending vertical segment, and embedded in scar tissue above and below the site of the injury. The measured gap, after removing the damaged area, was 18 mm. The prepared nerve graft was laid in the Fallopian canal.

At the plastic operation to close the wound, five weeks later, there was no response to faradism, but twenty-one weeks after the graft operation voluntary power had returned to the angle of the mouth, and faradic response was present in all the facial muscles.

There has been slow but steady return of voluntary and emotional movements to the muscles round the angle of the mouth and round the eye, but so far no return of power to the frontalis.

Facial Paralysis. Ballance-Duel Nerve Graft. Recovery.—HAROLD KISCH.

M.B., aged 2 years, had a cortical mastoid operation performed on 20.5.35. Facial paralysis was noticed immediately after operation. No recovery took place. On 22.6.35 the wound was re-opened

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and the nerve found to be extensively destroyed. A portion of the external cutaneous nerve of the thigh, previously degenerated, was inserted. The wound was packed with a B.I.P. strip. The strip was removed on 1.7.35, and afterwards dressings were done at regular intervals. Commencing recovery was first noticed about Christmas 1935. There is still some weakness of the muscles of the angle of the mouth.

Discussion.

Mr. C. Scott Ridout said that he had not himself performed the Ballance-Duel nerve-graft operation but he hoped to show two cases of spinal-accessory—facial anastomosis. One was in a boy who had had a fractured base of the skull, with facial paralysis. After some months had been spent in trying to restore movement by massage, the spinal accessory nerve was divided and joined to the distal portion of the facial, and within six months the boy was moving the side of his face fairly well; in a year or two probably no difference between the two sides would be noticed.

The other case was that of a boy, aged 8 years, who, within four months of the spinal-accessory—facial anastomosis began to show movement; the recovery was more rapid than in the first case.

This method involved only one operation instead of two. By the other operation it was somewhat difficult to be sure one was actually in the Fallopian aqueduct in a badly scarred case, and that helped one's preference for the spinal-accessory operation.

Mr. I. A. Tumarkin said that his first case of the kind had been that of a young woman who showed synkinesia—i.e. if asked to close her eye she also twitched her mouth, and was unable to control the latter movement. That was a very frequent phenomenon in any form of recovery after facial paralysis. It was thought by some that the outgrowing new axons, making their way outwards, included some which lost their way and instead of serving the eye, served the mouth. Another theory advanced to explain it was that a nerve stimulus was really an electrical impulse, which passed down the axon, and that in the case of a trunk like the facial nerve, an electrical impulse passing down the nerve needed to be insulated. In normal conditions insulation was provided by the myelin sheath; but in the case of new nerves the myelin sheath was probably imperfect and so insulation was also defective. Nerve energy going to the eye therefore became irradiated, like that of a broken electrical insulation.

He did not know what was the prognosis in such cases, but he had seen the phenomenon in many so-called recoveries after Bell's palsy.

Mr. Kisch (in reply) said that his patient had had ordinary massage while in hospital, and the mother was taught to keep the skin in condition after he left.

Œsophageal Pouch.—Leslie Powell.

Male, aged 51. Difficulty for one year in swallowing food, which stuck at a level just above the sternum. No vomiting or

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return of food. No loss of weight ; patient looked well. Skiagrams showed a pouch. Œsophagoscopy showed a smooth mucous membrane but the posterior wall was pushed forward by a soft swelling, which caused obstruction. No opening was seen.

Operation.—9.5.36. Collar incision as for thyroidectomy. Thyroid isthmus divided between clamps. Œsophagus identified by passage of œsophagoscope by assistant. Pouch dissected out, ligatured, and removed, and stump invaginated. Wound left partly open and packed with gauze soaked in hypertonic saline.

Patient now swallows well.

DISCUSSION.

Sir ST CLAIR THOMSON asked what was the present tendency in regard to the operation—a one-stage or a two-stage operation. In the early days of Sir Henry Butlin, the mortality following the one-stage operation was so marked that it might be expected to be 10 per cent. This decreased with the introduction—chiefly from America—of the two-stage operation, which for many years had held sway. In later years, however, following the work of Trotter and other operators, there appeared to be a return to the one-stage procedure.

Mr. CRAIG DUNLOP asked if a note had been taken as to the condition of the vocal cords before operation. The patient stated that the voice was better now than before operation, but it was still abnormal, and the right cord crossed the mid-line to meet the left cord, in the cadaveric position. There was hypertrophy of the false cord on the right side, and he (the speaker) wondered whether this was a pre-operative, or a post-operative condition.

Mr. H. V. FORSTER said that he had been asked by Professor R. E. Kelly to see a man, aged 80, who had a pouch so large that removal was out of the question. Professor Kelly performed a gastrostomy, retaining the pouch, and the patient, who was able to empty the pouch which had interfered so much with swallowing, did very well.

Since then Professor Guizez had successfully treated patients by dilating the entrance to the œsophagus. Had any members had experience of palliative measures of that kind which could take the place of operation in the old and feeble ?

Mr. V. E. NEGUS said he did not think that it was wise to operate on cases of this kind unless the crico-pharyngeal sphincter was stretched ; therefore at the beginning of the operation one should pass a large œsophageal speculum or œsophagoscope and stretch the sphincter widely, empty the pouch, and pass a feeding-tube. By this means much post-operative trouble was obviated.

The ætiology of the pouch was closely connected with lack of relaxation of the crico-pharyngeal sphincter ; hence the need for stretching it. For a smaller pouch it was reasonable to do that occasionally, as it gave much relief. The difficulty in swallowing was due not only to filling of the pouch with food, and the consequent pressure of the pouch on the œsophagus, but also to a pulling forward of the anterior lip of the pouch by the crico-pharyngeal sphincter.

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With regard to the choice of the single operation, or the two-stage operation, Mr. Trotter had advocated the single-stage operation, and he (the speaker) did not know of a good reason for not using it, as there was the danger of mediastinitis from opening the side of the neck and moving the pouch from the mediastinum, whether the pouch itself was opened or not. He thought it better for repair to be carried out at the first operation rather than after considerable gluing together of structures had taken place by the time the second operation was due.

Mr. J. F. SIMPSON, referring to the suggestion of Mr. Forster that the age of 80 was a contra-indication for operation on œsophageal pouch, said that he had assisted Mr. Colledge in removing such a pouch from a man aged 91, who made a good recovery. [Mr. FORSTER: This particular pouch was the largest on record.]

Mr. C. P. WILSON said that an unusual point about this case was that it was apparently easy to pass an œsophagoscope into the gullet, and the pouch appeared only as a soft swelling pushing forward the posterior wall of the gullet and thus causing obstruction. It was usually easy to pass an œsophagoscope into the pouch, but difficult to pass it into the gullet. He had seen many such cases, but not one in which one did not pass the œsophagoscope into the pouch at first, and had to search for the opening from the pouch into the œsophagus. The present pouch seemed to be of unusual type.

Mr. HAROLD KISCH said that he had had one case of the kind in an old man suffering from obstruction and dysphagia. The radiologist had assured him that the picture suggested stricture of the œsophagus, not a pouch, and with that he agreed. He passed an œsophagoscope easily right down the œsophagus, no obstruction being encountered, but he thought there was some fullness at the level of the upper end of the sternum. During the night the patient was seized with severe pain on the right side of the chest, and he died the next morning. At autopsy a large œsophageal pouch, filled with offensive bismuth and food material was found. There was no injury or sign of instrumentation. Apparently there was some danger in passing an œsophagoscope in these cases.

Mr. LESLIE POWELL (in reply) said that this patient had always had a "funny" voice and had stammered, and his larynx now looked as it did before the operation. With regard to the œsophagoscope passing into the œsophagus and not into the pouch, he thought that was accounted for by the sharp, backward bend of the spine there, so that the opening into the pouch was directed backwards.

He did not invert the pouch into the lumen of the œsophagus; he understood that that was done sometimes, without cutting it off. He just oversewed the stump. He left the packing in four days, at the end of which time the temperature came down to normal, and the wound was clean when the drainage was removed. On the following day, however, the temperature went up again, as there was a little leakage; it would therefore have been wiser to have left the packing in for another three or four days, so that the wound in the œsophageal wall might be soundly healed.

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Leontiasis Ossea.—LESLIE POWELL

Female, aged 57.

1909.—Swelling of right upper jaw removed at Guy's Hospital.

1921.—In-patient at Guy's. Bone removed from right upper jaw. Diagnosis: Leontiasis ossea.

1926.—Three months' history of enlargement of right maxilla. X-ray report: Osteoma. Bone removed. No osteoma; new bone formation.

April 1936.—Complained of enlargement of left upper jaw. Great hypertrophy of both maxillae. X-rays show thickening and increased density of all skull bones. Spine, pelvis, femur, etc., normal. Sigma reaction, negative. Phosphatase: ten times normal.

Enlargement of the Nasal Bones and Nasal Processes of the Maxillae.—F. C. ORMEROD.

Male, aged 24. Has noticed hard swellings on sides of nose, gradually increasing for several years; twelve years ago had external frontal sinus operation. Depressed scar over right eyebrow.

The hard swellings appear to arise from the nasal bones and nasal processes of the maxillae and resemble the swellings which constitute the disease known on the West Coast of Africa as " 'ngundu ". The patient has not been out of England. The nose is clear, the sinuses transilluminate, X-rays show a diffuse opacity in the region of the swellings and of the right frontal sinus. The tonsils are infected and there is very advanced dental caries and sepsis.

DISCUSSION.

Dr. DOUGLAS GUTHRIE showed lantern slides from a case similar to those now under discussion; in this case, the bones of the fingers also were affected. Inspection of museums would reveal a few specimens of upper jaw which had been removed—the operator being under the impression that he was dealing with a malignant growth. On section the bone was found to be normal bone; they were really cases of hypertrophy of the cancellous tissue of the upper jaw.

Dr. Guthrie then showed illustrations of a hypertrophied maxilla which had been excised by Christopher Heath. He said that some years ago Mr. Westmacott had described and illustrated a number of these cases, and had drawn attention to the fact that the alveolus was greatly thickened, and the teeth looked as if they had been stuck like pegs into the hypertrophied mass.

He next showed the original drawing which Maclaud, a French naval surgeon, had published to support his statement that he had discovered in West Africa " a race of horned men." This had aroused much interest, but it was proved later that the appearance was caused by a

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pathological condition ("'ngundu") and was not a racial peculiarity. Some authorities regarded it as a manifestation of yaws.

Finally, he showed the picture of a skull from a case of advanced leontiasis ossea—the classical case described by Dr. Bickersteth, of Liverpool; there was great hypertrophy of most of the bones of the face and head, and the orbit was invaded to such an extent that the eye was destroyed.

Mr. HERBERT TILLEY said that Mr. Westmacott's experiences with regard to this type of bone pathology were recorded in the *Transactions of the International Congress of Medicine* held in London in 1913. Specimens of bone which he had removed from affected areas were examined by Professor Walker Hall (Bristol) who reported that in all of them the bone was very vascular and large osteoblasts were a prominent feature. Otherwise there was nothing to suggest malignancy, or anything more than hyperostosis.

He (the speaker) had noticed that in the patients shown to-day, the bones involved were tender to pressure. A dull aching pain was experienced by some of the sufferers who had been exhibited. The same symptoms were present in two patients on whom he had recently operated by freely exposing the swollen areas of the alveoli, removing all bone which appeared to be abnormally vascular and then stitching together the flaps of mucoperiosteum which had been raised from the gums and anterior surfaces of the hard palate. It would be too early to predict the permanent result of the operations, but meantime there had been no recurrence of the neuralgia, or "dull boring type of pain" of which the patients had complained. The specimens of bone removed were being decalcified and stained in order to search for any organisms which might be present; the probability of finding these was enhanced by the fact that diseased teeth had been removed a long time before he had dealt with the corresponding alveolar regions. But even if they should prove to have been infected, such a fact might only be applicable to cases of dental origin and one might have to find some other explanation for hyperostosis commencing in, and limited to, the nasal or malar bones.

Many years ago Mr. Walter Spencer and himself had each shown a case similar to Mr. Powell's; in those cases there had been so much œdema over the nasal bones and below the eyes that the patients looked as if they had been stung. In both cases streptococci were found in blood removed from the swollen areas. In Mr. Ormerod's case pus and polypi were found in the ethmoidal regions, and in chronic cases of the kind, hyperostosis of the nasal bones was by no means uncommon. One was, therefore, constrained to the view that sepsis was a predominant factor in this type of case.

Sir ST CLAIR THOMSON said that he had had a series of cases of this condition thirty-six years ago, discussed before the Laryngological Society in 1900.* He had shown two cases, two were exhibited by the late Dr. William Hill, and one by Dr. Atwood Thorne. All these had only to do with symmetrical enlargement of the nasal bones and the

* *Proceedings, Laryngological Society*, London, 1900, 7, 2-6.

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nasal processes of the maxillary bones. Two of the patients were females, aged 11 and 24 respectively, and three were males, aged 12, 15, and 24 respectively. In private practice he had had several cases in elderly people. One patient's nose was so red and shiny that it precluded her attendance at society functions; in another case there was such great distension that superficial ulceration had occurred. Many of the cases at that date were suspected to be syphilitic; the Wassermann test had not then been discovered, and antisyphilitic remedies gave no benefit. He consulted several colleagues about one of these cases, but they declined to commit themselves to an opinion. Tuberculosis was excluded, but syphilis was not always ruled out, because some cases in children were watched closely and later showed a suspicion of congenital syphilis. Sir Felix Semon, one of the leading authorities, suggested trauma as a cause; Sir James Dundas-Grant shared the diffidence shown by the profession generally at that date in formulating the ætiology of these cases. There was, however, a tendency to accept the view now supported by Mr. Tilley, that in a number of the cases there was some septic source.

Mr. LESLIE POWELL said it had been found in his case that the phosphatase was increased and this suggested that the condition was constitutional or congenital, rather than due to sepsis.

Penicillium Glaucum Infection of Nose and Antrum.
—J. F. O'MALLEY.

Female, district visitor, aged 49.

History.—January 11th, 1935, complained of colds in the nose for months. Nose badly blocked for a week alternating on posture. Discharge rather free, chiefly watery, but mucopus at times. No sneezing.

On examination.—Lining mucous membrane of nose swollen and moist. Left side worse (no airway). Septum deflected to left and large right middle turbinate. Transillumination: No crescents but illumination of both sides looks equal. Treatment: Endrine twice daily prescribed.

X-ray examination and report.—14.1.35: "Frontals, ethmoids, sphenoids, and right antrum clear. Left antrum cloudy, no fluid level. *Conclusions:* Infection of left antrum."

21.1.35.—A little more airway. More discharge of mucopus and a piece of greenish-yellow "substance" blown out. This raised a suspicion of aspergillosis, and discharge was collected subsequently for two days.

Examination by Professor Okell gave, on three different culture media, a growth of penicillium glaucum.

Operation.—29.1.35: Submucous resection of septum with reduction of middle turbinates and antrostomy (left). Secretion from these regions contained the mould. Subsequent history of case uneventful, as nose healed well and remained free and clean.

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Left-sided Otogenic Sphenoidal-lobe Abscess, without Otorrhœa or Localizing Signs. Operation. Recovery.
—N. ASHERSON.

Girl, aged 5½ years. Three weeks before admission had left earache for one day. This subsided without otorrhœa. Since then, for two weeks, had attacks of severe frontal headache and vomited, once at the beginning and frequently for the last two days, during which the headache was constant. She was somewhat drowsy. Temperature 98° F.; pulse 56 to 72. Blood-pressure 142–60.

On examination.—Tympanic membrane dull, injected, not bulging. No landmarks visible. The child was normal mentally; no nuchal rigidity. Marked generalized hypotonia, especially in arms. Tendon-jerks absent in right arm; a momentary weakness of the right facial muscles at the angle of the mouth was noticed only once. Gait unsteady. Right optic disc normal; left showed well-marked papillœdema.

Lumbar puncture revealed a normal fluid, pressure not increased. White blood-cell count was about 18,000; chiefly polymorphonuclears.

Operation.—25.3.36: Left mastoid explored and found to contain only scattered smears of mucopus in the cells. Dura of middle fossa exposed by removal of squama. It was under great tension, did not pulsate, and rapidly herniated through the aperture in the squama, forming a nipple projection. This bulge was explored and found to lead in an anterior direction to a large temporo-sphenoidal abscess containing at least 3 oz. of thick pus. Large tube inserted and brought out through upper end of incision. Mastoid cavity packed with B.I.P. gauze.

27.3.36.—Tube withdrawn and smaller one inserted. Tube then shortened daily and by 8.4.36 could no longer be introduced.

The child made a rapid recovery from the first day after the operation.

The swab from the abscess grew staphylococci; a swab from the mastoid grew diplo-bacilli of the Friedländer type.

Lymphosarcoma of Tonsil.—A. LOWNDES YATES.

Female, aged 50. First seen 10.7.33, with mass of soft glands in left side of neck and soft swelling of left tonsil. Biopsy of tonsil showed lymphosarcoma. 1.8.33: Left tonsil and portion of soft palate excised by diathermy. 15.8.33: Radium (0·5 mm. platinum screen) embedded 1,024 mg. hours and radium slung in naso-pharynx for 750 mg. hours. Radium, with screen equivalent to 2 mm. platinum, applied externally at a distance of 4 cm. for

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24 gramme-hours. The radium plaque was removed intermittently, to permit of the administration of gastrexo to restore the red cell count to normal. The glands and tumour disappeared, but in *August*, 1935, pyorrhœa developed and subsequently there was ulceration of the area of the growth. Biopsy: Radium necrosis. The ulcerated area was painted with methylene blue (1 per cent.) and healed. The interstitial keratitis and nerve deafness date from puberty. Wassermann reaction negative.

DISCUSSION.

Mr. CAWTHORNE said that his experience of sarcoma of the tonsil was that it shelled out easily on dissection, and if the excision was followed up by external irradiation, either by a radium bomb or deep X-rays, the case did very well.

Mr. W. A. MILL said that in his experience these cases did remarkably well after irradiation at least on the first, and perhaps on a second, occasion, but that later the growths became very resistant, no applications having any effect, and usually the patients died within three years.

Mr. HAROLD KISCH said that he had a patient with lymphosarcoma who had had many recurrences in glands in parts remote from the original site, but the condition always yielded to intensive X-rays. There had been no recurrence in the tonsil, though the first treatment had been four years ago.

Secondary Melanoma of Nose.—P. J. JORY.

History.—March 7th, 1934, moles on right eyelid treated by diathermy. *April 18th*, 1934: recurrent melanoma of right eyelid treated by diathermy. *June 8th*, 1934: biopsy of recurrent growth. Pathological report—" Pigmented basal-celled carcinoma of doubtful malignancy."

Patient was then sent to the Radium Institute for treatment. *November 28th*, 1934: exenteration of right orbit at St. George's Hospital. Pathological report: " Melanotic carcinoma."

Patient now complains of persistent bleeding from the right side of the nose. Examination through a speculum shows a nodule projecting from under the right inferior turbinate. This bleeds easily when touched with a probe. A skiagram shows no evidence of infiltration of the right antral cavity.

Styloid Process Projecting into Tonsils.—C. P. WILSON.

Male, aged 31. Complains of occasional blood-stained discharge from throat in mornings.

On examination.—Some post-nasal catarrh and dilated veins seen on pharynx. Tips of styloid processes can be seen projecting into tonsils and through anterior pillars of fauces.

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Royal Society of Medicine

Functional Stridor.—MAURICE SORSBY.

Male, aged 47.

History.—Four years ago the patient began to blink. Soon afterwards he developed difficulty in breathing, associated with stridor. The stridor is practically continuous during the day—though varying in intensity—but it is completely absent during sleep. Until two months ago the patient was doing heavy work without any evidence of dyspnœa. Central nervous system normal. Wassermann reaction negative.

Present condition.—The patient looks emaciated, experiences difficulty in breathing and has a practically continuous stridor. The voice is quite normal.

Larynx: Both cords move, though imperfectly; they are œdematous; there is slight pachydermia posteriorly. The cords adduct on inspiration, causing stridor.

Congenital Pre-auricular Sinuses.—MAURICE SORSBY.

Girl, aged 12.

History.—A small sinus in front of each pinna has been present since birth. Both sinuses began to discharge a foul-smelling secretion over a year ago.

On examination.—A thin probe can be inserted into each sinus. The right is larger than the left ($\frac{3}{4}$ in. and $\frac{1}{2}$ in. respectively). X-ray examination after lipiodol injections shows that there is no communication with any other structure.

Some Aspects of the Problem of Facial Paralysis

By I. A. TUMARKIN

I PROPOSE to limit myself to one aspect of this problem, namely, the possibility of surgery in Bell's palsy.

In 1934 Duel reported several cases of old-standing Bell's palsy on which he had operated. He said:—

> "I believe that although operative treatment of severe Bell's palsy is not yet a fixed principle, yet with continued study of indications for early intervention, it will eventually become so."

Our difficulty at present is that we recognize only the severe cases by the fact that they never recover. We see the patients a year or more after their illness, with varying degrees of deformity, and we are deterred from advising operation at that stage by the feeling not only that a complete cure is unlikely but that we may jeopardize the slight recovery which has already occurred. We are tantalized by the feeling that if only we could have operated in the first few days of their illness, we could certainly have saved the

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patients. There is ample evidence to show that immediate decompression will produce immediate recovery. Literally the paralysis begins to disappear before the patient leaves the operating theatre. But supposing we do see these cases in the first few days of their paralysis. How dare we advise operation, when we know that any given patient has a 4 to 1 chance of spontaneous recovery?

Now let me digress for a moment to consider the frequency and the nature of the permanent lesion. Duel puts the frequency at 15 to 20 per cent. This may surprise many of my listeners, as it certainly surprised me. However I sent out a questionnaire to 150 patients, and analysed the replies. There can be no doubt

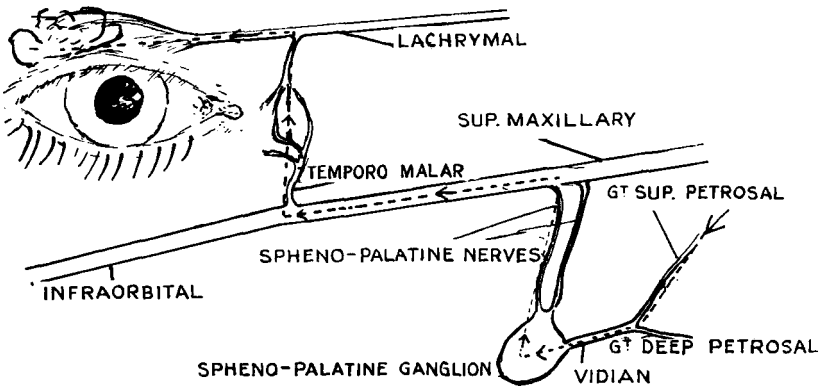


FIG. 1.
Normal path of lachrymatory impulses.

that in every five cases of Bell's palsy one will fail to recover completely.

The lesion varies from weakness of a single muscle down to complete unilateral paralysis with grotesque deformity. Contracture and true spasm were rare, but synkinesia was very common indeed. By synkinesia I mean that when a patient attempts to use one muscle, he involuntarily contracts others. The usual explanation is that after death of the nerve trunk, new axons push their way out. Some get lost and end up in the wrong muscle. Consequently some of the nervous energy put forth, say to close the eye, finds its way to the nose or mouth muscles, and *vice versa*.

A special example of synkinesia is the phenomenon of crocodile tears. Briefly, this consists of a troublesome epiphora which occurs during mastication. It is to be distinguished from the epiphora which occurs in the early stage of most facial palsies, and which is, of course, due to paralysis of the orbicularis palpebrarum. The

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crocodile tears appear late, and although some epiphora may or may not be produced by exposure to wind and so on, yet the really copious flow is only excited by the act of mastication. In a severe case the patient is constantly mopping his eye during a meal, and may, indeed, develop a secondary blepharitis.

We may explain this by assuming that fibres intended for the salivary glands, wander into the lachrymal gland. The salivary fibres of course travel along the chorda tympani normally, but if some get lost and enter the great superficial petrosal they will end up in the lachrymal gland by traversing: (1) The vidian nerve. (2) The sphenopalatine ganglion. (3) The sphenopalatine nerves. (4) The superior maxillary division of the Vth. (5) The temporo-malar nerve which communicates with (6) The lachrymal nerve. (See Fig. 1.)

This syndrome is evidence of a lesion involving the facial where it gives off the great superficial petrosal, that is, at the geniculate ganglion. Let us now return to our problem which I present to you under four headings :—

(*a*) Have we any criterion for deciding at the outset of a case that it is unlikely to recover ? (*b*) Where is the lesion ? (*c*) When shall we operate ? (*d*) What operation shall we perform ?

(*a*) Our questionnaire provided some very interesting statistics on the importance of certain early symptoms. It was clear that pain and loss of taste were of grave prognostic significance. A comparison between the 25 cures and 18 failures shown in the Table will make this clear.

Cases.	No pain and no loss of taste.	Pain but no loss of taste.	No pain but loss of taste.	Pain and loss of taste.
25 cures ..	18=72%	4=16%	2= 8%	1= 4%
18 failures ..	2=11%	6=33%	4=22%	6=33%

Pain plus loss of taste means 2 to 1 against recovery.
No pain and no loss of taste means 25 to 1 in favour of recovery.

Vertigo, hyperacusis, rash, pyrexia, and so on were of much less importance.

Stated simply, it may be said that if a patient has both pain and loss of taste, the chances are 2 to 1 that he will not recover ; but if he has neither of these symptoms the chances are 25 to 1 that he will recover. Less importance is to be attached to the presence of only one of these symptoms.

The distribution of the pain varied considerably, as did also its severity ; it was rarely a true otalgia ; more commonly it was referred vaguely to round the ear, or to the vertex, or even down the shoulder. The loss of taste was very definite. One patient accused his wife of poisoning him, as all his food tasted oily.

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(*b*) Now let us consider the site of the lesion. Unfortunately we are confronted by the fact that the term " Bell's palsy " certainly includes a variety of conditions :—

(1) Herpes oticus, so ably described by Ramsay Hunt, although well known before. (2) Mastoiditis, unrecognized because of the absence of otorrhœa, and other classical symptoms. (3) The elusive " rheumatic type " (" a frigore ") which constitutes the bulk of our cases, and of which the true pathology is unknown.

Clearly in the case of herpes oticus we must believe that the facial nerve is compressed at the geniculate ganglion itself. In other cases, however, it is usually maintained that the lesion is in the much more accessible descending portion of the nerve. Ney says, " In Bell's palsy the lesion is probably compressive in nature, and located low in the vertical canal inasmuch as the chorda tympani is rarely involved. Even if it *is* involved, it is rare to find paralysis of the stapedius." Ballance, speaking of a woman with persistent deformity, says : " If a decompression had been promptly performed five years ago on the lower 1 cm. of the vertical portion of the nerve, we think an almost perfect recovery would have followed " ; and Duel, speaking of the difficulty of approaching the tympanic section in the region of the oval window says, " Fortunately it is never necessary to uncover this portion in Bell's palsy." I regret to say that I am unable to accept this optimistic finding. It is quite possible that in the 80 per cent. of cases which recover spontaneously the lesion may well be limited to the descending portion of the nerve.

We, however, are interested in the remaining 20 per cent., and it is precisely in these that the evidence indicates a more central involvement, extending to the genu. As I have already mentioned, our conception of the pathology of herpes oticus implies such a central involvement. Furthermore, the phenomenon of crocodile tears implies a ganglionic involvement too. It is clear that that syndrome could not occur unless the great superficial petrosal had been involved, and that can only occur if the facial is strangulated in its first part. Now the extraordinary fact is that out of eighteen patients who failed to recover, not less than thirteen showed crocodile tears to some degree or other. At least ten had marked loss of taste.

This then, is my evidence, that in the majority of cases which fail to recover the lesion has involved the nerve in its *first portion*.

(*c*) When shall we operate ?

Delayed operation months or years afterwards cannot be expected to produce much benefit. Indeed it was surprising that so much was achieved in Duel's cases. On the other hand, early operation gives amazing results. Tempea says that the patient feels a return of power at once. One of my cases certainly showed

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recovery in thirty-six hours. This was not a case of true Bell's palsy. Actually the patient had had two or three radical mastoidectomies on her right ear. She came to me complaining of otorrhœa, vertigo, etc., and as conservative measures did not help, I again explored the mastoid. Three months later she suddenly developed a facial palsy. I promptly decompressed the fourth portion of the nerve, and in three days the face was normal. Another patient to whom I shall refer later, actually closed his eye before he left the operating table.

What if the reaction of degeneration is present? What can we expect from operation? It might be argued that the reaction of degeneration indicates a dead nerve trunk, and that recovery will be delayed for months, until the old trunk is absorbed, and new

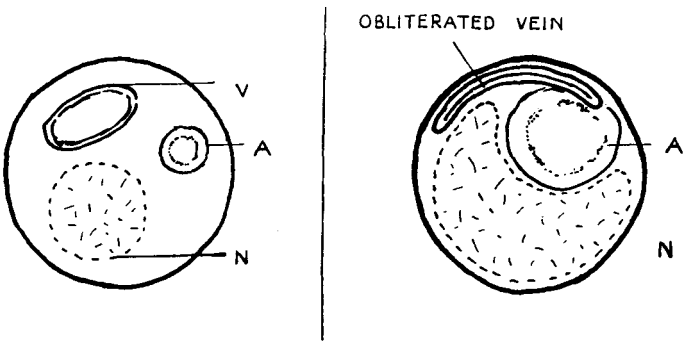


FIG. 2.

Cross-section of normal Fallopian canal. Fallopian canal in Bell's palsy. V—vein. N—nerve. A—artery.

axons have grown out. Curiously enough Sanders reports a case in which, although the reaction of degeneration was present for several days, the patient showed improvement within six hours of operation.

Similarly Duel records a case with reaction of degeneration which began to improve in a week. There is thus some evidence to suggest that R.D. does not necessarily mean absolute death of the nerve, and a timely decompression might still produce a dramatic resuscitation. We must remember that R.D. is not a clearcut syndrome. There are all degrees of partial R.D., and unfortunately it is not easy to standardize the tests.

(*d*) Lastly, I come to the question of the operation. Sanders has recorded a case in which he decompressed down to the ganglion. This involves exenterating the tympanic membrane, together with the malleus and incus—a serious addition to an already laborious and difficult procedure. Furthermore, the risk of

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labyrinthine infection cannot be ignored, especially in cases of herpes oticus, where the vesicles are already likely to be secondarily infected. I do not believe that complete osseous decompression is ever likely to become a routine procedure.

Tempea has recorded several cases of dramatic cure in which he merely uncapped the fourth portion (limited osseous decompression).

The interesting point arises: How can this limited operation succeed if, as I have suggested, the site of strangulation is in the first part of the nerve? A possible explanation is as follows:—

Consider the canal. Its contents—nerve, stylomastoid artery, vein, lymphatics, etc.—are believed to occupy from one-third to

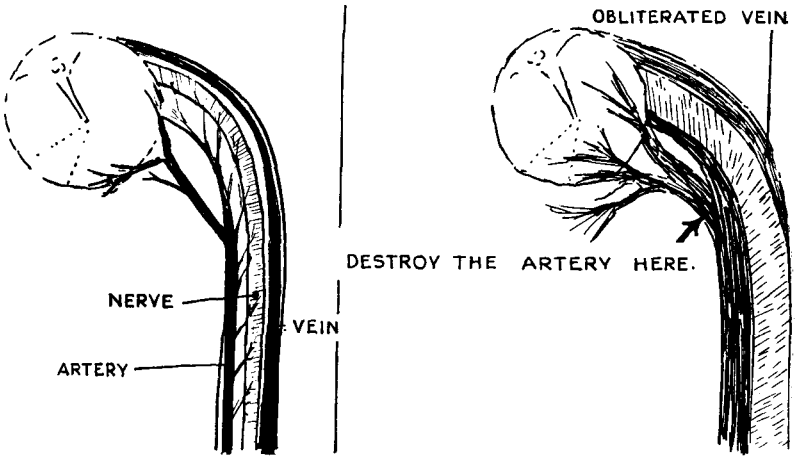


FIG. 3.

Normal canal. Vascular decompression. Dilated artery and nerve in Bell's palsy.

one-half of its capacity. When palsy is developing, we assume that swelling is taking place (Figs. 2 and 3).

Remember that the stylomastoid artery, in addition to nourishing the nerve, carries a large volume of blood for the supply of the tympanic membrane, and the adjacent bone. In cases of inflammation this vessel is probably enormously increased in size. The result is, that the thin-walled veins and lymphatics are obliterated (Fig. 2). A vicious circle ensues. Blood can get in, but cannot drain out, and so the nerve dies. But supposing we ablate the engorged bone to which the artery is carrying this great volume of blood (Fig. 3). Presumably it will sink down to normal calibre, and so we might give just enough room for the vein to open up, and the nerve to re-expand. I suggest then that these osseous decompressions may be achieving results by virtue of the incidental

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vascular decompression. If this be correct, then may it not be possible to abandon the laborious osseous decompression. Can we achieve vascular decompression by any simpler and less dangerous method ?

Theoretically we might ligature the stylomastoid artery or even its parent, the posterior auricular in the neck. I believe there are several objections to such an operation. Suppose, however, we do a simple mastoidotomy and then extend our operation in three directions, by removing: (1) The perifacial cells. (2) The posterior meatal wall, until we ablate the stylomastoid artery just as it emerges from the canal. (3) The outer attic wall, so as to diminish tympanic congestion.

This operation—vascular decompression, as I have christened it—is simple and safe. It should be easy therefore to determine whether it has any practical value. We have our criterion as to whether our patient is likely to recover or not, and in suitable cases we shall be justified in proposing this operation on the grounds that it may do good, and will certainly do no harm. Many patients will readily accept, as the following will show :—

On *April 21st* I was asked to see a case of herpes oticus. There was complete facial palsy with troublesome epiphora. The patient was haggard with pain and loss of sleep, and he had spontaneously complained of loss of taste. I carried out a vascular decompression, and there was an immense response. Within an hour he was able to close his eye, the epiphora disappeared and the sense of taste returned. The pain, which had been agonizing, disappeared also. Three days later there was a further outcrop of herpetic vesicles. The neuralgia returned, and the orbicularis weakened again. It never became completely paralysed, however, and the taste remained unaffected.

He is now improving steadily and I believe will recover completely. This fulminating herpetic type has a notoriously grave prognosis, and I feel that in less malignant types of palsy, the dramatic improvement of the first three days would have been permanent, and would have gone on to a complete cure even more rapidly.

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DISCUSSION.

Mr. G. H. STEELE, who showed a film demonstrating the technique of the Ballance-Duel operation, said that the case was depicted nine

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months after operation. There had been no improvement six months afterwards, but it was now continuing to improve.

Mr. LIONEL COLLEDGE said there was one point which did not seem to have received much attention, namely, that of distinguishing between cases in which the tympanum was intact, and those in which the tympanum had been destroyed by a radical mastoid operation. He believed that most of the cases operated upon by the late Dr. Duel had already undergone severe operations on the ear, and in practically all of them the tympanum had been destroyed and the nerve actually cut across. In such a case the choice of procedure was simple. It was different, however, when the patient had an intact tympanum. Was the operator justified in destroying the tympanum, or risking it, with the rather equivocal prospect of correcting the facial palsy? That also applied to certain cases in which the mastoid operation had left a facial palsy, but in which there was complete recovery of the tympanum. He (the speaker) thought there was still something to be said for nerve anastomosis, though some said it ought to be abandoned altogether. In such cases there was likely to be a good result from using the hypoglossal with a secondary anastomosis between the hypoglossal and the descendens. In any case it was impossible to procure a perfect recovery. As Mr. Tumarkin had shown, after a successful graft there occurred a mass passage of impulses down the nerve, and thus there could no longer be differentiation of the nerve supply to the eye and that to the corner of the mouth and the chin. The patient could only contract the whole side of the face at once, and symmetrical movement was not possible. Mr. Steele's cinematograph had shown that very well.

With regard to the proposal to carry out vascular decompression: was it worth while to perform such an elaborate operation in order to relieve the congestion? He thought Mr. Tumarkin might first try the effect of a few leeches applied to the area.

Mr. E. E. BURNIER said that he had had a case in a girl, aged 12. The nerve had been injured in an accident, and healing took place by cross-union of the fibres. The fibres going to the upper facial joined those of the lower facial, with the result that when the patient closed the eye on one side she moved the opposite corner of her mouth. She was seen by Dr. C. P. Symonds.

Mr. W. STIRK ADAMS said that the ætiology of Bell's palsy had been investigated by Russell Brain and R. S. Aitken (*Lancet* i, 19, 1933). By means of a complement-fixation test on the serum they showed, in eight cases, that when vesicles were present in the region of the ear a positive complement-fixation indicated the presence of herpes zoster virus. In a second group of eighteen patients suffering from Bell's palsy without associated vesicles a negative complement-fixation made it unlikely that zoster virus was responsible for the paralysis, while in four further patients without vesicles a positive zoster complement-fixation test strongly suggested a zoster infection as the cause of the paralysis.

He (the speaker) had decompressed the descending portion of the facial nerve in a girl who had, after two months, made no recovery

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from a spontaneous Bell's palsy. The nerve was swollen to about four times its normal size, the dense capsule of the Fallopian canal was eroded away completely on its posterior aspect and the posterior half of the nerve was lying in cancellous bone. He thought that the pressure of the inflammation, with consequent swelling, had produced erosion of the Fallopian canal in this manner. This suggested a considerable degree of continued pressure on the nerve in some cases of Bell's palsy. In this case there had been full recovery of facial movements three months after the operation and the patient could then wink either eye separately at will.

Mr. TUMARKIN (in reply) said that Dr. Duel had abandoned the foil just before he died, and he (the speaker) had never used it. Synkinesia was a common late result, and that fact supported his contention that if a real cure was to be obtained the nerve must be saved; it must not be allowed to die and then an attempt be made to get a new nerve. Traumatic palsies were in a different group from Bell's palsies; it was of the latter that he had been speaking. One must decide where the lesion was; if it was deep, the idea of osseous decompression must be abandoned; the nerve could not be saved. In the few operations for the condition which he had performed, he had not encountered the condition described by Mr. Stirk Adams. He did not think that swelling of the nerve was likely to produce direct erosion. There was probably some vascular trouble present; the vein became blocked, and there was a massive necrosis of bone owing to defective blood supply.

Discussion on Intratympanic Medication, with Special Reference to Thyroxine

DOUGLAS GUTHRIE: *The local action of thyroxine and other substances.*—Just over a year ago the late Dr. Albert Gray, at a meeting of the Section of Otology related his experience of the intratympanic injection of thyroxine in otosclerosis and in the so-called dry catarrh, and gave details of fourteen cases, in seven of which there was improvement with regard both to hearing and to tinnitus.[1]

Dr. Gray postulated that otosclerosis was "the result of a defective vasomotor response in the small blood-vessels of the ear" and that the local application of thyroxine, by producing a prolonged vasodilatation without inflammatory reaction, might overcome the defect and relieve the symptoms. He had noted that thyroid extract, applied locally to the nasal mucosa, caused active congestion without obvious irritation. Dr. Gray suggested thyroxine solely on account of its local effect, and said that any substance producing a similar local action would serve as well. This beneficial effect of hyperæmia may explain the success of oto-massage, of the local application of heat by diathermy, and of the Zünd-Burguet apparatus, but in each case the congestion passes off much

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sooner than does the congestion produced by thyroxine. The temporary improvement in hearing sometimes noted after taking nitrites or alcohol may be similarly explained. The "flamingo tinge" of the tympanic membrane, originally described by Schwartze as the sole objective sign of otosclerosis, but found in only 10 per cent. of cases, is usually attributed to osteitis of the promontory. May this not be Nature's effort to counteract the symptoms by the production of hyperæmia within the tympanum?

There are at least two substances which produce local action similar to that of thyroxine. One is dionin, which has been used by ophthalmologists in cases of corneal opacity, and produces an œdema and redness of the conjunctiva, lasting for several days. The other is doryl, a derivation of acetylcholine, which has an action opposite to that of adrenaline and has been recommended as a local application in ozæna. My experience with each of these substances is limited to one case, and no effect, for good or ill, was observed, but they may perhaps be worthy of further trial.

The effect of inflammation upon otosclerosis.—Dr. Gray made it quite clear that his object was to produce hyperæmia without inflammatory reaction. Is acute inflammation of any benefit in cases of chronic progressive deafness? And what is the result of an attack of acute otitis upon an established case of otosclerosis? There seems to be no recorded case in literature.

A few years ago, Sir Robert Woods[2] suggested the use of intra-tympanic injections of a weak solution of iodine. He held the view that otosclerosis was a chronic inflammation probably due to a micro-organism. He alleged that the reason for chronicity in chronic inflammation was that the initial inflammatory reaction had been insufficient to bring about a natural process of cure. From this he argued that otosclerosis should be treated by producing local inflammation without destroying tissue. The cure of chronic infection by exciting acute inflammation is an old principle which has been used with benefit in many diseases. No subsequent record of the treatment has been published, but in reply to an inquiry, Sir Robert Woods informed me that he had not given the method an extended trial but that he was confident of its efficacy in suitable cases. He wrote as follows:—

"To be of any real value treatment must be undertaken early, and in a disease so capricious and so slowly progressive, it is only after treating many cases that one can come to a reasonable conjecture as to the efficiency of any line of treatment. Furthermore, we know that this disease (otosclerosis) may advance steadily and then without apparent cause, halt definitely and permanently, and if our therapeutic measures should happen to coincide with such a halt, we may easily draw a wrong conclusion in favour of the remedy."

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The selection of cases for thyroxine treatment.—While there is no contra-indication to thyroxine treatment, its indiscriminate use can only bring the method into disrepute. As Dr. Gray told us, there is no need " to distinguish cases of otosclerosis from the so-called chronic dry middle-ear catarrh ". The cases unlikely to respond are those showing evidence of nerve-involvement, with lowering of the upper tone-limit and diminished bone conduction. Above all, the selected cases must be recent cases ; naturally the desired vasomotor response will be greater in young patients and the treatment is unlikely to be successful in persons over 50 years of age.

The technique of intratympanic injection.—It is rather surprising that this method of introducing a medicament into the tympanic cavity has been so seldom employed. The only record I can find, previous to those of Sir Robert Woods and Dr. Gray, is by Richter in 1911. Richter[3] stated that in cases of otosclerosis he had injected through the tympanic membrane fibrolysin, iodine solution, soda solution, and dilute hydrochloric acid, but in no case had there been any benefit. Of course an almost incredible number of drugs has been recommended at one time or another for injection *per tubam*, with the aid of the catheter, but the majority of otologists now agree that when the tympanic membrane is intact, very little fluid can be blown in by this route, any benefit being probably due to the inflation of air. No doubt solutions of various drugs could be injected into the tympanum through the Weber-Liel tube but this method does not appear to have been used to any extent. Ross and Rawson[4] investigated the blood-pressure in dogs after the intratympanic injection (*viâ* the membrane) of nicotine, sodium nitrite, and histamine and noted the effect upon vestibular reactions of cocaine, quinine, alcohol, etc. This appears to prove that drugs introduced into the tympanic cavity are absorbed into the general circulation, a fact worth remembering when testing the effect of various substances in otosclerosis.

In his original paper Dr. Gray described his technique of intratympanic injection of thyroxine in such full detail that there is no need to repeat his instructions. He conveyed the impression that the procedure is extremely simple. Nevertheless it demands a certain degree of manipulative skill. It is neither easy to puncture at the correct spot and angle nor to hold the point of the needle steadily in making the injection. The cocaine-aniline anæsthetic solution may be conveniently applied to the tympanic membrane on a tiny wool mop, thus minimizing the risk of irritation of the skin of the meatus by aniline. The thyroxine tablet or tabloid is powdered and suspended in five minims of water freshly boiled and slightly warm. Pure thyroxine is insoluble in water. It is soluble in alkali but is unstable and is said to have a slightly

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caustic effect which would obviously render it unsuitable for use in the ear.

A fortnightly injection is given to each affected ear, so that in bilateral cases a weekly injection is given, treating the two sides alternately. The entire course consists of from three to six injections for each affected ear, but the first injection will show whether the treatment is effective and, consequently, whether it should be continued. None of my patients complained of pain and there was no case of intratympanic hæmorrhage or of inflammation. Vertigo is avoided by using lukewarm water. It was interesting to note that no cough reflex was produced. Is this reflex diminished or absent in otosclerotics?

The fallacy of hearing tests.—When any new treatment for otosclerosis is introduced, criticism is usually levelled at the method of estimating the hearing before and after treatment. If the audiometer has been used, the critics may be satisfied, but the use of tuning-forks is held to be full of fallacies, and the voice tests are said to be so fallacious as to be almost worthless. Nevertheless the patient cares little about audiometer or tuning-forks; he wishes to hear the conversational voice. Have we not all been consulted by a patient complaining of slight deafness, and, on applying the usual tests, have found the hearing to be normal? Still more frequently have we been told by a patient under treatment that the hearing is much improved and, on testing, we have found the results quite unaltered since the previous visit. Are the statements of the patient and of his friends and kindred so inaccurate that they may as well be neglected? Has our treatment merely stimulated the will to hear? Has it merely awakened the dormant faculty of attention? Are the results of our tests merely a matter of academic or scientific importance, provided the patient and his friends are satisfied that the hearing has improved?

It is said that any treatment will temporarily improve the average case of otosclerosis. Some critic may attribute the benefit from thyroxine injections to the simple puncture of the tympanic membrane or to the injection of water alone. But tinnitus, as well as deafness, seems to be relieved by the treatment. In his reply to the discussion following his paper, Dr. Gray said that "the patients seemed pleased with the result, and that was the best test".

The most logical test would appear to be a voice for which the patient is not listening. As we apply the hearing tests, the patient is primed to react and is listening more or less intently, the extent depending upon his mental attitude at the moment. But if the patient in his own home hears the telephone bell or an unexpected remark of a member of his family, that surely is the best and most certain test of his hearing power.

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Royal Society of Medicine

The results of thyroxine treatment.—So far as I know, the only published results other than those of Dr. Gray, are recorded by Goldstein[5] in the *Laryngoscope* for February, 1936. Four cases were treated, with improvement in two ; in the remaining two the diagnosis of otosclerosis was not certain. The results were checked by audiograms.

My own experience of the method is too small and too recent to be of much value but the details may be of interest.

CASE I.—Mrs. R., aged 30. Dullness of hearing for three years, worse in left ear ; no hereditary tendency. Slight tinnitus ; slight wax in both ears ; tympanic membranes normal.

	Right.	*Left.*
Tuning-forks	C.128	C.256
Watch	6 in.	Contact.
Whisper	10 ft.	4 ft.

Three injections of thyroxine given at fortnightly intervals ; only left ear treated.

A week after first injection, states she hears better. C.128 audible by both ears ; results of other tests unaltered. After third injection patient and her husband (a critical lawyer) state that hearing is much improved ; tinnitus gone. C.64 audible in both ears ; watch—right 1 ft., left 1 ft. ; whisper—right 10 ft., left 6 ft.

There is thus a demonstrable improvement in both ears. Dr. Gray noted this contralateral effect in one of his cases.

CASE II.—Mrs. M., aged 28 ; loss of hearing in left ear for two years, gradually increasing ; no hereditary tendency. No tinnitus ; right tympanic membrane normal ; left, pink tinge ; wax in right ear, none in left.

	Right.	*Left.*
Tuning-forks	All audible.	C.256 and over.
Whisper	12 ft.	2 ft.

Three injections of thyroxine ; fortnightly intervals. Thereafter results of tuning-fork tests unaltered, but whisper now heard at 6 ft. left ear. States that she can hear much better and does not require to turn her head as before.

CASE III.—Miss D., aged 39 ; both ears affected, right ear worse, for six years ; paracusis. Father deaf since age of 20 ; also a younger sister deaf. Tympanic membranes normal ; no tinnitus.

	Right.	*Left.*
Tuning-forks	Lost below C.128.	
Watch	2 in.	4 in.
Whisper	2 ft.	5 ft.

After three injections of thyroxine in right ear was convinced that hearing had improved, and her friends have also remarked improvement (not knowing of treatment) : nevertheless results of hearing tests remain unaltered.

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CASE IV.—Miss C., aged 17; dullness of hearing for two years, right ear only; no tinnitus; no paracusis. History of early deafness on mother's side. Left tympanic membrane normal; right, slight opacity, no redness; no wax in either ear.

	Right.	*Left.*
Tuning-forks	C.128	C.64
Watch	4 in.	3 ft.
Whisper	3 ft.	15 ft.

Four injections of thyroxine given at fortnightly intervals in right ear. First injection caused slight vertigo for a few hours. Result: Right ear, C.64 audible, watch 1 ft., whisper 8 ft. A little secretion of wax appeared.

CASE V.—Miss McL., aged 30. Slight deafness for five years, gradually increasing; right ear worse.

	Right.	*Left.*
Tuning-forks	C.512	C.256
Whisper	1 ft.	4 ft.

Thyroxine injection into right ear on three occasions without result, but treatment interrupted by severe head cold.

SUMMARY

Of the five cases treated, four improved in hearing, and in two of them the improvement was demonstrable by tests.

Ultimate result and prognosis.—While one hesitates to pass judgment on the thyroxine treatment from such slender evidence as five cases can supply, it cannot be denied that the results are at least encouraging.

As everyone knows, there is a natural tendency to exaggerate the value of every new remedy or mode of treatment, especially when applied to the cure of diseases previously regarded as incurable. All that one can say at the present time, therefore, is that thyroxine injections deserve a trial in selected cases of otosclerosis. If further experience leads us to conclude that the thyroxine treatment is of proved value, what then shall we say of the future? Is the benefit permanent, or must the injections be repeated at intervals? And if that is so, what periods of time should elapse between the courses of treatment?

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GAVIN LIVINGSTONE: After Dr. Albert Gray introduced this method last year, treatment of a series of cases, following those mentioned in his paper, was begun at the Ferens Institute, Middlesex Hospital. It was decided to select only those cases in which the diagnosis of true otosclerosis was undoubted. The family history of deafness, beginning in early adult life, was one of the main points in clinching the diagnosis and this was found in 68 per cent. of the cases. Where Eustachian inflation improved the hearing, or where a history of suppurative otitis media or nasal catarrh was obtained, the cases were not included in the series. Tinnitus was present in about 64 per cent. of the cases selected for treatment.

The patients who were under treatment by Dr. Gray at the time of his death were included in the present investigation, and it has been a great privilege and delight to use the detailed instructive notes which he wrote about the cases. Every factor which might have a bearing, however remote, on the problem, was carefully noted by him. Cross-references to other patients were frequent and most illuminating.

All patients selected for treatment were tested with the pure tone audiometer (Western Electric 2 B E Model) both by air and bone conduction and an audiogram was kept. Other hearing tests employed were the conversational voice, whisper, and watch. The high and low limits for air and bone conduction were tested with the monochord and low-frequency tuning-forks respectively. The tests were carried out, where possible, by the same person and in the same surroundings.

The technique employed followed in all details that of Dr. Gray, whose patients undergoing further treatment noticed no alteration in the method of anæsthesia, injection, or after-treatment. The thyroxine injected was prepared with hot water; the tablets broke down quickly and a solution containing an excess of undissolved particles of thyroxine in suspension was obtained. This solution passed freely through the special hypodermic needles and caused no trouble during the injection. The dose given was $\frac{1}{64}$ gr. suspended in 5 minims of water, and a total of six injections. There may be an advantage in using the suspension of solid particles, which can act either as a reserve supply, or as a foreign body causing further congestion, but this is only conjecture, and there is little conclusive evidence supporting the statement. The anæsthesia obtained by instilling 1 c.cm. of a solution containing nine parts of freshly distilled aniline and one part of cocaine proved entirely satisfactory. The tympanic membrane was unaltered in appearance after the solution had been mopped away with small plugs of cotton-wool, and no cases of otitis externa were seen afterwards.

The complications following the injection may be divided into two groups—immediate and remote. The immediate complications

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were few. Most of the patients complained of pain or numbness radiating down the neck and backwards behind the ear; this pain usually lasted for about twenty minutes but, sometimes, in a milder degree, for forty-eight hours. Vertigo occurred in the early cases, but after hot water was used for the thyroxine solution no further trouble was experienced. The most frequent remote complication was deafness, caused by hæmorrhage at the site of injection, and the discomfort of the clot becoming adherent to the outer surface of the tympanic membrane. Further injections had to be postponed until the clot could be removed, because the landmarks were hidden and the anæsthetic solution was unable to penetrate the surface of the drum.

Out of 360 injections no case of infection of the middle ear has been recorded and, with aseptic precautions, there is no need to fear this complication.

One patient had most interesting reactions. In the right ear after injection she had a violent labyrinthine attack with vertigo, nausea, and vomiting, which lasted twenty-four hours. She also showed an immediate and great improvement in hearing, and this is still maintained three months later. The audiometer showed a decrease in the hearing loss for speech from 60 per cent. before to 30 per cent. after treatment. On injection of the left ear ten weeks later no labyrinthine upset occurred, but a partial facial paralysis developed after forty-eight hours and still persists, although it is diminishing. These results were so dramatic and occurred so rapidly that they must be the result of trauma at the time of injection rather than the reaction due to the solution of thyroxine injected. This facial paralysis is the only serious complication noted in 360 injections.

Objective improvement in hearing, when tested with the pure tone audiometer was infrequent, and when tested with the human voice was variable. In some cases voice tests showed a decrease in hearing, and audiometer tests showed no change, or a slight improvement. Subjective improvement was more common, and it is impossible to disregard entirely the patient's own conviction that he hears sounds he was unable to hear before, especially if he is confirmed in this by both friends and employers. Although the pure tone audiometer is of great value in the testing of hearing, some doubt must be thrown on the significance of the changes, especially where tinnitus simulates the higher frequencies. Variations of less than 5 per cent. of hearing loss have been disregarded in this series; it is hoped to control further series of cases with both the pure tone and speech audiometers.

The total number of cases treated was 25, of which 5 show an objective improvement on the audiometer. The total number of ears improved by over 10 per cent. units of hearing loss for speech

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is 6 (out of a total of 50). Number of ears improved over 5 per cent., 3; number of ears made worse over 5 per cent., 4.

An improvement shown by speech tests is frequently not confirmed by the audiometer; the converse is occasionally true, the audiometer showing improvement when speech tests show none. Subjective improvement occurred in eight cases.

Tinnitus was present in sixteen cases; there was improvement in this respect in six cases, but tinnitus is a subjective manifestation for which there is no satisfactory method of testing.

All these controlling tests are to be repeated in three months' time in order to see how long the improvement lasts.

Experimental investigation on cats.—It was decided to investigate the effect on the mucous membrane of a cat's middle ear, of an injection of thyroxine solution similar to that used in the treatment of otosclerosis; flavine was to be injected as a control.

The external auditory canal in a cat is tortuous and usually filled with cerumen; each cat selected had to have wide canals and was injected, while under nembutal anæsthesia, by Mr. Walker Ashcroft. Ether was not used, because of the possible congestion of the mucous membrane.

The cats were killed at intervals varying from three to forty-eight hours and the temporal bones were fixed, decalcified, and cut into serial sections.

Experiment I.—In right ear: 5 minims of thyroxine solution injected.
In left ear: 5 minims of flavine $\frac{1}{1,000}$ injected.
The cat was killed in three and a half hours.

The middle ear on both sides showed congestion of the mucosa and free blood in the cavity. There was no difference in the degree of congestion.

Experiment II.—Right ear: Thyroxine 5 minims.
Left ear: Flavine 5 minims $\frac{1}{1,000}$.
Cat killed in twenty-seven hours.

There was mild congestion of the middle ears; no difference was detected between the two ears.

Experiment III.—Right ear: Flavine 5 minims $\frac{1}{1,000}$.
Left ear: Nothing.
Killed in twenty-seven hours.

Moderate blood-clot, a little pus: mucosa congested and a more marked reaction than in Experiment II in which the same amount of flavine was injected and the cat was killed in the same time.

Experiment IV.—Right ear: Thyroxine 5 minims.
Left ear: Nothing.
Killed in forty-eight hours.

The right ear showed organizing blood-clot, pus, and some superficial shedding of the epithelium, a definite otitis media.

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Conclusion.—Before there is sufficient evidence to prove or disprove the reaction of the middle ear to thyroxine injection in cats, many more experiments with various controls must be carried out and the same experiments repeated many times in order that the appearances may not be altered by infection.

The present simple series shows that :—

(1) Infection occurs in cats very easily, and histological changes in the mucosa are due to sepsis rather than to the action of thyroxine.

(2) The appearances of the middle ear after three hours are the same after either flavine or thyroxine has been injected and there is no evidence to prove that thyroxine has a specific action causing congestion of the mucous membrane.

Dr. Gray, in his original paper, stated that he found a preparation of dried extract of thyroid gland made up with vaseline caused congestion of the nasal mucosa. I have carried out an investigation in a series of patients with healthy noses. One nostril was painted with normal saline, the other with thyroxine solution. No difference in congestion or in appearance was noted by the patients or the examiner. It would have been interesting to repeat the investigation, using a vaseline thyroid-gland paste instead of the pure thyroxine solution.

The results of the thyroxine treatment in the present series of patients are so varied, and show so little objective improvement that no speculation as to how or why they occur will now be attempted.

In the light of the present results the reader is doubtful whether the optimism expressed in Dr. Gray's paper will be fully justified ; nevertheless, in view of the fact that a small but definite number of cases treated by intratympanic medication were objectively improved, further investigation should be carried out over a longer period and, as far as possible, with accurate measurement of the amount and duration of the improvement ; to do this would entail work over a period of several years.

I am indebted to the surgeons who have allowed me to use their cases.

SUMMARY.

Total number of cases treated	25
Definite objective improvement	5
Subjective improvement ..	8
Improvement in tinnitus ..	6 cases out of 16

The experiments with cats tend to show that thyroxine does not cause a specific congestion of the mucous membrane.

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S. C. SUGGIT: The clinical material for this contribution has been drawn from the clinics of Mr. Kisch and Mr. Watkyn-Thomas at the Central London Throat Hospital and University College Hospital, with a few cases supplied by Mr. Formby. The greater number of the cases are clinically cases of otosclerosis, others of more doubtful clinical definition have been added deliberately. Whenever there has been any doubt as to the patency of the Eustachian tubes, inflation has been carried out as a preliminary. All the cases have been examined radiologically and reported on by Dr. Graham Hodgson; the blood Wassermann reaction has been tested in every case by Dr. Lucas at the Central London and Dr. Teale at University College, and has been negative throughout.

Intratympanic injection under local anæsthesia has been carried out according to the technique of the late Dr. Gray. At first $\frac{1}{64}$ gr. tablets of thyroxine dissolved in 4 minims of sterile water were used, but this was discarded at an early stage for British Drug Houses' solution of thyroxine 4 mg. in 1 c.cm. of normal saline, and 0·3 per cent. cresol as preservative. This solution retains its efficacy, provided it does not turn pink. In the control cases $\frac{1}{1,000}$ histamine acid phosphate or normal saline was used—4 minims at each injection. The injections have been made, as a rule, on alternate sides, at weekly intervals in the bilateral cases, and at fortnightly intervals in the unilateral cases.

The degree of deafness was estimated before treatment by the half-intensity calibrated forks and curves, expressed in decibels, were made for air and for bone conduction. Watch and conversation tests were carried out as a subsidiary measure. In the saline cases the audiometer air-conduction curves have also been available, using the Western Electric 2 B E Audiometer. No tests were carried out during the course of treatment, and as a rule about a month was allowed to pass after the last injection before testing the cases again. The cases have been tested in relatively silent conditions in the silence room at Univeristy College Hospital. They have been seen at two- or three-monthly intervals, and in those few cases that have shown any material improvement, audiometer tests have been carried out at these visits.

The thyroxine cases are shown divided into a short and a long series. The short series received two injections for each ear, the long series received four injections for each ear.

Tables I and II.—Among those cases which are considered to be improved are all those which show any demonstrable improvement on the decibel hearing curves, however little it might be. The figures indicate the proportion of true otosclerosis to atypical cases clinically, and the proportion of those showing X-ray evidence of otosclerosis to those showing no such evidence.

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TABLE I

THYROXINE. SHORT SERIES

Results.	No. of Patients.	Total.	Clinically otosclerosis.	Clinically atypical.	X-ray report. Positive.	X-ray report. Negative.
Worse	3					
No change	6	11 63%	6	5	9	2
Improvement subjective only	2					
Improvement in bone conduction only	3					
Improvement in air and bone conduction	4	7 37%	6	1	5	2
Tinnitus: No change		9	6	3	6	3
Tinnitus: Improvement		2	2	0	2	0

TABLE II

THYROXINE. LONG SERIES

Results.	No. of patients.	Total.	Clinically otosclerosis.	Clinically atypical.	X-ray report. Positive.	X-ray report. Negative.
Worse	0	—	—	—	—	—
No change	4					
Improvement subjective only	3	7 58%	7	0	5	2
Improvement in bone conduction only	1					
Improvement in air and bone conduction	4	5 42%	5	0	3	2
Tinnitus: No change		7	7	0	5	2
Tinnitus: Improvement		4	4	0	3	1

Table III. Combined series.—This Table indicates the total thyroxine results. Twelve out of thirty cases showed some demonstrable improvement. In the follow-up no sustained improvement in hearing, subjective or objective, has been obtained, and in no case has the patient received practical material benefit. Six out of twenty-two cases of tinnitus showed relief, partial or complete, and relief has been permanent so far.

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TABLE III

THYROXINE. COMBINED SERIES

Results.	No. of patients.	Total.	Clinically otosclerosis.	Clinically atypical.	X-ray report. Positive.	X-ray report. Negative.
Worse	3					
No change	10					
Improvement subjective only	5	18 60%	13	5	14	4
Improvement in bone conduction only	4					
Improvement in air and bone conduction	8	12 40%	11	1	8	4
Tinnitus: No change		16 73%	13	3	11	5
Tinnitus: Improvement		6 27%	6	0	5	1

Fig. 1. *Right ear.*—The graphs of three of the thyroxine cases are shown in full to demonstrate the best results obtained.

Fig. 2. *Left ear.*—Subjective improvement was present in this case, and tinnitus has now been completely relieved for four months.

Fig. 3. *Right ear.*—In this case there was little change on the right side.

Fig. 4. *Left ear.*—The left ear showed moderate improvement and subjective improvement was also present on this side.

Fig. 5. *Right ear.*—In this case the hearing was very confused after injection, but cleared during the subsequent months; later she thought she heard the higher notes better.

Fig. 6. *Left ear.*—Tinnitus was severe, and has been much improved now for four months. All these three cases received four injections on each side.

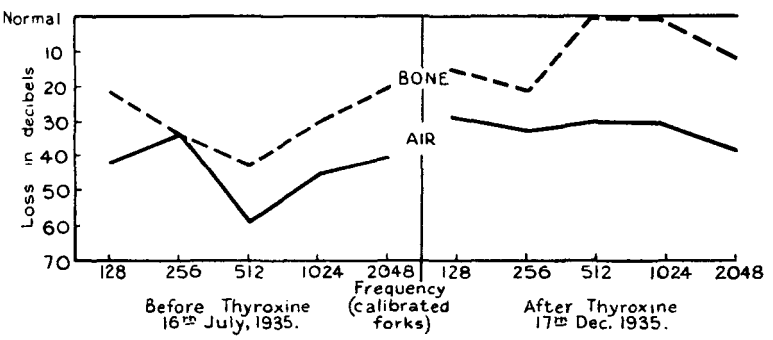


FIG. 1.

CASE No. 1144. Male, aged 29. Right ear. Clinically otosclerosis. X-ray report negative.

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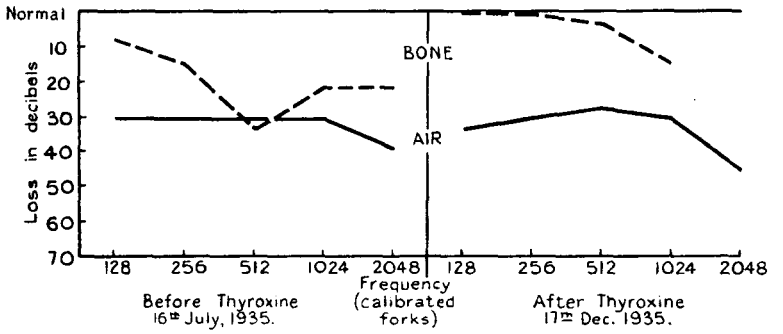


FIG. 2.
CASE No. 1144. Left ear. Clinically otosclerosis. X-ray report negative.

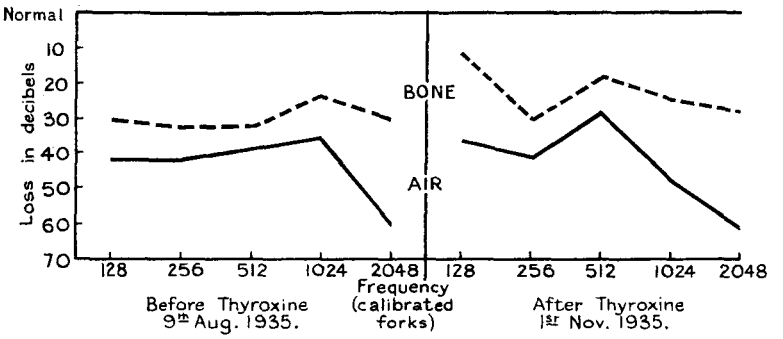


FIG. 3.
CASE No. 1158. Female, aged 18. Right ear. Clinically otosclerosis. X-ray report negative.

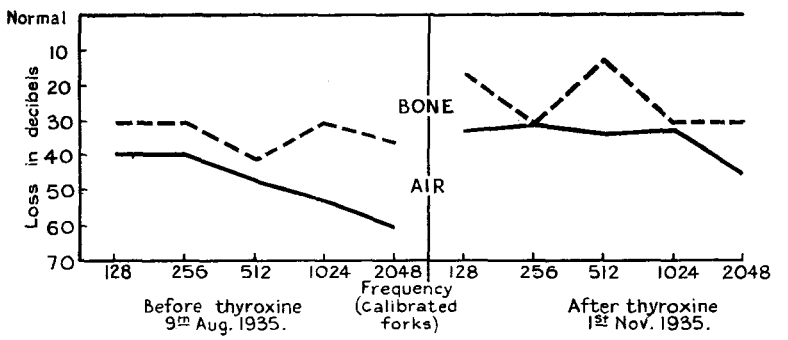


FIG. 4.
CASE No. 1158. Left ear. Clinically otosclerosis. X-ray report negative.

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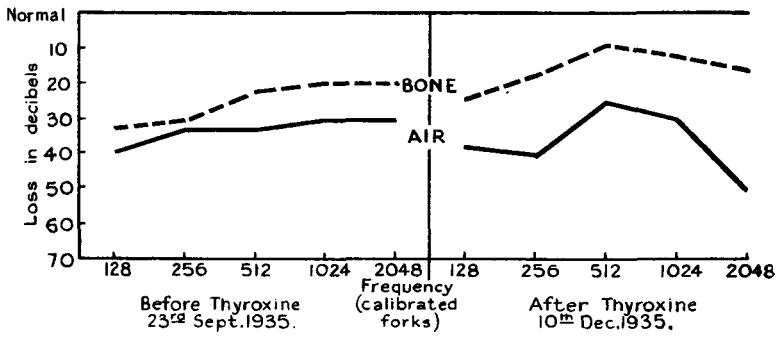


FIG. 5.

CASE No. 1212. Female, aged 32. Right ear. Clinically otosclerosis. X-ray report positive.

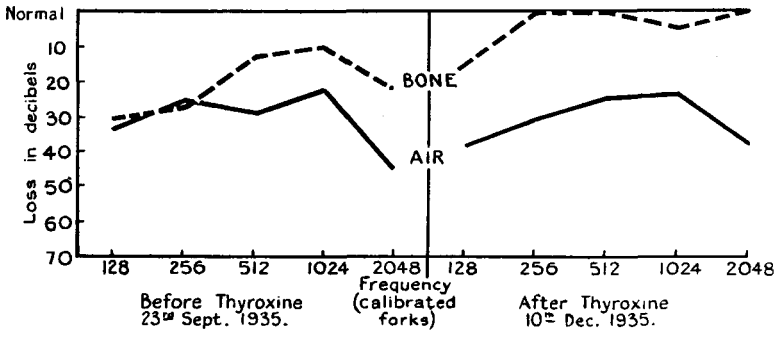


FIG. 6.

CASE No. 1212. Left ear. Clinically otosclerosis. X-ray report positive.

Six cases were injected with histamine acid phosphate $\frac{1}{1,000}$.

Table IV. Histamine.—Four out of these six cases showed an improvement equal to any obtained with thyroxine, but the series is too small to have any statistical value.

TABLE IV

HISTAMINE.

Results.	No. of patients.	Total.	Clinically oto-sclerosis.	Clinically atypical.	X-ray report.	
					Positive.	Negative.
No change		2 33%	1	1	2	0
Improvement in bone conduction only ..	2	4 66%	3	1	3	1
Improvement in air and bone conduction ..	2					
Tinnitus { No change ..		1	1	0	1	0
Tinnitus { Improvement		1	1	0	1	0

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Fig. 7. Right ear.

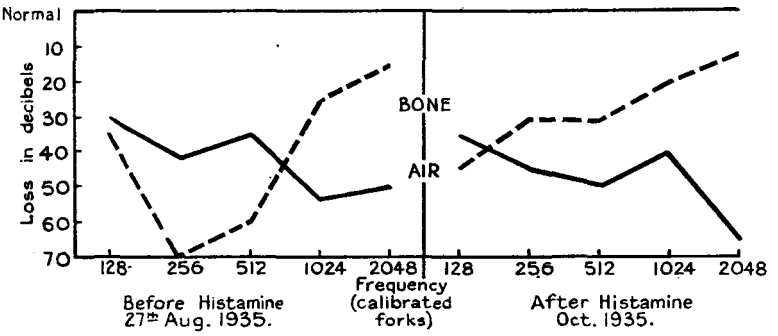


FIG. 7.

CASE No. 1185. Female, aged 24. Right ear. Clinically otosclerosis. X-ray report negative.

Fig. 8. Left ear.—This case shows rather a worse air conduction on the left side following injection, but quite a definite improvement in bone conduction on both sides. There was practically no subjective improvement in this case ; tinnitus was absent.

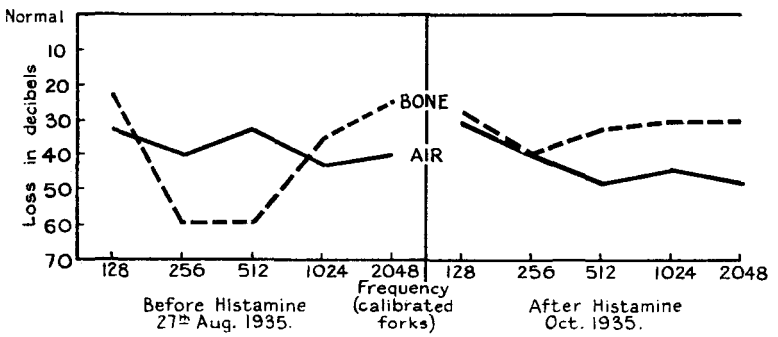


FIG. 8.

CASE No. 1185. Left ear. Clinically otosclerosis. X-ray report negative.

Fig. 9. Right ear.—This case is the only one in which both thyroxine (two injections), and histamine (two injections), were tried, an interval of five weeks elapsing between the two treatments. The patient is a woman aged 54, clinically atypical, but X-rays show changes similar to those seen in otosclerosis, in the basal turns of both cochleae. The right (the worse) ear only was injected. There was no improvement with regard to tinnitus from either thyroxine or histamine. The graph shows rather worse air conduction and little change in bone conduction after thyroxine, but an improvement, though small, after histamine, both in air

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and bone conduction. There was no subjective alteration in hearing.

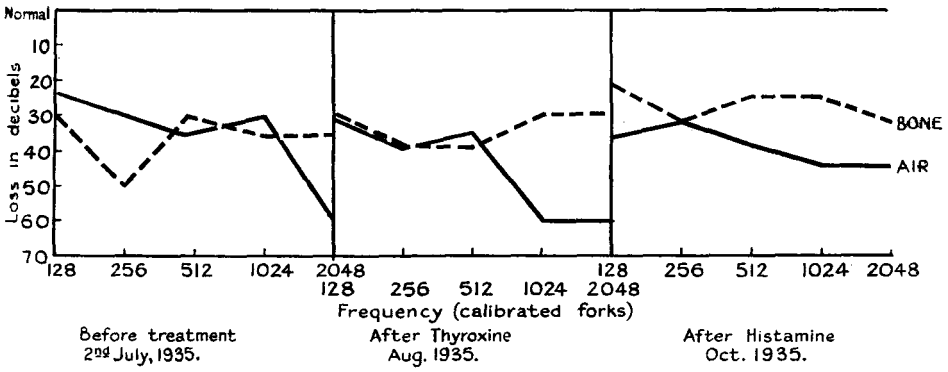


FIG. 9.

CASE NO. 1129. Female, aged 54. Right ear. Clinically atypical. X-ray report positive.

Fig. 10.—The patient is this case, a woman, aged 24, is a typical otosclerotic; X-rays show slight changes in the left labyrinthine capsule, but show no changes in the right. The left ear was treated by two injections of histamine, without improvement. Some weeks after treatment she had tonsillitis followed by acute otitis media on the right (untreated) side. A pulsating purulent discharge continued for nine weeks, when a Schwartze mastoid operation was carried out. After an uneventful recovery tonsillectomy was performed. Three months later the hearing was tested and the graph shows practically no change. This case is shown in order to contest the statement that a local hyperæmia may cause a regression of the otosclerotic process, upon which basis thyroxine treatment was originally founded.

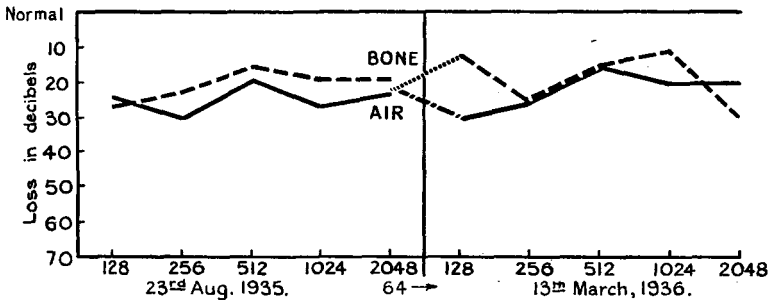


FIG. 10.

CASE NO. 1181. Female, aged 24. Right ear. Typical otosclerosis. X-ray report. Right negative; left positive. Acute otitis media from 14.10.35 to 17.11.35. Right Schwartze mastoid operation, 17.11.35.

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Table V.—Eleven cases in which normal saline has been injected are shown in this Table. Four minims has been injected each time, the number of the injections varying between two and four for each ear. Seven show demonstrable improvement. Six had tinnitus, which diminished in three cases. Insufficient time has elapsed to show if this improvement persists.

TABLE V

NORMAL SALINE

Results.	No. of patients.	Total.	Clinically otosclerosis.	Clinically atypical.	X-ray report	
					Positive.	Negative.
Worse	0					
No change	4					
Subjective improvement only	0	4 36%	4	0	3	1
Improvement in air conduction only	1					
Improvement in bone conduction only	0	7 64%	6	1	6	1
Improvement in air and bone conduction	6					
Tinnitus: No change		3	3	0	2	1
Tinnitus: Improvement		3	3	0	2	1

Fig. 11.—This case, a girl, aged 15, with typical otosclerosis and marked X-ray changes, had two injections of normal saline on each side. The audiometer curves for air conduction only are shown.

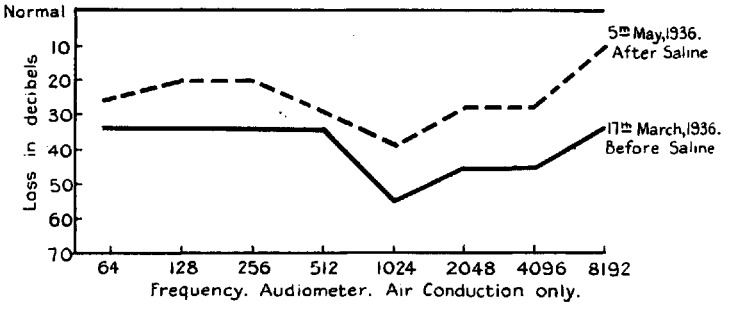


FIG. 11.

CASE NO. 1377. Female, aged 15. Right ear. Typical otosclerosis. X-ray report positive.

Fig. 12.—Bone conduction was tested out with forks, but showed no change. These two graphs show a considerable improvement

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on both sides. This was accompanied by definite subjective improvement. Tinnitus was not present.

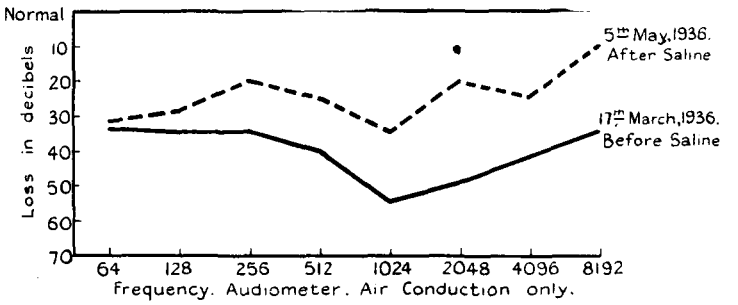


FIG. 12.

CASE NO. 1377. Left ear. Typical otosclerosis. X-ray report positive.

The conjunctival test was carried out on six individuals, including myself. About two minims of the same thyroxine solution that was used for intratympanic injection, was introduced into the conjunctival sac of one eye, the other being left as control. In no case was there any suggestion of hyperæmia of the conjunctiva, after an hour's observation.

To summarize: Little practical result, other than a marked improvement with regard to tinnitus in some cases, has been obtained by intratympanic injection of thyroxine. What results have been obtained have been obtained equally well, if not better, by substituting normal saline. From this and from observations on the cases themselves I feel convinced that these results are due entirely to the mechanical effect of fluid in the middle-ear cavity.

I wish to record my thanks to the members of the honorary staff whom I have mentioned for their assistance.

T. B. JOBSON: In this series of 15 cases of otosclerosis treated by injections of thyroxine, 11 patients were female and 4 were male. Anæsthesia of the tympanic membrane was accomplished by applying cocaine and aniline oil on a cotton-tipped wooden applicator. After from 10 to 15 minutes the injection was made with little or no pain. The outlines of the membrane were not obscured, and it was easy to make the injection at the seat of election behind the umbo. A two-and-a-half inch bent hypodermic needle was used. It was found that the extra half-inch gave better visibility. The fluid injected and the syringe were carefully kept at body temperature. This was found to prevent the unpleasant vertigo which occurs when cold fluid is injected into the tympanum.

In the earlier cases the quantity of fluid injected was gradually increased from five minims to ten. But it was found that the extra fluid was rapidly extruded from the tympanum through the

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Eustachian tube to the pharynx. Keeping the head inclined backwards minimizes this loss of fluid. But even after adopting this position it was found that six minims was the most suitable dose and that it was no use injecting more than this quantity. In a few cases it was found that patients were more deaf for a day or two. Also that they had an unpleasant " full " feeling in the ear. No serious symptoms occurred, and there was no otitis media in any of the cases.

The ages of the patients were :—

Between	20	and	30	..	..	7	cases.
,,	30	,,	40	..	..	4	,,
,,	40	,,	50	..	..	3	,,
,,	50	,,	60	..	..	4	,,

The result with regard to hearing was a definite improvement in 1 case, slight improvement in 6, while in 8 cases there was no improvement. Of the improved cases, 5 out of the 7 patients were between the ages of 20 and 30. It will be noted that the cases were not selected, and some were very advanced cases.

To me these results were a little disappointing. I had anticipated that at last we had found a method of treatment which promised some real success, and that the thyroxine treatment of otosclerosis would be a permanent monument to its brilliant and well-beloved originator, Dr. Albert Gray. I can only hope that by carefully selecting cases, by limiting the age of patients to 30 or 35 years, and rigorously excluding advanced cases we may get better results from this method of treatment.

R. R. Simpson : A year ago the late Dr. Albert Gray suggested that I might use thyroxine in cases of otosclerosis and report my results from a clinical standpoint.

Forty cases, all of which I considered to be cases of true otosclerosis, were treated. In all except one deafness had been present for a year or more. In the exceptional case the patient had no deafness and no paracusis, and her upper and lower tone limits were normal, but she had tinnitus of eighteen months' duration and there was a family history of deafness, her mother having had tinnitus and deafness since she was 18. This patient showed normal membranes and a meatus devoid of wax.

Tinnitus was present in 35 of the 40 cases. In the 5 cases in which tinnitus was absent, all the patients had normal membranes and deafness increasing over a number of years, four had paracusis, and three had raised lower tone limits.

Paracusis was present in 21, absent in 13, and not recorded in 6. Inflation with no improvement was carried out in 19 cases, and in 21 cases no record was made of inflation.

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The lower tone limit was raised in 19 cases, was normal in 10, and was not recorded in 11.

The tympanic membrane was normal in 61 ears, indrawn in 13, and showed a healed perforation in 6.

There was a family history of a similar type of deafness in 18, no family history in 16, and in 6 cases it was not recorded.

The treatment given was exactly as described by Dr. Albert Gray. Each case was given six injections (three in each ear) of thyroxine, gr. $\frac{1}{64}$, suspended in sterile water. The injections were given under local anæsthesia induced by cocaine (10 per cent.) in aniline. The recumbent position, with the patient's mouth wide open and the head turned to the opposite side, was used, and after the injection had been made the patient's head was turned back to the middle line and the head slightly extended for five to ten minutes. The hearing was estimated by the whisper and the conversation voice. The conversation voice was considered a practical way of testing cases such as these, where deafness is fairly marked, and it is by the conversation voice that the patient and the friends will judge of the results of treatment.

After treatment was completed, a month was allowed to elapse before the patient's hearing was tested and recorded again.

Results.—Recently I sent a questionnaire to these patients as I thought it would be interesting to know :—

(1) If the patient thought the hearing had improved.
(2) If the patient's friends thought the hearing had improved.
(3) If these statements tallied with my findings on testing the hearing.
(4) If the patient thought there had been improvement with regard to the tinnitus.

In the questionnaire I said " If you have received no benefit from these injections, please do not hesitate to say so, as that would be very valuable information."

(1) Do you think that your hearing has improved since you had the injections ? There were 36 replies : 23 said it had improved, 13 that it was the same ; (improvement in 64 per cent.).

(2) Do your friends think that your hearing has improved ? 35 replies : in 21 cases friends thought the hearing had improved and in 14 cases it was the same; (improvement in 60 per cent.).

(3) Hearing tests after the injections were completed were carried out in 33 cases ; 7 cases did not return for testing. Of the 33 cases tested, 9 were much improved (27 per cent.), 7 were improved (21 per cent.), 17 were the same. In no case was the hearing worse after the injections. By "much improved", I mean an improvement of 5 ft. and over on testing with the conversation

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voice. In 4 of these " much improved " cases the deafness was more marked in one ear, and in 3 of these treatment was given to one ear only—the more affected—and the hearing improved considerably; in 1 case an improvement of over 15 ft., in another an improvement of 12 ft. (these two cases are sisters), and in the third case an improvement of 10 ft. The hearing in the untreated ear also showed some improvement. Dr. Albert Gray commented on this phenomenon in his original paper.

(4) Tinnitus. There were 34 replies. Twenty said that there had been improvement with regard to this symptom, 11 were the same, and 3 stated that they were worse (improvement in 59 per cent.).

Commentary.—The procedure is a simple one and easily carried out. I found no difficulty with the anæsthetic and I had no case in which the details of the membrane were blurred by it. Five patients commented on the improvement in their general health after the injections. Two said that in spite of the tinnitus their heads felt much clearer after the injections. Two patients felt ill for a day or so after and one complained of headaches which lasted for twenty-four hours after each injection.

It will be observed that in 19 cases inflation was carried out without any improvement in the hearing. In 21 cases there is no record of inflation. It might be objected, therefore, that these were not cases of true otosclerosis. To meet this objection I analysed the improvement in the inflated and the non-inflated categories. Of the 19 patients who had been inflated and showed no improvement, 3 were improved by the injections (and of these 2 were much improved), and 10 were not improved; 6 of this group did not return for testing. Of the 21 cases where no inflation was recorded 13 were improved by injection (6 of these were much improved), 6 were not improved, and 1 patient did not return for testing. In one case there was no deafness—that was the case in which the patient complained of tinnitus only. The 13 cases which improved in the second category appear to lend support to the view that inflation might have helped them, but in analysing the 13 cases I find that they show the characteristic signs and symptoms of otosclerosis. Of the 13 cases, 3 were in males and 10 in females. In 11 tinnitus was present, in 9 paracusis; in all 13 the membranes were normal in appearance (one case showed the " flamingo " tint), 10 cases showed a raised lower-tone limit and in 8 there was a family history of a similar type of deafness.

A short course of four injections was repeated in five cases but no further improvement was noted in any case.

Mr. RITCHIE PATERSON said that after Dr. Albert Gray's communication to the Section of Otology he had taken up this treatment at once, carrying it out at first indiscriminately for some

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months, but later he used it only for the kind of case in which Dr. Gray had originally intended it to be used. Dr. Gray had advised him to use a similar solution to that which he himself was employing. Later, he (the speaker) ceased to use that and returned to his own, namely that made by B.D.H. gr. $\frac{1}{80}$, although it was not so well miscible with water. He had 13 patients, 6 of whom gave a family history of otosclerosis, while 11 had well-marked tinnitus. The ages ranged from 12 to 46 years, and in all the Eustachian tubes were patent and repeated inflation produced no improvement in the hearing. In 11 cases there was marked improvement in the hearing, patients hearing sounds that they had not been hearing for a long time. The average hearing loss for speech as measured with the 2 B E audiometer, averaged in these improved cases a diminution of almost 10 per cent. Of the 11 cases of tinnitus, 9 were improved; in 4 of these it had disappeared completely.

Mr. LOWNDES YATES said that he had used this method in about 20 cases and had then discontinued it. Some of the cases had improved but the question arose as to whether the improvement was due to the use of the cocaine in aniline oil or to the injection of thyroxine, since several patients had stated that they heard better after the anæsthetizing solution had been employed but before the solution of thyroxine had been injected. A number of cases were therefore treated only by application of cocaine in aniline oil to the membrane and it was found that the cases in which the improvement was manifested were those in which tinnitus was present. In those cases in which tinnitus was not present, no improvement in hearing was noted. Further investigation suggested that almost any mild degree of tinnitus could be stopped temporarily if the solution of cocaine was left long enough in the ear. Some of these patients seemed to be materially benefited and were pleased with the results, but in all of these it was probable that there was a neurotic element which had been induced by the tinnitus. The method of treatment with cocaine in aniline oil in cases of mild tinnitus seemed to be worth trying, on a more extended scale, as it was very simple in application and took very little time.

Mr. G. H. STEELE said that before the use of thyroxine—but after Dr. Gray had shown that the condition was one of impaired vascular supply—he (the speaker) thought it would be interesting to see what could be achieved by cervical sympathectomy as a means of producing vasodilatation in the ear. He had performed the operation on a woman who had otosclerosis and who had been temporarily improved with amyl nitrite. He removed the stellate ganglion, and there could be no doubt about the objective improvement in her hearing. That method had no local element in it; it was simply a vasodilatation produced by operating at a distance.

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Mr. W. A. MILL said that it would be valuable to test cases to ascertain whether there was improvement lasting months, even years, or whether it was universal for the hearing to become worse after a time. In about twenty cases he had carried out the thyroxine injection treatment, in the first place with the tablet, in the second place with the solution made by British Drug Houses. The patients were not tested with the audiometer, but by means of the voice, and in no cases was there improvement in hearing beyond a few inches, though in three cases the tinnitus had disappeared.

Mr. A. D. SHARP said he had had ten cases of the kind under observation, and his experience was that one might expect definite improvement in one case in three, both in respect of the hearing, from the subjective point of view, and the tinnitus—the latter very definitely. He had had two cases of otosclerosis, in which the patients had contracted scarlet fever; both reported that after the fever there was definite improvement in the hearing.

Mr. F. C. ORMEROD said he had also treated a small series of cases, and he wondered whether the thyroxine had anything to do with the small improvement which ensued. Mr. Livingstone and Mr. Suggit had shown that thyroxine had little effect when applied to the nose or the conjunctival sac. Others had shown that comparable results had followed from injection of normal saline, and others that a result had followed the anæsthetic alone. Some pharmacological research was needed with the object of finding a better drug for the purpose than thyroxine.

Dr. DOUGLAS GUTHRIE (in reply) said it was to be hoped that those intending to use the method would follow the explicit and exact lines laid down by Mr. Suggit.

Mr. Livingstone had spoken of the difficulty of injecting the tympanic membrane of cats. He (the speaker) had experienced this difficulty, which was due to the tortuosity of the meatus in the cat. He had, however, injected the tympanum of a rabbit with thyroxine and had noted no consequent redness or alteration of the membrane.

He hoped that the intratympanic injection of other drugs would be tried. The discussion had shown that though thyroxine itself might not be of great value, the method was likely to be so, and it appeared advisable to continue the experiments with various substances. It was first suggested and practised by Sir Astley Cooper in 1800.

Improvement of hearing following puncture only was an old observation. He (the speaker) had recently perused a book on aural surgery, published in 1837, which had a frontispiece showing a tiny trephine for perforating the tympanic membrane; it was said that good results had been obtained from the procedure.

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Mr. LIVINGSTONE (in reply) said he agreed that it was the method, rather than the thyroxine, which should be investigated. The results which he had obtained did not, he thought, justify controls being used at all. He did not know how to use controls effectively. He had a solution containing thyroxine, and a similar kind of solution without that drug, but he did not think even this was satisfactory. He thought that puncture of the drum should be carried out in a series of cases; all controls must be over a long period. He did not feel optimistic as to ultimate or remote results.

ABSTRACTS

EAR

On the question of Inheritance in Otosclerosis. M. WEBER. (*Hals- u.s.w. Arzt*, 1936, xxvii, 1-42.)

The Zeitschrift für Laryngologie, etc., now called *Der Hals- Nasen- und Ohrenarzt*, contains a new feature "Erbblätter", intended for articles devoted to the study of heredity problems in our speciality. The sub-title of Dr. Weber's important first article in this section is "The theory of the homozygote dominance of stapes ankylosis."

The problem of inheritance in otosclerosis is particularly difficult. There is the fact that the diagnosis of otosclerosis during life is never anything but a tentative diagnosis. Further, the finding of an otosclerotic focus in a temporal bone is very often accidental. e.g., among a collection of ear specimens in Leipzig (Professor Lange's) there were 56 instances of otosclerosis. In not a single one of these patients had a diagnosis of otosclerosis been made during life. However, 15 out of the 56 were persons who had died at the Leipzig Clinic, mostly from complications of middle-ear suppuration and their clinical histories are given. Among them were 4 instances of stapes ankylosis. The family histories as regards deafness were negative in all the 15 cases. The tympanic membranes, as recorded in the case histories, had shown various changes, and some cases showed radical mastoid cavities. The reddish tinge, said to be characteristic of otosclerosis, had not been observed once.

The laws governing inheritance of defects are discussed in a general manner and subsequently as applied to otosclerosis. In this disease there is an inherited tendency towards the development of a particular defect in the bony capsule of the labyrinth.

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