involved, and in this respect again the relation of suppuration of these nasal sinuses to the optic nerve is similar to middle-ear suppuration and the facial nerve. In all these cases the cause of the neuritis was definitely due to gross and severe suppuration of the sphenoid and ethmoid, and, though unilateral neuritis is considered to be more common and indicates a nasal origin, both nerves were sometimes affected, and it has been claimed that optic neuritis has been known to be due to sinus suppuration on the opposite side of the nose. For this and anatomical reasons, it is always advisable to open and drain the sphenoidal and posterior ethmoidal cells of both sides in cases of retrobulbar neuritis of nasal origin. It is true that acute otitis media occasionally produces facial paralysis, but there are a large number of cases of transient paralysis in which no cause can be found, and the paralysis disappears in a few weeks. In this respect facial paralysis resembles the 23 cases of idiopathic retrobulbar neuritis about to be discussed, the majority of which recovered.

The scrutiny of the 23 cases of retrobulbar neuritis for which no cause could be determined showed that these were of sudden onset and usually occurred in women under 40 in whom the nose was perfectly normal, and repeated examinations with exploration of the sphenoidal sinuses and antra yielded a negative result. In 3 of these cases the middle turbinates were removed, the sphenoidal and ethmoidal sinuses were opened and found to be normal, and there was no improvement in the sight as the result of this procedure. In another case the nose was not above suspicion, and, as there was no improvement, the sphenoid and ethmoid were opened and found to be absolutely normal. This case ultimately turned out to be disseminated sclerosis, in which the sight varied as in other cases due to the same cause.

In most of the 23 cases x-ray examination, Wassermann reaction, tests of urine and of the nervous system, and searches for tuberculosis were all negative, neither was there any evidence of toxæmia, and though the patients were seen at intervals for more than twelve months no further information as to the etiology was obtained. Nevertheless the sight improved or became normal. It is possible that an examination of the cerebro-spinal fluid may have thrown some light on these cases, but unfortunately lumbar puncture was not done.

Bruckner records ten cases of unilateral retrobulbar neuritis in which the sphenoid and ethmoid were examined and no nasal lesion was found. Other observers, particularly in America, report that a much greater number of cases of retrobulbar neuritis are due to nasal disease, and it may be claimed that some of the above idiopathic cases have a latent nasal lesion which cannot be detected macroscopically.

If the severity of the symptoms in a case of retrobulbar neuritis is progressing and every other cause for the condition is eliminated, or if there is the slightest suspicion of sphenoidal and ethmoidal disease, then it would be justifiable to remove the middle turbinate and open up the sphenoidal and ethmoidal cells; the risk of damage done by such procedure is negligible.

In conclusion, only 4 out of 54 cases of retrobulbar neuritis were produced by nasal suppuration, and in those 4 and in others recorded the suppuration and disease of the sphenoidal and ethmoidal cells was obvious and extensive. An improvement in the sight after the sphenoid and ethmoid have been opened and when little or no disease was found does not conclusively prove that the neuritis was caused by the nasal condition.

LITERATURE.

StClair Thomson: Optic Neuritis of Sphenoidal Sinus Origin, *BRITISH MEDICAL JOURNAL*, June 2nd, 1923, p. 925. Cerebral and Ophthalmic Complications in Sphenoidal Sinusitis, *Trans. Medical Society of London*, xxix, 1906.

Leon E. White: Aeration of the Posterior Accessory Sinuses in Acute Optic Neuritis, *Laryngoscope*, xxxii, May 22nd, 1922, p. 382.

DISCUSSION.

Sir STCLAIR THOMSON (London) said that at present there was a "boom"—the second one in twenty years—in the association between sinusitis and retrobulbar neuritis. He

agreed with Mr. Davis that it was rare, and that it was orbital inflammation which was the common result of sinusitis, not ophthalmic inflammation. Surgeons ought not to operate upon the sphenoidal sinus on the supposition that it might cause retrobulbar neuritis although clinically it was healthy. The association was a rare one.

Mr. A. J. WRIGHT (Bristol) agreed with the opinion expressed by Mr. Davis. When the sinuses were the cause, this could be diagnosed by rhinologists. Unexplained cases were common, and they would all improve occasionally, with or without treatment.

Mr. T. RITCHIE RODGER (Hull) said that some cases of sinusitis were very difficult to diagnose. He quoted a case, diagnosed as cavernous sinus thrombosis and subjected to operation, in which, although pus and polypi were absent, relief followed four hours after the procedure of sphenoidal drainage. He felt certain that some unexplained cases arose from non-purulent sinusitis.

Sir J. DUNDAS-GRANT (London) discussed the anatomy of the associated parts, and quoted a case in which sphenoidal drainage relieved the pain, and in which the Wassermann reaction was positive.

Mr. SOMERVILLE HASTINGS (London) found that the association of retrobulbar neuritis and sinus disease was commoner than some of the previous speakers had said. He agreed with Mr. Ritchie Rodger that opening the sphenoid sometimes led to immediate improvement although no disease was found.

CANFIELD'S OPERATION ON THE ANTRUM:

DESCRIPTION AND RESULTS.

BY

SIR JAMES DUNDAS-GRANT, K.B.E., M.D., F.R.C.S.

WHEN referring recently to some cases as having been treated for their chronic suppuration in the maxillary antrum by "Canfield's operation" I was asked by a

FIG. 1.—Horizontal section of left maxillary antrum, showing the narrow anterior "foe'sle" to be opened in this operation.

distinguished laryngologist what Canfield's operation was. I knew it only by this name, having made its acquaintance in Loeb's majestic *System of Operative Surgery of the Nose, Throat, and Ear*. It appeared to me to have such distinct and valuable features as to justify its being named after its putative deviser. The main feature in it is that the opening is made in the narrow anterior part of the antrum, close to the margin of the piriform orifice of the skull. This margin can be distinctly felt by a finger pressed into the naso-facial fold externally, while if the nose is tilted up and the naris is opened by means of a nasal speculum, not pushed too far in, a corresponding fold running nearly vertically can be seen or felt. The anterior part of the antrum, which is narrow, comes forward towards the edge, though at some little distance posterior and external to it.

The antrum being exposed at this anterior part it is easy to look straight into it or introduce an irrigating cannula in a way that no other intranasal operation permits of. It is likely also that the position of the resulting opening, situated as it is at a narrowed part of the nasal passage, allows of the production of negative pressure as the respiratory currents of air pass over it.

In Canfield's original paper (*Journ. Amer. Med. Assoc.*, vol. li, p. 1136) the operation is described as "the submucous resection of the lateral nasal wall in chronic empyema of the antrum, ethmoid, and sphenoid," and he appears to lay stress upon the mode of dealing with the

turbinated bodies rather than on the site of access to the interior of the antrum, which is, in my opinion, the essential feature of the operation. A few more details with regard to this latter point might have been given with advantage, and I venture to supplement Canfield's description by adding them in the form suggested by my experience.

For half an hour before the operation the vestibule and anterior part of the nasal fossa should be plugged with a 10 per cent. solution of cocaine hydrochloride in the full strength (1 per 1,000) solution of adrenaline, on ribbon gauze, or preferably non-absorbent cotton-wool.

At the operation (under a general anaesthetic) the head should be slightly raised as for the submucous resection of the nasal septum, and the posterior naris should be plugged. A nasal speculum—by preference Killian's shortest type—is introduced and turned outwards, so as to expose the outer wall of the vestibule of the nose. The cocaine plug having been removed, an intranasal incision is made with a short-bladed scalpel down the fold described above as corresponding to the margin of the piriform fossa. This should go down to the bone and hug its outer surface. Skillern removes an elliptical piece of tissue by making two incisions meeting above and below. A periosteum elevator is then introduced, and slid quickly up and down so as to detach the periosteum to the depth of about half an inch, carefully avoiding the infraorbital nerve. Then with the greatest decision a flat strip of gauze (two or three ply) is pushed between the bone and periosteum, the outer end being turned outwards over the cheek. The bleeding being thus checked, the nasal muco-periosteum is raised by means of a narrow elevator introduced through the same incision but on the nasal side of the bony edge. The elevator is then pushed inwards under the inferior turbinated body for about three-quarters of an inch (avoiding the orifice of the nasal duct).

To make a flap an incision is now made from the top of the original one down the whole of the anterior margin of the inferior turbinated body and for a short distance along its inferior margin the muco-periosteum is detached, and a portion of the turbinated bone resected by means of flat punch forceps. By a transverse incision across the roof and walls of the inferior meatus this muco-periosteal flap may be formed for insertion into the floor of the antrum when the opening is made.

The insertion of such a flap is not, however, of very great importance, and it will be found sufficient to remove the anterior third of the inferior turbinated body. A strip of gauze is now introduced so as to check the bleeding, which, if the preliminary adrenalization has been well carried out, is seldom great, though otherwise considerable.

FIG. 2.—Author's notched osteotome.

The opening in the bone is now to be made. A Killian's speculum, usually the middle-sized one, is introduced through the original vertical incision with one blade on the facial surface of the bony ridge and the other on the nasal one. The ridge being freely exposed, a flat chisel or my notched osteotome, devised for this operation (Fig. 2), is introduced at the lower part with its cutting edge horizontal, pointing backwards and outwards. An assistant hammers on it with a leaden-headed mallet so as to cut into the bone for about the third of an inch. The chisel is then extracted and replaced at the upper part, level with the line of attachment of the inferior turbinate, and is driven into the bone to the same depth. An endeavour should now be made to unite the facial extremities of the two chisel cuts by a vertical one, which should penetrate the antrum, but as a rule the projecting wedge of bone can be gripped by means of bone forceps and broken off. With the forceps the opening can be enlarged both in the facial and the nasal direction, and the pus, polypoid swellings, and debris of bone removed by means of gauze swabs and curettes. The antrum can now be swabbed out with a 10-volume hydrogen peroxide, then with a 3 per cent.

solution of zinc chloride, and a vaselined plug of gauze, preferably encased in a thin rubber finger-cot, introduced.

The margins of the opening (Fig. 4) may be trimmed with the bone forceps, especially the lowest part of the nasal side, which should be cut down as near to the floor of the nose as possible. If a muco-periosteal flap has been made,

FIG. 3.—Diagram showing notched osteotome applied to margin of piriform orifice.

FIG. 4.—Diagram showing amount of bone removed.

the plug should be removed and the flap pushed into the floor of the antrum, the plug being renewed. In twenty-four hours this plug is removed, and as a rule it need not be replaced.

The following are notes of a consecutive series of cases in which I have operated by this method:

CASE I.

Margaret H., aged 18, applied for treatment at Brompton Hospital on account of increasing debility and depression; she was found to have discharge from the left nasal cavity which had existed for three years; she had weekly washings out of the left antrum for a couple of months without cessation of the discharge. Almost immediately after the carrying out of Canfield's operation the discharge ceased completely, there was no fetor, and she felt well.

CASE II.

Harry W., aged about 40, had suffered from frontal headache for two and a half years and nasal discharge on both sides. On the right side pus was present between the septum and the anterior lip of the hiatus, and on the left side between the septum and the middle turbinate. The opening into the frontal sinus from the nose on the right side was obstructed, but on the left one free. A quantity of fetid pus was washed out of the right antrum by Lichtwitz's method, but on the left no pus was found in the antrum, though some could be washed out of the frontal sinus. The head was relieved by the washing out of the right antrum and of the left frontal sinus; at a later period the headache was confined to the right side, and continued until the Canfield operation was carried out. When seen ten days later he reported that he had complete freedom from pain and heaviness in the head, and that his nose was quite clear.

CASE III.

Colonel — complained of fetid discharge on the left side of the nose of over two years' duration; pus was found in the right antrum, and two days later the antrum was opened by Canfield's method. Within a few days after the operation the suppuration had stopped.

CASE IV.

Reuben P., aged 34, had been rejected from the army on account of signs at the right apex but with absence of bacilli in the sputum. He was sent to Brompton Hospital for Consumption on account of pain in the chest, cough, and expectoration. He was referred to the throat department, where the right maxillary antrum was washed out, after which the pain in the chest disappeared; he was conscious of nasal obstruction and an offensive smell in his nose; there was a deflection of the septum and hypertrophy of the right middle turbinate. The washing out of the antrum was repeated on several occasions, and fetid pus was always evacuated. The radical operation by Canfield's method was carried out early in 1922; the suppuration then disappeared and his chest was soon so clear that it was considered unnecessary for him to attend further. Signs of obstruction in the right nasal cavity were relieved by removal of the middle turbinate.

CASE V.

Jessie G., aged 28, complaining of cough and pain on the left side of the chest, was found to have nothing definite in the lungs nor any bacilli in the sputum; she had pain in the left frontal region and discharge in the left side of the nose, with an unpleasant smell of which she was conscious. The left antrum was opaque on transillumination, and when washed out was found to be full of fetid pus. In spite of repeated washing out the discharge of fetid pus continued, and the Canfield operation was carried out. In a week's time she was free from headache and discomfort and also from suppuration, except what appeared to be a slight oozing from the frontal sinus.

CASE VI.

Matt. R., aged 32, complained of fetid purulent discharge from the nose confined to the left side, of four years' duration, accompanied by left frontal headache. Transillumination showed opacity of the left antrum, and Lichtwitz's puncture gave vent to a quantity of fetid pus. The middle turbinal was enlarged, and the anterior part of it removed so as to free the infundibulum and the orifice of the antrum. This was followed by relief to the headache, but repeated punctures showed no diminution of the amount of pus. Canfield's operation was performed, and in a few days the purulent discharge had completely disappeared. A small mass of granulations developed on the anterior margin of the opening, which interfered with the introduction of a cannula, but after this was removed there was no further difficulty.

CASE VII.

Mr. F. L. B., aged about 50, was the subject of a paper read by me at the Newcastle meeting of the Association, as a "case of suppurative inflammation of the maxillary antrum with 'nasal ganglion neurosis,' suggesting malignant disease: operation followed by recovery." In this case there was intense pain; the antrum was translucent on transillumination, and no pus was washed out by means of Lichtwitz's trocar and cannula. Canfield's method of operation was employed, and the anterior part of the cavity was found free from pus or new growth; there was, however, a vertical bony partition shutting off the posterior part of the cavity; this was broken through by means of a strong spoon, giving vent to a quantity of soft granulation-like tissue, bathed in pus; convalescence was retarded by a streptococcal infection which yielded to injections of antistreptococcal serum, and recovery was complete. The patient found no difficulty in washing out the antrum through the convenient opening afforded by this operation. Further details and skiagrams will be found in the *Journal of Laryngology and Otology* for February, 1922.

CASE VIII.

Nellie D., aged 25, who had suffered for a number of years from pulmonary trouble, with cough and profuse expectoration, was referred to me in May, 1921, on account of a purulent discharge from the left nasal cavity. I did not see her again till September, 1922, when an alveolar puncture was made and pus washed out. In February of the present year there was still fetid pus in the left antrum. Canfield's operation was at once performed. Some discharge still continued to flow, but this was found to come from the frontal sinus, and it disappeared after removal of the anterior part of the middle turbinal and the washing out of the frontal sinus with argyrol on three occasions. An accompanying headache on the left side disappeared, and the physician reported such great improvement in the chest conditions after the treatment of the antrum that further attendance on that account was unnecessary. The left antrum is now quite dry, and on transillumination quite translucent.

In this case, for the first time, I have made use of the notched osteotome, having experienced the tendency of the straight-edged chisel to slide off the sharp ridge of bone.

CASE IX.

Mrs. W., aged 55, was operated on through the nose a number of years ago, before the adoption of the Canfield method, on account of chronic suppuration in the left maxillary antrum. There was still a discharge of pus, and it was proposed to perform Canfield's operation on the antrum. In May, 1922, she developed suppurative inflammation in the right antrum with extreme pain and headache. In July I performed Canfield's operation; the pain disappeared at once, and the suppuration ceased in a few days; it has not returned, and the opening into the antrum is still patent.

CASE X.

Mr. J. W., aged 38, was operated on in 1912 by the old intranasal method for chronic empyema of both antra. The right one settled down completely, but the left one continued to discharge. I performed Canfield's operation, and at once the headache and mental depression from which the patient suffered disappeared completely. In this case the antrum contained a number of polypi. The discharge disappeared almost at once.

In this case the operation was facilitated by the use of the notched osteotome.

The enormous improvement in general health which follows this operation has certainly done so in other forms of radical procedure, but in none—in my own experience—has the improvement been so rapid.

I may mention that exception has been taken to this operation on account of the amount of bleeding, which was extremely troublesome in my earlier cases. Since the adoption of the methodical cocaine-adrenaline preparation insisted on by my friend Mr. Clayton Fox, and the "decided" insertion of the gauze strip on the facial surface of the bone, this has become quite insignificant.

Though this may be considered a rhinologist's operation, I venture to think that the details I have here given will place it within the scope of others. Its efficacy may well be tested in cases in which the more usual methods have failed to give complete satisfaction, and I have every confidence as to the result.

BUTYN AS A LOCAL ANAESTHETIC IN NOSE AND THROAT PRACTICE.

BY

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ALTHOUGH the alkaloid cocaine was isolated from the leaves of the coca plant so far back as 1860, it is only during the last forty years that it has been generally used as a local anaesthetic in the form of its most soluble salt, the hydrochloride. In the early days of its employment serious toxic and even fatal effects were occasionally reported, and this soon led to efforts to discover any equally efficient local anaesthetic substance considerably less toxic than cocaine and free from those exhilarating properties which have resulted in its becoming a drug of addiction; thus during the final decade of the last century the synthetic alkaloidal substances eucaine, stovaine, and orthoform were brought out, to be followed early in the present century by anaesthesine and novocain, to mention only some of the more widely employed local anaesthetics.

These agents, however, whether on account of their salts being sparingly soluble in water or of their transitory effects, failed to displace cocaine entirely. The hydrochlorides of eucaine, novocain, and stovaine proved reliable anaesthetics for infiltration anaesthesia by injection in weak solution, and comparatively free from toxic effects, and they have supplanted cocaine in this method of local anaesthesia. Again, the very sparingly soluble powders, orthoform and anaesthesine—both benzoates—have proved useful local anaesthetics for insufflating on to ulcerated surfaces in cancer and tuberculosis of the throat.

For the production of local anaesthesia by surface application to mucous membranes as a preliminary to surgical procedures none of the above substances, however, proved really efficient, and cocaine hydrochloride remained not only pre-eminent but the only possible local surface anaesthetic for surgical requirements in the nose, throat, and elsewhere.

With the full recognition that caution must be used in the employment of much cocaine for surface anaesthesia and that toxic effects occur in certain susceptible individuals, they are occurrences of extreme rarity and fatal results have apparently been conspicuous by their absence in recent years. Cocaine having been superseded in infiltration anaesthesia by substances far less toxic and equally efficient, it may be confidently expected that it will one day be supplanted as a mucous surface anaesthetic by the discovery of a substance which is equally efficient but far less generally toxic, having no such special toxic effects to which a small number of individuals are keenly susceptible and possessing no properties likely to lead to its becoming a drug of addiction.

As the result of prolonged experiments, the expert staff of the Abbott Laboratories of Chicago, working in collaboration with Professors Adams and Kamm of the University of Illinois, have produced a synthetic substance—*butyn*—which is readily soluble, and which, it is claimed, fulfils most of the requirements of a safe and efficient cocaine substitute.

Butyn is not a cocaine derivative, and there are therefore no restrictions as to its purchase, but, like the other local anaesthetics mentioned above, it is chemically related to cocaine, as will be seen from the following table.

Ethyl series:

- (1) Novocain = Para-amino-benzoyl-di-ethyl-amino-ethenol hydrochloride.
- (2) Anaesthesine = Para-amino-benzoic-ethyl-ester.

Methyl series:

- (3) Cocaine = Methyl-benzoyl-ecgonine.
- (4) Eucaine = Trimethyl-benzoxypiperidin hydrochloride.
- (5) Orthoform = Methyl-amino-oxy-benzoate.

Butyl series:

- (6) *Butyn* = Para-amino-benzoyl-gamma-di-n-butyl-amino-propanol sulphate.

A committee appointed by the American Medical Association reported early in 1922 very favourably on *butyn*, as the result of extensive investigations of its clinical employment, more especially in eye work. Beaumont of Bath con-