the thirteenth and fourteenth in the case of meat-fed animals, the layer of epithelial cells has extended a little way over the base of the ulcer.

On the twentieth day the base of the ulcer was completely covered in four milk-fed animals, and almost completely in three others.

Of the animals fed on meat the layer of cells had only extended a short distance over the base on the fifteenth day, and of three cases examined on the twentieth day one had a large uncovered area in the centre, and in the other two the base was completely uncovered owing to its superficial layers having undergone necrosis. The earliest time at which I have seen primitive glands develop is the tenth to the fifteenth day. They appear at first as little pouches, invaginated, as it were, from the layer of cubical cells.

These results, therefore, confirm those of my experiments dealing with motor insufficiency, and show that the delay in healing in that condition is merely an exaggeration of that which occurs under normal circumstances when a diet is administered which remains for a long period of time in the stomach, the fault being in both cases in the base of the ulcer rather than in the overgrowing epithelium.

The conclusions to be drawn from these experiments are as follows:

1. The theory with regard to the part played by the gastric juice in the production of gastric ulcer receives further confirmation, because ulceration is the more rapidly produced in proportion as the gastric juice is allowed a longer period of contact with the wall of the stomach.

2. The epithelium grows over the base of an ulcer more rapidly when the animal is given a milk diet than when it is given a meat diet. In the case of a milk diet the base of a moderately sized ulcer is usually completely covered by the twentieth day, whilst in the case of a meat diet the same sized ulcer would in most cases be uncovered in the centre at that time.

3. Frequently, in the case of meat-fed animals, the ulcer is completely uncovered on the twentieth day, the granulation tissue of the base of the ulcer having become necrotic. Such an ulcer may be only one-fifth of the size of the original ulcer owing to the contraction of the fibrous tissue in the base, although healing has only commenced at the edge.

4. In the treatment of a case of ulcer of the stomach the following principles should be observed:

- (a) During the early stages of the healing of acute ulcer the patient should be given a food which does not stay long in the stomach and which does not excite a copious flow of gastric juice.

- (b) The period of treatment in bed should be at least three weeks.

- (c) The starvation diet of the older physicians is not necessary, because the general nutrition suffers too much, and because ulcers heal well on some diet such as the above.

- (d) In the case of acute ulcers which are extending, or chronic ulcers, healing cannot be expected to occur in three weeks, because the ulcer must first be got into a suitable condition for healing, and then, owing to its size and thickness, the healing must take some weeks longer to be completed, so that the treatment in bed is to be conducted like that of simple acute ulcer, but extended over a period at least twice as long.

- (e) Since in many cases of gastric ulcer there is hyperacidity of the gastric juice, and when the gastric juice is acting destructively hyperacidity increases this destructive tendency, this high degree of acidity should be controlled by the administration of alkali. This is not so necessary in acute ulcer as in the more chronic forms, because the few estimations that have been made of the gastric secretion in acute ulcer show that it is not hyperacid, and I have found experimentally that the effect of acute ulcer is to diminish the secretion in the early stages, and that the latter becomes normal as the ulcer heals.⁷

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THYROID GRAFTING AND THE SURGICAL TREATMENT OF EXOPHTHALMIC GOÏTRE.

BY

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So long as the causation of exophthalmic goitre and myxoedema was regarded merely as being an excess or deficiency of thyroid secretion the treatment of these conditions was comparatively simple, being merely the removal of thyroid excess or the making good of thyroid deficiency. But we know now that the matter is of far greater complexity. Not only have the parathyroids to be taken into consideration, but the possibility of abnormal, as well as excessive, thyroid secretion has to be borne in mind. Further, there are the interactions of the various glands with internal secretion to be reckoned with, and the organic changes in nervous and cardiac structures brought on as the result of prolonged functional disturbance. In a severe case of exophthalmic goitre we have, therefore, (1) to lessen the thyroid secretion, (2) to counteract the thyroid toxicity, and (3) to add some source of normal secretion. In cretinism and myxoedema the thyroid-therapy has recently been supplemented or replaced by thyroid grafting, and we are indebted to the personal suggestion of Sir Victor Horsley for the idea of applying this procedure to the cure of a severe case of exophthalmic goitre:

The patient, F. S., aged 19, had suffered for over twelve months with typical Graves's disease, with protruding eye-balls, goitre, dyspnoea, and tachycardia. For this she had been treated by Dr. Michell Clarke by various medicinal remedies, together with the x rays, without any amelioration. In September, 1909, we removed the right lobe and isthmus of the gland under novocain (subcutaneous) anaesthesia, with very marked improvement of her symptoms. But this improvement disappeared at the end of ten days, coinciding with the healing of the drainage track, from which a rather profuse discharge had been taking place. By December, 1909, all her previous symptoms except the exophthalmos were as pronounced as ever, the respirations often being over 100 and the pulse 190 per minute. On December 21st, 1909, the greater part of the left lobe was removed, fragments being left at the upper and lower poles. It was hoped that thereby a sufficiency of thyroid, together with the parathyroids, had been retained.

On December 26th, 1909, she developed a very severe attack of typical tetany, which lasted for four days and nearly proved fatal. She was treated by calcium lactate, morphine, saline infusions, and thyroid extract. In spite of continued thyroid medication she had three or four slight attacks of tetany during the next few months, but on the whole her condition was improved. The dyspnoea and accelerated pulse, with orthopnoea, continued, however, and her condition was very far short of cure, the exophthalmos being the only sign which definitely disappeared after the first operation.

From December, 1909, until June, 1910, her face and hands became somewhat puffy, and the menstruation, which had been free, almost ceased. She often suffered during this time from severe headache, which she attributed to the absence of menstrual flow. It was evident, however, that psychical excitement had a good deal to do with her symptoms, because although the respirations were 100-120, and the pulse 100-140 when awake, they were only 16 and 88 respectively when asleep. On June 1st, 1910, we grafted a piece of thyroid from another patient, who had a small adenoma, into her neck. The graft was about 2 cm. x 1 cm. x 1 cm. in size, and we were fortunate enough to identify two well developed parathyroid bodies which were separately implanted. The grafting was performed under novocain anaesthesia into the left side of the neck under the sterno-mastoid muscle. During the same day as the operation nothing special was noted, but much to our astonishment the next day (June 2nd, 1910) she had well marked tetany; that is to say, the hands were clenched in the characteristic attitude, the arms pronated, and the whole trunks and limbs were absolutely rigid. Chvostek's sign was also well marked, the facial muscles contracting when a light tap was made over the seventh cranial nerve.

This condition continued for twelve days, but it was very remarkable that in spite of the extreme tetany, the patient's general condition remained perfectly good, and she slept soundly at night. During sleep the contractions were to a large extent relaxed. These features strongly suggested a functional origin for the condition, and I asked Mr. Green Armytage if he would try the effect of hypnotism upon her. This he kindly did, with the most gratifying results. She readily succumbed to the hypnotic sleep, and the next day she could roll bandages and feed herself. By June 17th she was up and about, and her

general condition had much improved, but Chvostek's sign only disappeared very slowly. During the last six weeks she has been better than at any time for the last two years. The pulse is seldom over 100, and the respirations are 16 to 40. She can lie down in the bed with only a high pillow, which she has never been able to do since her illness began. She had an almost natural though rather scanty menstrual period at the end of June, three weeks after the thyroid grafting, and the neck became slightly swollen over the graft at that time. On July 18th the skin over the graft became inflamed and painful, and after fomentation the wound opened and discharged a small quantity of thick fluid with a catgut suture, after which it healed up.

Of course it still remains to be seen whether the amelioration of her condition will be a permanent one.

In view of the comparative novelty of this treatment by thyroid grafting it has appeared to us that this case is worthy of record, and we may now proceed shortly to review the work that has been done on this subject, the clinical part of which has been chiefly connected with the treatment of cretinism and myxoedema.

The application to practical therapeutics by Murray of Horsley's experimental work on the thyroid has made it possible to extirpate the whole thyroid for malignant disease or exophthalmic goitre, and to treat cretinism and myxoedema on rational lines. The results of this form of treatment, whether by extracts of the dried gland or by preparations of the active principle (iodothym), have not been, however, uniformly satisfactory.

There are cases after removal of the whole thyroid in which the individual fails to respond to thyroid medication in any of its forms, or in which toxic symptoms are produced by very small doses. Cases of myxoedema occur in which doses sufficient to maintain mental vigour produce tachycardia, and one or two deaths have been recorded as a result. Add to these objections the difficulty of persuading certain patients to take thyroid preparations regularly or continuously, the necessity for varying the dose in proportion to the amount of bodily exercise, and the inconvenience and expense to the patient of this mode of treating thyroid inadequacy, it is not surprising that efforts are being made to solve the problem by thyroid grafting.

In this paper we wish to lay stress on the methods and results of thyroid transplantation in man, referring only incidentally to the experiments on animals in so far as they bear on the main part of our subject.

It has been fully established that heteroplastic transplantations—that is, the grafting of thyroid from one animal into an animal not closely related to it zoologically—is futile, for, even though vascular connexions be established, the secretory portion of the graft is rapidly destroyed by the cytolytic action of the host.

The retention of vitality in an implanted piece of thyroid tissue depends on several factors. Given that a perfect technique has been achieved there are still certain vital factors to consider. Sufficient nutrition for the new tissue is furnished partly from the fluids in the piece of tissue itself, partly from the lymph surrounding it, but the final source must be the blood vessels which grow into it from the surrounding tissue. In a successful case these blood vessels can be found growing into the graft within three or four days. Even after this there is still a danger that the autolysis in the graft and the cytolytic action of the host will destroy the secretory cells, though this must be rare in homoplastic transplants.

The experimental work of von Eiselsberg,¹ Cristiani,^{2,3,4} and others has established that thyroid grafts in animals "take" and that they functionate. These results cannot be said to have been completely transferable to the procedure in man, and it has been denied by some operators that human grafts "take" at all, it being held that they are rapidly absorbed. Others, while admitting the feasibility of thyroid grafting, argue that sufficient tissue cannot be transplanted for full functional purposes having regard to the varying requirements of the individual in exercise, child-bearing, etc. The latter objection is borne out to a certain extent by some of the cases mentioned below, for in nearly all some thyroid had to be taken by the mouth even after an apparently successful graft; the dose necessary being considerably less than before the operation.

Other important questions to be settled are the selection of the best technique, the best locality for placing the grafts, and the source of the thyroid for grafting purposes. When possible, a piece of healthy thyroid, taken from a

self-sacrificing relative, is, of course, best; but, failing that, the healthy tissue of a lobe removed for localized adenoma will serve. This is recommended by Horsley (discussion on the surgery of the thyroid, British Medical Association, Bath and Bristol Division, March, 1910), and was actually used in our case.

Finally, we have to inquire whether the reported improvement in the condition of patients after thyroid grafting is maintained throughout life.

Lannelongue,⁵ in 1890, performed heteroplastic transplantation of a sheep's thyroid into a patient without success—a result to be expected on *a priori* grounds. Kocher¹⁹ reports several favourable cases of transplantations of pieces of thyroid into the tibia. He holds that the requirements for success are fresh pieces of healthy gland and a highly vascular bed for them to be placed in. He prefers the tibial marrow cavity to the spleen on account of the greater ease and safety of the operation and the equally vascular site. The cases are not quoted very fully, and it appears unlikely that the results were in any sense perfect. The disadvantage of a very vascular site is that unless complete haemostasis is secured the graft is surrounded by an envelope of clotted blood offering a barrier to rapid vascularization of the grafts. Kocher secures haemostasis by operating in two stages. Several others have adopted Kocher's method with slight modifications in technique.

Chava Sermann²⁰ experimented on dogs under Kocher's direction, but in two cases only out of eight did the engrafted tissue functionate and show healthy glandular tissue on microscopical examination. A rubber ball was placed for ten days in the marrow cavity to prepare a bed for the grafts in these two cases.

Müller of Rostock, in the discussion of Kocher's paper, reported two cases of cretinism with marked intellectual improvement following transplantation of thyroid tissue into the tibia, and von Eiselsberg had two similar cases.

Garré²¹ of Bonn at the same time mentioned a case of chronic tetany after thyroidectomy in which he grafted a parathyroid removed from a case of Graves's disease into the tibia, with marked improvement. He, however, expressed a preference on theoretical grounds for transplantation of an entire organ or lobe with vascular suture.

Cristiani,^{2,3,4,6,7} to whom we are indebted for the bulk of the work, both experimental and clinical, on thyroid grafting, points out that thyroid grafts "take" better in thyroidectomized animals than in those not so treated. From his researches he has arrived at the following conclusions relating to technique: He uses small fragments of thyroid tissue the size of a wheat grain, and places each by a separate small stab wound in the subcutaneous tissue of the neck and shoulder regions. He emphasizes the necessity for absolute asepsis; no antiseptics must be used for either the graft or the implantation wound. Rapidity of execution he considers very important, as he finds small pieces of thyroid die if exposed to the air for two minutes. The best results were obtained when the grafts were kept warm in a strictly isotonic solution, preferably Locke's or Ringer's; isotonic salt solution is far less satisfactory. Grafts can be kept in human blood serum for an hour without suffering appreciably.

Cristiani (loc. cit.) has shown that, by using very small pieces of thyroid tissue, the area of central necrosis found even in satisfactory grafts is relatively small, and Carrel,⁸ by further diminishing the size of the pieces, obviated necrosis altogether. Cristiani and Charrin,⁹ using the technique described above, operated on a patient, aged 14, with predominant symptoms of myxoedema and some of those of Graves's disease. When 17 years old total extirpation of the thyroid was performed by another surgeon in two stages. After the operation the symptoms of myxoedema were aggravated, and required the exhibition of a daily dose of thyroid equal to one or one and a half grams of the fresh gland. Even a slight diminution of the dose caused a relapse, and if she indulged in sport she had pain in the lower limbs and other symptoms of thyroid inadequacy.

On two occasions, at three months' interval, they grafted thirty-eight pieces of thyroid tissue into the subcutaneous tissue. Slight but transitory symptoms of thyroidism followed, but she could soon reduce the dose of thyroid by the mouth very considerably. Six months after the second graft she became pregnant, and was

delivered of a normal child in due course. An interesting feature of the case was the increase in size of the grafts during the pregnancy and their recession after delivery (Cristiani and Kummer¹⁰).

Gauthier and Kummer¹¹ agree as to the necessity for keeping the graft warm, and for rapid working. They adopted Cristian's method of multiple subcutaneous grafts. One patient was a nearly idiotic girl of 3, unable to speak, uttering meaningless cries, and with constant rotatory movements of the head and hands. She was not myxoedematous, and thyroid medication had failed. Within one month of the grafting she walked, and showed signs of great improvement in intelligence; this improvement has been maintained one year at the time the paper was written.

Carraro¹² experimented with thyroid grafts, and made observations from the second to the thirtieth day. He obtained the best results with thin discs of thyroid gland implanted in the subcutaneous tissue. One side of the transplanted piece must be still covered with some of the connective tissue capsule of the gland to ensure its vitality.

Salzer¹³ experimented on rabbits because of the ease of removal of the thyroid, there being only one thyroid artery, and the parathyroids are easily distinguished and avoided. He confirmed Cristian's conclusion that thyroid grafts "take" better in thyroidectomized than in normal animals. He selected the properitoneal tissue of the anterior abdominal wall, and found that in a short time the following zones are distinguishable in a grafted piece of tissue:

1. An outer zone of well-nourished normal follicles.
2. A zone of tubular epithelial glands which probably afterwards become regenerated into normal follicles.
3. A zone of granulation tissue.
4. A central area of necrotic tissue.

At a later stage, all traces both of granulation tissue and necrotic areas have disappeared, and except for a central knot of connective tissue the whole mass consists of colloid containing follicles. As a result of these experiments, he considers that in thyroidectomized animals the grafts came to their full function in five to seven weeks.

Bircher¹⁴ refers to Wilson's statement that implantation in the neck gives better physiological results than other methods. He is very sceptical as to any permanent good results from thyroid grafting, and refers to three cases in his own practice to bear out this.

Case I was a typical cretin 11 years old. In May, 1908, Bircher implanted three pieces of healthy thyroid, 2, 4, and 10 mm. in diameter, from a woman 26 years of age, into the subcutaneous tissue of the occipital region. After a short improvement there was in August of the same year a relapse into the former state. In the same month he implanted five pieces from a girl of 19, which similarly failed. In September he excised the grafts and found on histological examination that no normal thyroid tissue was left; necrosis, connective tissue, and capillaries had replaced the whole.

Cases II and III, both aged 23, showed similarly negative results.

Payr¹⁵ of Griefswald, in the discussion on Kocher's paper, referred to a case of transplantation into the spleen two years before. The case had been a very unfavourable one, in which Payr had transplanted a large piece of maternal gland into the spleen. The child for three years previously had been treated internally with various thyroid preparations, with but little success. After the grafting the intellectual and somatic conditions during the first month and up to the end of the first year improved rapidly; after that the improvement was slower.

With regard to the intellectual state, the child had been entirely imbecile and did not react to sensory impressions. All these symptoms were much ameliorated, and growth and increase of weight were very evident. Towards the end of the second year the progress was less evident and the child became anaemic, developed general glandular enlargement, including the spleen, and became very liable to catarrhal conditions. The weight was the average for a child of her age; dentition, nails, and hair were normal; and the skin showed no evidence of the former myxoedema.

The posture and carriage of the child were not absolutely straight, and the gait became spastic. Payr refers to the work of Scholz and Zinguli, who demonstrated important changes in the central nervous system, especially the cerebrum in cretinism, and on this bases his belief that these organic cerebral defects cannot be improved by thyroid grafting. Finally, he maintains his preference for the spleen as a site for the graft.

Ozerny, at the German Surgical Congress in 1906, spoke of a case of tetany after complete thyroidectomy for cancer in which immediate relief was afforded by grafting a piece of fresh gland into the spleen. On autopsy at the sixth day the thyroid was found perfectly healed into the splenic tissue.

Bramann¹⁷ reports 3 cases of myxoedema and cretinism where transplantation was done with marked bodily and intellectual improvement. The recent great advances in vascular surgery have made it possible to transplant whole lobes or glands with preservation of circulation through them. Stich and Makkas²³ using the so-called "patching" method of vascular suture, removed half the thyroid from dogs with the superior artery and vein and a piece of the carotid and jugular stems attached. The half gland was then sewn into the neck muscles of thyroidectomized dogs, the vessels being sutured to the corresponding artery and vein. In 10 cases the functions were fully carried out by the transplanted glands. In 3 cases the gland was reimplanted into the same animal from which it had been removed, and in the remaining 7 into other animals. Autopsies were made from 51 to 245 days, and the circulation found good in all, though in the central parts there were usually necrotic patches.

Carrol and Guthrie²⁸ similarly extirpated the thyroid of a dog and replaced it in his neck. The vessels were anastomosed and the circulation re-established about half an hour after the extirpation. The gland was observed from time to time by opening up the wound, and it was found to remain quite normal. The case we have reported illustrates very well the complexity of the various factors concerned in exophthalmic goitre. The following are its features of special interest:

1. The temporary improvement following partial thyroidectomy, which lasted only as long as the wound discharged.
2. The occurrence of tetany after subtotal thyroidectomy in which the parathyroids had apparently been preserved.
3. The cure of this tetany by thyroid medication.
4. The persistence of dyspnoea and tachycardia in spite of subtotal thyroidectomy.
5. The occurrence of tetany of a functional type after thyroid grafting.
6. The cure of this form of tetany by hypnotic suggestion.
7. The great amelioration of the symptoms by thyroid grafting.
8. The occurrence of menstruation and coincident swelling of the grafts after thyroid transplantation.

It is obvious both from a consideration of our case, together with the review of the literature of the subject, that the value of thyroid grafting is by no means settled, but enough has been said to encourage further work in this direction. It seems fairly certain that grafting can be successfully undertaken as far as the immediate vitality of the grafts is concerned. Further, that in recent cases of thyroid inadequacy, a good functional result will accrue from this method. But time only can show what are the permanent results of this method.

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COMMON CAUSES OF DISCHARGE FROM THE EARS, AND ITS TREATMENT.*

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DISCHARGE from the ears is a subject of considerable importance, particularly now, when the inspection of school children is rigorously carried out, and hundreds of children suffering from otorrhoea are to be treated. A complete list of causes of aural discharge I shall not attempt, but intend only to deal with those that may be met with daily.

Cases of discharge from the ears may be simply divided into two classes: (1) *Non-purulent*; (2) *Purulent*. Of these the former is small compared to the latter, and will be briefly dealt with first.

1. *Non-purulent*.

Discharge may come from the pinna, the meatus, the middle ear, or the cranium.

(a) *The pinna*. A common condition met with here is an eczema, seen often in children and often passing to an impetigo; it is either a primary infection or secondary to a suppurative discharge from the middle ear. This condition is best treated by the daily application of a 5 per cent. solution of silver nitrate combined with some ointment for home use—either boracic or yellow oxide of mercury; under this it is remarkable how quickly improvement follows.

(b) *The meatus*. Wax is a common cause of discharge, especially when it has been present some time. Removal by syringing is the obvious treatment. Should difficulty be experienced in this removal, a few drops of hydrogen peroxide, 5 or 10 volumes per cent., will facilitate matters.

Meatitis.—There are many causes of meatitis, but the commonest are an eczema and suppuration of the middle ear. An eczema may be localized to the ear, or may be part of a general eczema. It gives rise to a scaling of the meatal wall and a thin serous discharge. In many cases this discharge does not come out from the ear, but forms a collection of debris, consisting mainly of desquamated epithelium, in the deep parts of the meatus, very irritating, and causing deafness. This collection of debris often occurs in the groove formed by the floor of the meatus and the anterior inferior part of the membrane, which meet at an acute angle. Painting the meatus with the 5 per cent. solution of silver nitrate two or three times a week gives good results. In the cases where the debris collects, this must be carefully and thoroughly removed with the aid of a fine probe armed with small pieces of cotton-wool. It may be a tedious performance but the results are most gratifying, and well repay the time spent. For the patient's own use, a few drops of the following, used every night, will be found most useful in allaying irritation and preventing the scaling:

R Ung. hydr. nitr. dil. ʒi
Ol. amygdalae ad ʒj.

Should this not be satisfactory, perhaps ung. picis carbonis will sometimes prove useful. Meatitis in adults and children often causes great narrowing of the meatus, making a view of the membrane very hard or, indeed, impossible to obtain. Very frequently this marked narrowing without any obvious otorrhoea is due to a perforation in Shrapnell's membrane. In these cases as well as painting with silver nitrate, packing the meatus tightly with strips of gauze will soon cause dilatation. This should be done every day until finally a good view is obtained of the Shrapnell membrane fistula, which can then be treated.

Blood from the meatus is unusual and perhaps should not be included in my list, but the condition is so inter-

esting that I include it. It is the result of self-inflicted injuries, and is seen, as a rule, in girls of a neurotic disposition. The following case is an example:

A girl of 17 had suffered from almost daily haemorrhage from the ears for nine months. For six of these months she also had frequent epistaxis. Her medical man had her under constant observation, suspecting self-inflicted injuries, but never was able to detect her. She was a healthy-looking girl—described as a tomboy when at school—but her look was somewhat furtive. Examination of the ears revealed nothing abnormal and she heard perfectly; in the nose were seen soabs on either side of the septum. She was put under observation, and during the first two days her ears bled twice, on both occasions while the nurse was absent from the room. One ear was then covered with wool and gauze and sealed with collodion; she bled from the opposite ear; this was then covered in a similar way and no bleeding occurred at all. Her mother was told, and some weeks after sent the report that the attacks of bleeding had practically stopped and the girl was much better and brighter.

(c) *Middle Ear*.—Discharge of blood occurs as a result of rupture of the tympanic membrane; the tear is usually found in the posterior part of the membrane, and follows a blow on the ear or a severe fall on the head, or, as I saw recently, a dive from a height, coming down with the side of the head on the water. The treatment must be directed towards keeping the meatus aseptic, not by syringing, but by the insertion of a strip of antiseptic gauze, or perhaps by a plug of aseptic wool.

(d) *Cranium*.—In fracture of the base of the skull across the middle fossa discharge of blood and cerebro-spinal fluid occurs through the almost invariably accompanying rupture of the tympanic membrane. Treatment here must, as far as the ears are concerned, be as for the cases of ruptured membrane—aseptic wool plugs in the ears.

2. *Purulent*.

The discharge may come from the pinna, the meatus, or the middle ear, the last being the most frequent source.

The Pinna.—The eczema previously mentioned often becomes impetiginous, and the treatment is on similar lines—silver nitrate applications and yellow oxide of mercury.

The Meatus.—Sometimes boils give rise to a discharge from the ear when the opening in the boil is small; the treatment consists in laying the boil freely open and packing with gauze.

The Middle Ear.—In the vast majority of discharging ears the middle ear is the cause. Why is this so? Here is a temporal bone cut across in such a way as to show the middle-ear cleft; and it shows very well the direct connexion between the Eustachian tube, the tympanum, and the mastoid antrum, and makes clear the ease with which infection can occur in the tympanum from the Eustachian tube.

Infection of the middle ear always, or almost always, takes place per the Eustachian tube; it is only very rarely that infection passes in from the meatus, and only in a very few cases does infection arise by the blood stream. The infection by the Eustachian tube from the naso-pharynx takes place more easily if there is any obstruction in the tube, and obstruction can easily occur by congestion of the mucous membrane, infection itself following on any inflammation about the pharynx—for example, a tonsillitis, a pharyngitis, or a naso-pharyngitis.

In children adenoids account for the greatest number of discharging ears, since infection follows from the frequent attacks of tonsillitis or pharyngitis consequent on the mouth breathing. The treatment is clear: Remove the adenoids and restore nasal breathing, not by any means an easy task in many cases, but one of great importance. Previous to removal of adenoids the patient should be made to do nasal breathing exercises for one to two weeks, unless the case is one where the patient cannot breathe at all through the nose; after removal of the adenoids the exercises are continued, and a course of arsenic and iron prescribed. It must be insisted upon that the presence of any ear symptoms, not necessarily otorrhoea, but deafness or occasional pain in the ears, gives the indication for removal of adenoids, since prevention is far better than cure.

Any other cause of nasal obstruction leading to mouth breathing may be a cause of inflammation of the ear, and so of an otorrhoea—for example, chronic nasal catarrh, hypertrophied anterior or posterior ends of the inferior turbinals, deflected septum, or the remnants of adenoids, which may persist till 25 or 30 years of age. Should any

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