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.

(4) *December 9th.*—0.5 c.cm. forty-eight hours broth culture subcutaneously. Mouse died at 12 noon, November 10th. Streptococcus recovered in pure culture from heart's blood.

C.V2 was of only slight virulence, producing no apparent ill effects when inoculated into a mouse, but being recovered from the spleen when the animal was chloroformed.

The mice had been kept under observation for some days and all appeared very healthy.

Mouse I was inoculated subcutaneously on December 15th with 1 c.cm. sterile filtrate from a forty-eight hours broth culture of R.V2, filtered through a Berkefeld filter, and on December 18th with 0.9 c.cm. of the same filtrate. It was not very well for two days after the second inoculation.

Mouse II (very much the smallest of the four) was inoculated subcutaneously on December 15th with 1 c.cm. filtrate from a forty-eight hours broth culture of C.V2, and on December 18th with 1 c.cm. of the same filtrate. It remained quite well after both inoculations.

On December 23rd Mice I and II were inoculated with 0.5 c.cm. of a forty-eight hours broth culture of R.V2 subcutaneously, and two other normal untreated mice (III and IV) were also inoculated with 0.5 c.cm. of the same culture from the same tube.

Mouse III was very ill the following morning (December 24th) and died that night. The streptococcus was recovered in pure culture from spleen and heart's blood.

Mouse IV seemed well enough on December 24th, but became ill on December 25th, and died that night. The streptococcus was recovered in pure culture from spleen and heart's blood.

Mice I and II remained in good health and are still quite well. It is interesting that Mouse II, which was much the smallest of the mice and obtained only the comparatively non-virulent streptococcus filtrate, remained particularly lively.

Though I was not aware at this time of the details of the Dicks' work on scarlet fever (beyond a general knowledge of the Dick skin test), these results suggested to my mind the question whether an antistreptococcal serum to be used for the treatment of puerperal fever might not be more potent and give more satisfactory results if made up of two components—an antitoxic and an antibacterial—the one to be obtained by the injection of streptococcal soluble toxins, the other by injection of the bacteria themselves in the usual way.

The paper by Dr. Robb in the *BRITISH MEDICAL JOURNAL* of January 2nd (p. 11) on the results of treatment of scarlet fever (a disease in which the organism is so closely allied to those most frequently found in puerperal fever) with the Dick serum prepared in this way or by the injection of toxin alone decided me to publish the results of these experiments.

THE ELECTRICAL TREATMENT OF TIC-DOULOUREUX.

BY

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In the *BRITISH MEDICAL JOURNAL* of March 6th (p. 417) a writer on the surgical treatment of tic-douloureux made the very sweeping statement that: "Of the various procedures which have been devised for the cure of this most distressing malady two only have stood the test of experience. They are: (1) Some form of alcohol injection. (2) Operation on the Gasserian ganglion by the Hartley-Krause method of approach."

There is at least one other method, of which a trial should be made before destruction of the nerve is attempted by the injection of alcohol, or before resort is made to the severe operation on the Gasserian ganglion. This is the administration of the constant current of as high an intensity as the patient can readily tolerate. Its principle is by no means new, but recently its details have been entirely altered. Formerly a current of from 5 to 10 milliamperes for ten minutes was recommended; now we employ a current of from 60 to 90 milliamperes, usually about 80 milliamperes, for thirty or forty minutes; this is equivalent to a dose of 2,400 milliamperes minutes, compared with 50 or 60 milliamperes minutes. No difficulty attends the administration of the treatment, but the employment of this high intensity of current should always be under the direct supervision of an experienced electrotherapist. As a rule, better results will be obtained in private practice, where the operator can devote the whole of his attention to his patient, than in a busy hospital department, where it is often difficult to secure the undivided attention that

is so essential for the administration of the current to its full and most effective intensity.

The following is a list of cases of tic-douloureux that I have treated in hospital and private practice.

1. A man, aged about 65, a private patient, was treated during 1912. He gave a history of trigeminal neuralgia of several years' duration. Two courses of "ionic medication" with sodium salicylate were given, with only some slight temporary benefit.

This failure was probably due to the employment of too weak a current. Owing to inexperience of the method I was then afraid to increase the current beyond 20 milliamperes. At that date the benefits of the method were wrongly attributed to the specific action of the drug, which it was presumed was electrically introduced to the affected area. Now it is generally admitted that the benefits obtained result from the reflex stimulation and its consecutive effects set up by the current; on this theory the need for an intensive current is more evident. In each of the other cases sodium chloride solution was employed, and no attention was directed to the polarity of the active pad beyond employing the pole which appeared to excite the greater irritation. The presence of a large mass of nasal polypi, not suspected until the conclusion of the last treatment, may have contributed to the failure.

2. A woman, aged about 65, also a private patient, had suffered from severe tic-douloureux for several years. She was treated in 1918 by thirty-three administrations of intensive galvanism—60 to 80 milliamperes for thirty to forty minutes.

In reply to inquiries, this patient writes as follows on March 9th, 1926: "After I had your treatment and came home I found the pain in my face was much better, and gradually it went away; I was able to eat, and then it went away entirely for four years; I had no trace of it at all. I had it again once or twice after those four years... but it was not in the same place; I never had it where I used to have it, but lower down my jaw. I am much fatter than I used to be, and have been able to sing at concerts and give my lectures... I had injections of alcohol at — Hospital by Dr. —, but he did not hit the nerve, and they were useless."

3. A woman, aged about 20, a private patient, a recent but severe case, was incapacitated from following any employment. "The attacks would come very suddenly, and the pain was very sharp and cutting, so fierce that she used to shriek with the pain." Treatment given in December, 1920, consisted of seventeen applications of 50 to 70 milliamperes for about forty minutes. On March 14th, 1926, the patient's sister reported that she had not had any repetition of the tic-douloureux, nor any pain at all in her face since the electrical treatment was finished.

4. A woman, aged about 50, a private patient with twelve months' history of severe tic-douloureux, was still undergoing a course of treatment commenced in January, 1926. The treatment in this case consisted of a constant current, 70 to 90 milliamperes for thirty minutes, preceded by diathermy for ten minutes. The patient states that she is now "very much better; can eat comfortably now. No throbbing pain. I am getting on splendidly; only a dull ache at times, chiefly in the jaw bone."

5. A woman, aged 77, a hospital patient. This was a very severe case of more than twenty-five years' duration. Treatment commenced on June 1st, 1922—30 milliamperes for thirty minutes. Treatment was applied continuously, with improvement and relapses, until June, 1923, when the patient expressed herself as "a great deal better in every way." She continued to go on with only slight attacks of pain at long intervals until towards the end of 1925, when the attacks became frequent and more severe. She resumed treatment on December 25th, 1925, with a current of 60 milliamperes; she had considerably improved on January 6th, 1926, when an attack of bronchitis prevented her from attending for further treatment.

6. A woman, hospital patient, had had tic-douloureux for five years. Daily treatments of 40 milliamperes for thirty minutes were commenced on December 18th, 1924. The patient reported on January 1st, 1925: "Much better—better than it has been for a very long time; it does not affect my eye now." On January 13th: "Much better; wishes to attend a little less often." On February 2nd: "Quite well; no pain for ten days." No further history was obtainable in this case.

7. A woman, hospital patient, had had tic-douloureux for eight years. The pain was at times so severe that she was unable to eat. Treatment was commenced on August 26th, 1924—40 milliamperes for thirty minutes. On January 19th, 1925, she reported: "No severe pain now, but not so well last few days, tingling after washing face." January 31st: "Very little pain now, only in the early morning. Goes three or four days without any pain." In reply to letter of inquiry she wrote on March 16th: "It has not disappeared, but seems to have settled more in the lower jaw, and underneath same; should you advise trying the electrical treatment again?"

8. A man, aged 61, hospital patient, had had tic-douloureux since 1919; worse since he had his teeth out two years ago. "Can't eat anything or spit on account of the pain." Current to toleration for thirty minutes. Commenced treatment March 10th, 1925; treatment ceased on October 23rd, 1925, when he reported: "Getting on grand, just a twinge when I washes my forehead. Can spit fine." Called up to report progress on March 15th, 1926, the patient stated: "Ten times better than it was. Slight pull on gums."