to health with only about $2\frac{1}{2}$ H. doses to each side of the thyroid, if large, or to the whole gland from one or other side, if small, repeated in five to eight treatments in all, taking two to four months for great relief or for cure. For very small thyroids I use 1 mm. aluminium filter, for moderately enlarged ones 3 to 4 mm. filter, and for large hard glands 0.5 mm. zinc filtration, in each instance giving a dose about one-half to two-thirds of the dose which will produce an erythema on the sensitive skin of the exophthalmic patient, whose erythema dose is about 60 to 70 per cent. that of the small erythema dose for an average skin.

I have not used radium, as the Middlesex Hospital radium is so much booked up for cases of malignant disease. But Abbe, Aikens, Dawson Turner, Burrows, and others have reported good results. The radium techniques recommended differ very much, quantities from 10 mg. to 500 mg. element being used, either close to the surface, or at 5 to 6 cm. distance, or buried in the gland.

As to whether radiation treatment causes adhesions and hinders a possible later operation, I have an open mind; there is rather a conflict of facts and opinions in the literature. Von Eiselsberg was one of the first to raise the objection, but Holzkecht has said rightly that adhesions, if due to radiation, should be anterior rather than posterior, as the back of the thyroid, with the usual near medium voltage technique, has a considerably less dose than the front. To avoid the possibility, in cases where operation is in the balance, a two or three months' trial of radiation may be made without much risk of causing adhesions, with the usual mild technique. If distance doses and high voltage treatments are given for medium or small thyroids the risk would be greater. In large gland cases a choice should, if possible, be made between operation or radiation, and one or another method adhered to for whatever result there may be.

It is well known that x-ray private cases on the whole do better than hospital out-patients, because the home conditions are more suitable, and as a rule they can obtain rest and quietness while the treatment is in progress and the disease is active.

The only anxiety in undertaking any new cases is in the first weeks, when a suitable dose and dose method is being chosen for the particular patient. I have seen stimulation effects, due to insufficient dosage, in patients referred to me who had begun treatment elsewhere. Towards the end of the treatment it is sometimes very difficult to know when to stop; when in doubt a few months' rest should be given. I have seen slight myxoedematous changes appear towards the end of a course of treatment; in every such case, however, the pendulum has swung back, when treatment was stopped, to an approximately normal thyroid balance. I think the best results are attained when there is a gain in weight to slightly above the patient's previously normal weight.

The nervous symptoms are usually the first to improve: sometimes after one treatment benefit is noticed; sometimes the pulse rate comes down very quickly, in others it takes some months to reduce though the patient feels well. The exophthalmos and thyroid enlargement remain to some degree in most of the long-standing cases. In more acute cases not supervening on an old goitre the eye symptoms and thyroid enlargement may become normal.

As to local results, I have had no case of burning. Slight telangiectases have been seen in three or four cases where the method of employing doses just suberythematous has been kept on too long, or where insufficient pauses have been made, as improvement began to be evident.

Interesting points for discussion arise as to the response to radiation of predominantly vagal or sympathetic types of case, and as to the part played by the thymus. Many radiate the thymus as a routine, together with the thyroid. I have only given thymus radiation when there is not the expected response with thyroid treatment, or when marked myasthenia, coarse tremor, lymphocytosis with leucopenia, and amenorrhoea, added to a predominantly vagotonic type, suggest the presence of a considerable thymic element in the case. Of the patients who die at operation so many succumb from "thymic death" that thymic radiation might well be given where possible as a routine before

thyroidectomy. X-ray examination may be helpful in the diagnosis of thymus enlargement or substernal thyroid.

Surgery had a thirty years' start of radiology in the treatment of exophthalmic goitre, but thyroid surgery has been fortunate in remaining almost entirely in the province of experts, whereas anyone, medical or lay, who has access to an apparatus can give x-ray treatment. Moreover, x-ray dose measurements only passed the elementary stage in the last fifteen or twenty years. Hence many x-ray failures. It is regrettable however, that books, even such as Crile's, should be still disfigured with pictures of x-ray burns on the neck; such photographs are as meaningless now as old operation statistics would be. From the radiological point of view it is deplorable that Crotti, in his book, should devote 606 pages to a consideration of the thyroid, and dismiss radiation with a table of old statistics and a third of a page of print, ending up with the entirely erroneous verdict that "even in the most competent hands complications, such as burns, may occur." A statement like this should really not have appeared in a book dated 1922.

In conclusion, it may be said that radiation is one of the few therapeutic measures which have stood the test of time. It stands well in the forefront among the 239 different drugs and other remedies for the disease which were collected by Marine.

TREATMENT OF THROAT AND EAR CASES IN CHILDREN.*

A RETROSPECT OF FIVE YEARS' WORK IN THE ELEMENTARY
SCHOOLS.

BY

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ROYAL INFIRMARY.

DURING the last five years I have been doing work more or less in connexion with the Gloucestershire scheme for the extension of medical services, and I desire here to explain the class of work being done under it. The children in the elementary schools are systematically examined, and those requiring it are sent on to the infirmary or other hospital or out-stations for the necessary treatment, the majority being cases of throat, nose, and ear, and eye disorder.

During the period under review I have operated on some 2,000 cases of "tonsils and adenoids" and treated a very large number with chronic suppurative otitis media. Incidentally 150 mastoid operations have been performed, 95 of which have been selected from those children with "runny ears." Formerly treatment of such cases was more or less haphazard, and many children went through their childhood and school period untreated, or at the least with half-hearted treatment for nose, throat, and ear affections, which accounts for the large number of deaf people among the less fortunate class to-day. As an example, many of the mothers bringing their children for treatment I find are dull of hearing, and some very deaf. War statistics also brought to our notice the large number of men suffering from chronic suppurative otitis media. By this treatment of school children there will, as the years go on, be much less deafness, also a decrease in sickness and incapacity, and an ultimate reduction of inefficiency and poverty in their after-life.

Vertical sections of the tonsil ranging from birth up to 2 years of age show that crypts, at first merely surface deep, as the tonsil grows and fills the tonsillar fossa extend by degrees into the tonsil until they almost reach the capsule; in the upper part of the tonsil these crypts tend to run obliquely down, whereas at the lower portion they are more or less horizontal. It is due to this anatomical structure of the crypts and their tendency to retain debris—dead cells, particles of food, and micro-organisms—that we get most of the pathological conditions in the tonsil. We rarely find diseased tonsils in infants, for the above structural conditions in the crypts only, by gradual development, become marked at about 2 years of age.

* An address delivered before the Gloucestershire Branch of the British Medical Association, February 22nd, 1925.

We have no certain knowledge why the tonsils hypertrophy. However, we often find it in a number of members of one family; this may be due to idiosyncrasy. On the other hand, a constant post-nasal discharge, such as would be present in enlarged adenoids—and as a rule we find them concomitant—or chronic retention in the crypts and recurring acute parenchymatous tonsillitis may be a cause. Certainly when they are hypertrophied they are more liable to pathogenesis owing to the great depth and tortuosity of the crypts. Nevertheless, it is not always the large or hypertrophied tonsils which are the worst offenders. Tonsils that cannot be said to be large may be very diseased, and have only a very small portion of the covering normal epithelium tissue. The crypts may show exuberant granulations round their entrance, be wide and run right down to the capsule, and be filled with decomposing tissue.

The tonsils may be a chronic focus of infection. The report by the Ministry of Health on the incidence of rheumatic disease concludes:

"In acute and subacute rheumatism tonsillar sepsis may be an important factor: of patients with acute rheumatism nearly 50 per cent. had enlarged or septic tonsils; only 2 per cent. of patients with acute rheumatism had had their tonsils removed."

However, we have to bear in mind that there are other such foci in the body—for example, middle ear, accessory sinuses, teeth, appendix, and bowels—and these have to be excluded as a possible source of systemic infection before resorting to tonsillectomy, unless there is direct evidence in the tonsil.

The modern method of removing the tonsils is either by the reverse guillotine or by dissection, the whole object being their complete removal from the sinus or bed, and not, as formerly, the shaving off of that portion projecting between the pillars of the fauces. Consequently of the "buried tonsil" more often than not only a third was removed.

By the reverse guillotine method, devised by Whillis and Pybus in England and Sluder in America, practically all tonsils can be completely enucleated by the surgeon who takes the trouble to make himself efficient in this method. One who has gained the knack and who knows the pitfalls will have very few failures. Certainly this applies to children and young adults, in whom the tonsil is more easily manipulated; in many older patients requiring removal of the tonsil, or a stump of a tonsil left from a former tonsillotomy, it would be quite impossible, owing to fibrous adhesions binding it to the walls of the fossa, to enucleate it by means of the guillotine, for only by dissection can the desired result be obtained.

In children I use the former method, whilst in adults I invariably dissect. [Specimens were shown from nine children operated on that morning with the guillotine and one adult by dissection. The tonsillar tissue was not in any way cut. One of the tonsils was still fixed in the guillotine as removed that morning, and when the cutting blade was withdrawn it could be seen that the inner surface of the tonsil was covered by the smooth capsule, whilst in the patient could be seen the clean tonsillar bed and the anterior and posterior pillars of the fauces standing out distinctly. Two large tonsils, dissected out, which were also shown, were intact and practically the same as those removed with the guillotine.]

There has been much correspondence in the *BRITISH MEDICAL JOURNAL* during the last twelve months by advocates of these different methods. The one side say that the only sure way to enucleate the tonsils is by dissection; there being less chance of injury to the walls of the tonsillar fossa and less chance of haemorrhage, primary and secondary, because the vessels are ligatured at the time of operation. The other side say that with the guillotine, efficiently used, about 98 per cent. will be successful tonsillectomies; that it is much quicker, and does not require such a skilled anaesthetist. In general time should not be taken into account, though in busy clinics it is an important factor. Anyone who undertakes this class of work should make himself efficient in both methods. He will then be in a position to select the method according to the case.

When I first took charge of the throat and ear department in this hospital some five years ago my clinic was

inundated with cases of chronic suppurative otitis media. To-day these numbers are lessened to a great degree, and I can only attribute it to two causes: (1) That the throat and nose in children has been systematically treated at the outset, thus lessening the chance of acute middle-ear suppuration which may eventually become chronic; (2) the intractable long-standing cases of chronic middle-ear suppuration have had a mastoid operation with ultimate cure.

The usual plan is first to clear out the throat and posterior nares if indicated, or the nose, for one occasionally finds accessory sinus disease (ethmoid or antrum of Highmore); but even excessive and persistent nasal discharge—simulation sinus disease—clears up under the "tonsils and adenoids" operation or "adenoids" only.

The external auditory canal is cleaned out twice daily by gentle syringing with a mild antiseptic so as to remove all debris, followed by instillation of a 50 per cent. solution of rectified spirit which will dry the ear and cause shrinkage of any granulations about the drum. Occasional politization, by forcing pus into the meatus, tends to cleanse the middle ear. It is important that the ear be kept as dry as possible. In this way we help to keep the perforation patent, so allowing drainage from the middle ear and giving its lining membrane a chance to recover. Except in very large perforations I cannot see that much lotion can ever reach the middle ear, let alone the antrum and mastoid cells, the real seat of trouble in most of these long-standing intractable cases.

Our object, however, is free drainage from the middle ear primarily, for there is not much chance of pus or muco-pus draining from the mastoid cells, antrum, and attic if the middle ear is more or less dammed. Thus with the external auditory canal kept clear and the Eustachian tube patent, by attention to the throat and nose we have a double outlet for discharge, so giving a chance for resolution in the middle ear, antrum, etc. Quite a number of very chronic cases do clear up under this treatment. Nevertheless there are very many which resist. These, having had a fair trial of two months without cure, I put on the list for a mastoid operation.

Out of 168 mastoid operations I have done during the last five years 95 have been on school children. The operation, put in a few words, consists in thoroughly opening up the mastoid antrum. All diseased cells and lining membrane are removed from the mastoid, the drum and ossicles being left. In a few cases I have also removed the outer attic wall, but left the drum and ossicles intact. A flap is made of the posterior membranous wall of the external auditory canal; the meatus is enlarged and a drainage tube inserted to keep the flap in position and at the same time to ensure the large meatal opening for post-operative dressing. The post-auricular wound is permanently closed. The middle ear is made thoroughly aseptic by syringing through the aditus at the time of the operation. The wound is smeared with bipp, and through the tube in the meatus the cavity is packed with gauze.

[A child, aged 12 years, one of a type of these operations, was shown who had the first operation done on the right ear three months before; this was followed, two weeks later, by a similar operation on the left ear. Both ears were seen to be soundly healed and dry. The walls of the cavity made in the mastoid, seen through the meatus in each ear, were lined with skin. The perforations in the drums were healed. The drums were much scarred, but the child had quite good, if not normal, hearing, though it had had "running ears" for eleven years.]

There have been no complications in any of these cases, and with few exceptions the temperature has not risen above normal. The average stay in hospital has been two weeks. After this period the post-auricular wound is healed and the head bandage is removed and the patient sent home, the remainder of the dressing through the meatus being carried out at the out-patient department, until the internal wound is covered with skin, which takes about six weeks. On the other hand, some of these cases have not been cured by this operation; there is still a discharge through the drum or a sinus, and in eleven cases I have had to do a radical mastoid operation—that is, clearing out the attic and removing the drum and ossicles and the bridge of bone separating the middle ear from the antrum which had been left intact at the first operation. But

surely it is better to do the less severe conservative operation first with a good chance of permanent cure, as one can always fall back on the major or radical operation if the first is not successful.

Cases Followed Up.

I have lately visited all the schools in the district and seen the majority of cases I have operated on during these five years. I have talked with the masters and mistresses of the various classes, and asked their opinion as to the benefit or otherwise to the children so treated. Practically without exception they noted the change in their condition, physical and mental—for example, the disappearance in many of former listlessness and inattention (probably due to slight deafness); loss of attendance at school due to frequent colds or chills with throat troubles; and especially, fewer cases of "running ears."

Conclusion.

The question whether we are overzealous in our operative treatment is very pertinent. Some will ask, Is it necessary to remove all these tonsils and adenoids, ridding patients of lymphoid tissue which is possibly needful in their years of growth? So far all the cases operated on that I have followed up, and they number some hundreds, were in good health at the time of my examination, and certainly showed no signs of any deleterious effect from the loss of this lymphoid tissue.

In my visit to the schools I noted a great improvement in the children who had been operated on for chronic suppurative otitis media. A number suffered from a low form of toxæmia previous to operation, and the removal of this focus of infection had resulted in marked benefit to the child, quite apart from the improvement in hearing. Also, remembering what a large proportion of the tonsil and adenoid cases showed at the time of operation enlargement of the cervical glands, I carefully examined the necks of these children, and only in some few did I find any trace of these glands, and these only in those operated on during the last three months. I am sure that the general surgeon who can look back twenty or twenty-five years will remember the frequent occurrence of "cervical adenoma" in his morning operation list, and must have noticed the decrease in number during the last few years. The focal cause is now recognized and removed.

The systematic treatment of school children which is now carried out in all throat and ear clinics must have a great effect for good, and I feel confident that in the next decade there will be much less premature deafness in the adult.

EXPERIMENTAL RESULTS

SUGGESTING THE

PRODUCTION OF IMMUNITY BY FILTRATES FROM STREPTOCOCCI ISOLATED FROM THE VAGINA IN PREGNANCY.

BY

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WHILST inoculating mice with broth cultures of streptococci isolated from the vagina during the course of an investigation on the vaginal organisms in pregnancy, in which I have been engaged for the past fifteen months, I was struck by the very marked immediate effect produced on the animal when certain virulent streptococcal cultures were used.

The dose used in these inoculations was 0.5 c.cm. of a forty-eight hours broth culture given subcutaneously, and as a rule little or no disturbance was produced. But once or twice the inoculation had a very marked effect—the mouse seemed dazed, remained still, breathing rapidly and looking very ill. In a short time this condition passed off and the animal appeared normal until, perhaps twenty-four hours later, symptoms of a general septicaemia manifested themselves.

I thought that this immediate effect (since it was observed only when certain virulent streptococci were used)

must be due to a toxin produced in the broth by the streptococcus, and to test this conclusion I prepared broth cultures which were filtered through a Berkefeld filter after forty-eight to seventy-two hours' growth. Results obtained with the filtrates (tried first subcutaneously and later intraperitoneally) were similar to those obtained with the broth culture—in some cases little or no effect was produced, in others the animal appeared seriously ill for a short time. Virulence (in the ordinary sense) and toxicity appeared in a general way to run parallel. Ordinary broth—as a control used in the same dose and same way—produced no ill effect. About fourteen days later I made use of one of these inoculated animals along with another untreated animal in a streptococcus virulence experiment, and was surprised to find that the untreated animal (which was considerably the larger) died in less than twenty-four hours (the streptococcus being recovered from spleen and heart's blood), whereas the one which had had a previous toxin inoculation remained perfectly well, and when chloroformed a week later cultures from spleen and heart's blood were sterile. It should be mentioned, however, that the untreated animal received 0.75 c.cm. of the broth culture because of its unusual size, the treated one only 0.5 c.cm.—a dose which had been sufficient with this particular streptococcus to cause death in mice in twenty-four to forty-eight hours on two previous occasions. The streptococcus used for the toxin inoculation was one giving similar sugar reactions to the one used for bacterial inoculation, but had been isolated from a different patient (vagina in both cases). Both were slightly haemolytic.

I determined to try further streptococcal broth filtrate inoculations with a view to finding whether or not any protection was thus afforded against the streptococcus used in the production of the broth filtrate or other streptococci.

The first series of experiments was inconclusive, owing to uncertainty as to dosage, length of time protection might be supposed to last, loss of virulence in organisms used for the final bacterial inoculation, so that neither treated nor untreated animals died—though the results in the main pointed to some degree of immunity being acquired.

Results in the second series of experiments, however, though the numbers are much too small for final conclusions, suggest so strongly that protection against the vaginal streptococci may be afforded by previous inoculation with the filtrates from their broth cultures that it seemed worth while to make them known even in their present incomplete shape.

Experiments.

Four mice were used in the experiments to be described—three were of almost equal size, one was considerably smaller than the others. The organisms used were isolated from the vagina in two cases of pregnancy and showed the following reactions. The broth used in preparation of cultures and filtrates was the ordinary laboratory lemco broth.

Strain.	Haemolysis.	Lactose.	Saltin.	Glucose.	Saccharose.	Raffinose.	Mannite.	Inulin.	Litmus Milk.	
R.V2	+	-	+	+	+	-	-	-	Very faint trace of acid	Virulent.
C.V2	-	+	+	Trace	+	-	+	-	Acid and clot (pink ring)	Slight virulence.

R.V2 had been obtained from the same patient on two occasions with an interval of months between, and had always been virulent, killing a mouse in twenty-four to twenty-eight hours. The strain used had been isolated on October 13th, 1925, and had been used in four previous virulence experiments on mice with the following results:

(1) *November 2nd.*—0.5 c.cm. forty-eight hours broth culture subcutaneously. Mouse died on night of November 3rd. Streptococcus recovered in pure culture from heart's blood.

(2) *November 17th.*—0.5 c.cm. forty-eight hours broth culture subcutaneously. Mouse died on night of November 17th. Streptococcus recovered in pure culture from heart's blood.

(3) *November 26th.*—0.75 c.cm. forty-eight hours broth culture subcutaneously. Mouse died on night of November 27th. Streptococcus recovered in pure culture from spleen. Present also in large numbers in heart's blood, but mixed with contaminating spore bearer which outgrew it on plates.