of the greater part of its nasal wall without disturbing the buccal one. The latter method inflicts so much less injury than the Caldwell-Luc operation that its advantages are obvious. The amount of rhinologic skill required, however, debars the general surgeon from its employment and makes it eminently the method for the rhinologist.

M. Hajek²⁶ presents an important article on suppuration of the posterior ethmoidal cells and of the sphenoidal sinus. He describes his operative method for exposing the front wall of the sphenoidal sinus and for resecting it so extensively that relapses of the suppuration can not occur. He shows cuts of two beautiful forceps which seem perfectly adapted for the work.

Original Articles

REPORT OF FOUR CASES SHOWING THE RESULTS OF KILLIAN'S OPERATION.*

FREDERICK L. JACK, M.D.

Aural Surgeon to Massachusetts Charitable Eye and Ear Infirmary.
BOSTON.

All these patients whose cases are here reported had suffered for years from chronic suppurative ethmoiditis, with abscess breaking into the orbit. Exophthalmos varied from slight to marked protrusion of the eye. The operation performed was practically the one described by Killian.¹

In the Massachusetts Charitable Eye and Ear Infirmary, we prefer Krause's trephine for making the opening in the nasal bone and then remove by means of bone forceps as much as is necessary for freer access to the nasal cavity. By this method there is less risk of breaking downward, an accident which probably would be followed by some deformity. Mosher's graduated curette is of great use in the deeper parts of the nasal cavity. In intranasal operations it is of inestimable value.

Great care must be exercised in avoiding injury to the lachrymal sac. Ophthalmologists tell us that injury to the superior oblique muscle is not harmful; care will prevent both of these accidents.

In one of these cases the sac was mildly affected for several days, although apparently it received no injury at the time of operation.

One is hardly warranted in drawing positive conclusions from four successful cases.

A somewhat wider experience with the so-called conservative or intranasal method, however, and the growing list of fatal results² render it questionable if the external operation should not be considered the more conservative; that it proved so in these cases is evident. Rhinologists are not agreed on the results by the intranasal method. For obvious reasons its performance is not without danger. One can not see the entire field of operation, and it is almost impossible to remove all the diseased bone.

The chief objection to the external method is the scar and the deformity from sinking of the tissues, but these

Fig. 1.—Patient in Case 1, six and one-half months after the operation.

objections hardly apply to the cases here reported. I am of the opinion that this method in the future will show a larger percentage of cures and a lower mortality.

Foster³ states that in a series of eighty cases, published and unpublished, which he has been able to collect, only two deaths occurred, making a mortality of only 2.5 per cent. The cases collected by Turner show 87 per cent. of cures for the Killian operation, as against 58 per cent. for the Ogston-Luc.

Convalescence was rapid and uncomplicated. The wounds healed by first intention except in Case 2. Tampons to prevent hemorrhage were removed in twenty-four hours. There was no ethmoid packing and no after-treatment, except gentle cleansing of the nose. The supraorbital scar in all these cases is now practically covered by the eyebrow. The scar over the side of the nose can barely be made out. The contour of the skin is preserved by the supraorbital bridge.

The results of the x-ray examination have been unsatisfactory. The use of the x-ray as an aid in the diagnosis of diseases of the accessory sinuses is now almost universal, but the value to be placed on skiagraphy is not yet fully determined.

Coakley⁴ has published the following conclusions:

First.—It is possible by means of a skiagraph to determine the presence or absence of a frontal sinus which extends vertically above the glabella.

26. Fraenkel's *Archiv für Laryng.*, 1904, p. 105.

* Read in the Section on Laryngology and Otology of the American Medical Association, at the Fifty-seventh Annual Session, June, 1906.

1. Killian: *Münch. med. Wochsft.*, No. 28, 1895, and *Archiv für Laryngologie*, vol. xiii, 1902.

2. Mosher and Tobey: Report of Cases at the Meeting of the New England Laryngological and Otological Society, May 17, 1906.

3. Foster: *Boston Med. and Surg. Journal*, Jan. 25, 1906, p. 96.

4. Coakley: *Transactions American Laryngological, Rhinological and Otological Society*, 1905, p. 496.

Second.—A frontal sinus may be small, parallel with the upper, inner margin of the orbit and not detected in the skiagraph.

Third.—In all cases of unilateral diseases of the frontal sinus verified by operation, a cloudiness has been observed in part or all of the area occupied by the sinus and an indistinctness in the outline of the cavity when compared with the opposite or healthy side.

Fifth.—He believes that the examination of a skiagraph of the two frontal sinuses when compared with the results found on transillumination will aid very much in determining the presence of a diseased frontal sinus.

Sixth.—A skiagraph may also be of considerable value in determining the height and width of the ethmoidal cell area.

In two of my cases, however, the plates were entirely negative on the suspected side, the cloudiness appearing on the opposite or healthy side. This may have been and probably was due to faulty methods. Opinion based

Examination.—Nov. 28. O. D. normal and quiet. Fundus normal. The left globe was pushed outward; there was no limitation of motion in any direction. There was slight ptosis. At the inner superior angle of the left orbit, apparently occupying the region of os planum of ethmoid, was a firm elastic fluctuating swelling about the size of a marble. The rough edge of the orbital plate of the frontal bone can apparently be felt. The surface of the lachrymal bone was normal; there was no frontal tenderness. The fluctuating tumor was practically painless.

Nose: There was deviation of the septum to the left. The left middle turbinate was somewhat enlarged and blocked the narrow space above; there was no discharge.

November 29: The x-ray plate shows destruction of the inner wall of the left orbit, with disease of entire left ethmoid labyrinth.

Operation.—December 1: Ether was administered and the Killian operation performed. The usual frontal incision was elongated and carried down along the edge of the nasal bone, the cut was nicked for better coaptation. A fluctuating tumor was found protruding into the orbital cavity through the os planum of the ethmoid. It was incised, and the whole ethmoid labyrinth was found filled with mucopus. The floor of the

Fig. 2.—Patient in Case 2, six months after the operation.

on many careful examinations of plates verified by operations is necessary to determine their true diagnostic value.

CASE 1.—R. D., a weaver, age 54, born in Ireland.

Diagnosis.—Left frontal sinusitis, ethmoiditis.

Complications.—Left exophthalmos, with destruction of inner wall of left orbit.

Operation.—Radical frontal sinus operation (Killian).

History.—The patient was transferred from the eye department; his previous history was negative. He received a kick in the left eye 12 years ago. Eight weeks before admission he noticed a lump in the inner angle of the orbit. There was dull pain on pressure and slight headache over the left frontal sinus. He had a slight chilly sensation but apparently no fever. There was a slight discharge from the left nostril but no history of epistaxis. There was no nausea or vomiting; appetite was fair. V. O. D. = 20/20. V. O. S. = 20/40, .50 cyl. ax. 180° = 20/30.

Fig. 3.—Patient in Case 3, five months after the operation.

frontal bone was wanting. The outer wall of the frontal bone was removed with exception of a narrow piece of bone with periosteum over the inner brow. The bone edges were beveled and the nasal bone and part of the ascending process of the superior maxilla were chiseled away. The ethmoids and the anterior two-thirds of the middle turbinate were removed. The incision was closed (silkworm gut) with the exception of a small opening at the outer end which was kept open for a wick. The nostril was packed with a long strip of selvaige gauze. The eye was in normal position after the operation.

December 2: The packing was removed from the nose and not replaced. The incision was clean. There was slight chemosis of the lids. Eye was normal.

December 4: The wick was removed; there was considerable nasal discharge.

December 8: The incision was almost healed.

December 9: The incision was healed; there was considerable nasal discharge. The ocular movements were apparently normal.

December 17: There was a very fine cicatrix. There was considerable crusting and discharge from the left nostril.

December 19: The wound had entirely healed (since December 9). There was a very fine light cicatrix, no depression, no external deformity. There was still considerable crusting of the nostril but the discharge grew less every day. The nose was sprayed with an atomizer. The patient was recommended for discharge (Fig. 1).

CASE 2.—S. J., aged 9.

Diagnosis.—There was a growth at the inner canthus of the left eye, frontal sinusitis and ethmoiditis.

Operation.—Exploration of frontal sinus (partial Killian).

History.—The patient had an abscess over the left eye two years ago, but had no further trouble until July, 1905. There was swelling at the inner angle of the orbit, lasting to date, with severe headaches. There was no pain in the eye and no history of trouble with the nose. The general condition was fair.

Examination.—December 4: O. S., normal. There was no chemosis of lids (with the exception of a small area to be described). The ocular movements were normal. Just above the inner canthus was a moderately large, apparently papillomatous growth which was movable and had no connection with the bony wall of the orbit (os planum of ethmoid). There was slight secretion about the growth and very slight redness of the skin immediately surrounding it. There was no tenderness over the frontal sinus. The probe did not enter the growth.

Left Nostril: There is a slight deviation of the septum to right. There was hypersecretion but no purulent discharge from nose. There is slight compensatory hypertrophy of inferior and middle turbinate on the left side. The mucous membrane was not reddened.

Operation.—December 6: Ether was used. The eyebrow was not shaved (after Killian). The usual frontal incision was prolonged downward along the nasal process of the superior maxilla. A bridge of periosteum and bone just above the root of the nasal bone was preserved. The bony inner wall of the orbit was exposed. There were no signs of disease. The frontal bone forming the supraorbital ridge was normal. A small hole was chiseled in the frontal bone low down, just above the articulation of the ascending process of the superior maxilla, and another more external into the supraorbital ridge. A very small and normal frontal sinus was found. The wound was closed (silkworm gut) with the exception of very small opening for drainage at the inferior angle.

December 8: The small drain was removed. The wound was clean. O. S. normal. There was still slight chemosis of the upper lid.

December 10: The subcutaneous sutures were removed.

December 11: The incision was practically healed. There was no chemosis of the upper lid; the movement of the lid was free. Ocular movements were apparently normal.

December 17: There was a slight thin cicatrix following the incision. A small ulcerated area just above the inner canthus was almost covered with epidermis.

December 19: The incision was healed. There was still a very small ulcerated area just above the inner canthus.

The patient was discharged well to the out-patient department Dec. 19, 1905 (Fig. 2).

CASE 3.—S. J., aged 6.

Diagnosis.—Right orbital swelling above the inner canthus; right ethmoiditis and frontal sinusitis.

Operation.—Radical frontal and ethmoid operation.

History.—The child had an attack of whooping cough in the summer of 1905, followed by pain about the eye at times, and occasional bloody discharge from the right nostril since the abscess of the orbit was incised in the out-patient department eight days before admission to hospital.

Examination.—O. D. normal. Ocular movements were apparently normal. There was some swelling and redness of the tissues just above the inner canthus and the scar of a recent incision. There was no marked chemosis of the lids, and no tenderness over the right frontal sinus. The mucous membrane of the nostril was somewhat reddened and there

was hypersecretion. The middle turbinate was somewhat enlarged. The previous incision healed without fistula. X-ray plates were unsatisfactory.

Operation.—December 29: The posterior nares were plugged. The eyebrows were not shaved. The usual frontal incision was elongated and carried down along the nasal process of the superior maxilla closely following the circumference of the orbit. The cut was nicked for better coaptation. The periosteum was left along the superior ciliary ridge. With a chisel the bone was removed over the usual location of the frontal sinus, exposing a small area of the dura.

With a hand burr a small hole was drilled upward at the junction of the internal angular and nasal process of the superior maxilla into a very small normal frontal sinus; a bridge of bone with the periosteum was left over the brow. The nasal process was chiseled away and the ethmoid cells were curetted. These cells were found filled with granulations and pus. The ethmoidal vessels were pulsating. The

Fig. 4.—Patient in Case 4, four and one-half months after the operation.

anterior wall of the sphenoid and the pulley of superior oblique muscle were easily seen. The right middle turbinate was removed. The wound was closed with silkworm gut, and the right nostril was packed with a long strip of selva gauze.

December 30: Packing was removed from the nose; there was no hemorrhage.

December 31: There was slight chemosis of the lid. The wound healed rapidly.

January 5: The wound was healed. There was a very slight discharge from the nose. The eye was normal.

January 9: There was practically no discharge from the nose.

January 21: The patient was discharged well (Fig. 3).

CASE 4.—M. M., aged 60, a stonecutter.

Diagnosis.—Left ethmoiditis and frontal sinusitis.

Complications.—Orbital fistula and atrophic rhinitis.

Operation.—Radical frontal and ethmoid operation.

History.—For the past eight or ten years there has been a crusting and discharge from both nostrils. For six weeks before admission to hospital there had been a very profuse discharge from the left nostril. For one month there had been swelling and itching of the nose near the inner canthus of the eye which caused patient to rub it violently. One week before admission the swelling increased and there was a discharge of thick pus.

Examination.—O. D. apparently normal. In the right nostril there was atrophic rhinitis with crusts. O. S.: There was slight conjunctival injection with chemosis and reddening of the upper lid. A fistula was discharging pus above the inner canthus; a probe apparently encountered denuded bone. The lachrymal sac apparently was not involved. There was no distinct tenderness over the left frontal sinus. There was marked deviation of the septum to the left, and there was a distinct mucopurulent discharge from the region of the middle turbinate, which, apparently, was not enlarged. There was atrophic rhinitis. An *x-ray* picture was not taken.

Operation.—January 29: The eyebrow was not shaved. The usual frontal incision was elongated and carried down along the nasal process of the superior maxilla; the cut was nicked for better coaptation. The periosteum was stripped back with the exception of a narrow band along the superior ciliary ridge. With a hand burr a small hole was drilled into the left frontal sinus just below the root of the nasal bone. The frontal sinus was opened (Killian chisels V) high up and the edges were beveled, a supraorbital bridge of bone with periosteum being left over the inner brow. A few granulations were found in the frontal sinus, otherwise it was normal, no pus. A portion of the left nasal bone, the nasal process of superior maxilla, and part of the os planum of the ethmoid were chiseled away. The ethmoid cells were curetted out; they were filled with granulations, but no pus. The left middle turbinate was removed. The wound was closed with silkworm gut. The left nostril was packed; a postnasal plug was introduced at the beginning of the operation. A fistula leading into the abscess cavity did not apparently directly communicate with the ethmoid cells.

February 4: The incision healed by primary union. The stitches were removed February 3. There was a slight discharge of pus from the fistulous area just above the inner canthus. There was slight conjunctivitis (bulbar), but the motions of the eyeball were apparently normal. There was considerable crusting of both nares, slightly more marked on left.

The man was discharged well Feb. 12, 1906 (Fig. 4).

DISCUSSION.

DR. C. G. COAKLEY, New York City, stated that he saw Killian operate and saw the result, last summer. Dr. Coakley finds that in the cases in which he himself has operated there is a great deal of discharge from the nose for some months after the operation. In all the cases he saw last summer in Killian's clinic, patients who had been operated on from three to five months previously, there was still a discharge, but the patients were relieved from the headache and other symptoms for which the operation was performed. Still they could not be called cured from the standpoint of a clean nose. Practically all patients who had been operated on two or more years before Dr. Coakley visited the clinic, and five or six came for his inspection, were perfectly well and free from any scab or sign of pus in the nose. The scar from the Killian operation is linear and in that respect it is better than some other methods of operating. The depression which comes from Killian's operation is greater than from any other form of operation of which Dr. Coakley knows. The large depression can not be helped but it can be overcome to a great extent by the subcutaneous injection of paraffin. He believes that Killian's operation is valuable and one that is satisfactory in many cases.

DR. H. P. MOSHER, Boston, said that he has seen a number of cases of Killian's operation, seven in all. He agreed with Dr. Coakley that the amount of depression in the Killian operation is considerable but in his experience, even in large sinuses, it is not more than the amount of depression from some other operations. He asked why there should not be a

considerable discharge for a time after such an extensive operation as the Killian. It does not seem to him at all abnormal. It goes away in time.

DR. THOS. J. HARRIS, New York City, declared that the last word in reference to the proper surgical procedure on the frontal sinus has not yet been spoken. He believes that it will only be by the largely increased experience of all rhinologists that we will be able to say what is the best method of attacking the frontal sinus radically. While he agreed with the favorable remarks on the Killian operation, he said that it is but fair that we should not lose sight of the fact that the Killian operation is not the only operation. The operation Dr. Richards has used in a number of cases has been satisfactory. He showed a year ago cases in which the medical results could not be excelled. The method commonly used, the open method, is undoubtedly a proper one to pursue, Dr. Harris said, and yet perhaps the Killian operation will give better results in the majority of cases. Still it presents difficulties in practice, and possible accidents may occur. Any one who has not tried it and expects that it will be as easy as a paracentesis of the drum or opening an abscess will be disappointed. In considering the best method of approach, the possibilities of intranasal surgery must be considered. A short time ago Dr. Harris was of the opinion, he said, that an approach through the nose to the frontal sinus was distinctly contraindicated, but he has watched Dr. Ingals' work and although he has not done the operation, he thinks it might be one to consider. Dr. Wyeth has recently written an article on this subject and he states that he has had no chronic empyema of the frontal sinus with symptoms of such degree and extent as to demand external operation. Dr. Harris grants that this operation perhaps suggests possibilities of untoward danger, but with the instruments used and the methods suggested by Dr. Ingals and Dr. Myles there is the possibility of a satisfactory approach through that route.

DR. W. P. EAGLETON, Newark, N. J., referred to the four cases mentioned by Dr. Jack in relation to ophthalmitis, and said that Dr. Jack was not speaking of chronic suppuration, but the relation to exophthalmos. Killian's operation is the only one that gives an entrance not only to the frontal sinus, but to the anterior and posterior ethmoidal cells. Of all the operations it is the only one that will give a chance of drainage. Dr. Eagleton has seen a case of double ophthalmitis with exophthalmos on one side, and total blindness on one side, completely cured by drainage through Killian's incision going back through the ethmoidal cells. About the advantages of the external operation he said that he knows of two instances, one fatal, that have never been reported, and one in which the patient, a man, is now in bed after four months with infective arteritis after an internal operation. He knows of no instance in which the external operation has been followed by a fatal result or fatal infection.

DR. G. L. RICHARDS, Fall River, Mass., declared that there is one phase of this question of frontal sinus disease which has not been referred to, but which from the standpoint of the private patient does have some effect. That is, a patient says, "I have had catarrh for years." The physician looks in the nose and finds a blocked frontal sinus and swollen middle turbinate. He removes the turbinate, the drainage is improved and the patient disappears. The physician looks these patients up, and they say: "I have no more trouble or pain. I have always had catarrh." The physician has made substantially a cure. The patient has only a little mucopus discharge, uses only one or two handkerchiefs a day and has no more trouble. Dr. Richards had a patient not long ago, illustrating that point. The middle turbinate had forced its way through and produced a fistula near the internal angle of the eye, which suggested an abscess of the tear duct and he had been treated for that. Dr. Richards took off the middle turbinate and told the man to come back and he would do a radical operation. The man came back when sent for and said: "No operation on me." From a strictly rhinologic standpoint he was not cured, but from the patient's standpoint he was practically cured.

DR. E. FLETCHER INGALS, Chicago, had no criticism to make of the external methods, they are admirable operations, he

said, but many times they are unnecessary. From experience during the last year he is of the opinion that the intranasal method he has recommended, where a probe can be passed into the frontal sinus is as safe as any, and the results are good in the majority of cases. Dr. Ingals has seen only one case in which the results were not good, and that was where some one meddled afterward with the external operation; that caused all the trouble. The suppuration continued and kept discharging through the nose and the patient disappeared with the discharge going on. In that case it was clear that there was some condition that had not been thoroughly attended to at the time of the external operation and perhaps another operation would have been required to clear up the work. Dr. Ingals would not urge that the internal operation is a panacea, but he believes that when the cavity can be entered with the probe it is a safe and good operation and will cure a large percentage of the cases in a few months, which is as much as can be claimed for the external operation, and there is not the scar.

DR. OTTO T. FREER, Chicago, said that one point in the Killian operation which he would like to have considered is the removal of the orbit, which seems to him an objectionable feature.

DR. F. L. JACK, Boston, in closing the discussion, said that he did not hope to have a discussion on the frontal sinus at all, he simply wanted to explain his cases, which he had hoped to show. There was no question as to the operation. The patients had large orbits and exophthalmos. Some of the cases had lasted for a number of years. He said that his hospital house officer tells him that the cases are perfectly dry, there is no discharge from the nose; he has seen them recently. So far as Dr. Jack has seen the cases there is absolutely no depression. He has one or two cases in which one would have to get within a foot of the patient in order to see any scar. Of course there would be no question of a Killian operation in the class of cases mentioned by Dr. Egleton. It is the only one to do.

A NEW METHOD OF ANASTOMOSIS OF THE VAS DEFERENS.*

G. FRANK LYDSTON, M.D.

Professor of Genito-Urinary Surgery and Syphilology, State University of Illinois; Attending Surgeon, St. Mary's and Samaritan Hospitals.

CHICAGO.

With the subsidence of the furore which attended the introduction to the profession of operations on the spermatic cord for prostatic disease, vasectomy was practically relegated to the dead lumber room. While recognizing the fallacy of the claims first made for testicle and cord operations in the relief of prostatic hypertrophy, and having early put myself on record in opposition to the extravagant claims made for such operations, I do not believe that the profession will be inclined to accuse me of over enthusiasm in my endeavor to establish the operation of vasectomy as a legitimate means of relief for certain conditions.

Despite the over enthusiasm which attended the introduction of cord operations, it was not fair to push them aside simply because they did not fulfill the extravagant expectations of those who for one reason or another first advocated them. Whatever may have been the merits of the operation as originally devised, this much must be conceded, viz., that cord operations in suitable cases have a profound influence on the innervation and circulatory supply of the prostate and seminal vesicles. Incidentally, a marked effect on nutrition must necessarily result. These effects, which we will term, for

the sake of argument, physiologic, are not so manifest in elderly patients, in whom the importance of the sexual function is not great, as in younger patients, in whom the sexual function is at its height of activity.

This is an important point, for the value of the cord operations has thus far been estimated from their effects in advanced prostatic diseases in old subjects. These operations have not been employed to any extent in younger patients, in whom beneficial results can be more logically expected.

In setting forth the claims of vasectomy as an operation which has a legitimate field in genitourinary work, I wish it to be distinctly understood that I do not advocate the operation in any case in which there is a reasonable probability of relief being afforded by less radical means. The operation, when properly performed, is practically free from danger. It does not produce, as was formerly supposed, atrophy of the testicle—a condition which, when it follows vasectomy, can be explained on grounds other than disturbed circulation and innervation incidental to the operation on the vas. It is hardly fair, when the operation is clumsily performed, the testicle traumatized, and the tissues perhaps infected, to attribute the resulting atrophy of the testes to the vasectomy.

The principal objection to the operation thus far advanced is its alleged effect on the sexual power. It does not, so far as my experience goes, produce impotency, and while the bilateral operation necessarily prevents the testicular secretion from taking its normal course, sterility can not fairly be charged up to the operation, if the patient has been impotent prior to its performance. In other words, in most of the cases in which I advocate the performance of vasectomy, the patient is already impotent, and therefore dynamically sterile, and the operation does not add to his woes in these respects.

The most important point of all is the fact that while the operation does not produce permanent sterility, it is by no means necessary that the patient should remain sterile after the operation has accomplished its purpose. It is practicable in probably by far the larger proportion of cases to restore the continuity of one or both vasa deferentia at any time the surgeon may so elect, thus restoring fertility.

The operation of vasectomy has a certain range of application in sexual neurasthenics, spermatophobias, and in genuine spermatorrhea. The type of such cases is the individual who has been "quacked" for many years, is impotent, and profoundly neurasthenic, with or without frequent seminal losses. We are wont to say that suggestion and kindly counsel are all that are necessary in the management of such patients. Every practitioner of experience well knows that these means are often ineffective. Treatment, both local and general, is a failure in a certain proportion of such cases.

In a large proportion of cases of pseudo-spermatorrhea, the morale of the patient is so disturbed by prolonged treatment by quacks and worry that the condition with which we have to deal is one of psychopathia. These patients are impotent and perhaps have even lost sexual desire. More or less frequently recurring nocturnal emissions constitute a symptom which, pooh-pooh it as much as we like, has a very disastrous effect on the mind of the patient. Treat such patients as conscientiously as we may, a certain definite proportion of them fail to find relief. Indeed, no relief can be afforded the mental condition until the emissions have been checked for a more or less prolonged period. It is

* Read at the Meeting of the Illinois State Medical Society, May 16, 1906.