**REPORT OF SOME CASES, MOSTLY TRAUMATIC, OF SERIOUS
DAMAGE TO THE NOSE AND ACCESSORY SINUSES,
OPEAATED UPON EXTERNALLY WITH EX-
CELLENT COSMETIC RESULTS.***

DR. JOHN R. WINSLOW, Baltimore, Md.

The following cases, of interest in themselves, seem to be especially in line with war-time practice, and are on this account put upon record.

It is regrettable that for several reasons it is impracticable to present these cases in person rather than by photograph.

Accept my assurance, however, that they have not been "camouflaged," and rather under-represent the results than otherwise.

A Case of Extensive Traumatism of the Nose, Face and Frontal Sinuses due to a Fall from a Height. Operative Cure with Exceptional Cosmetic Result: Mrs. H. A. C., age 35, was seen by me about 2 p. m., Sunday, April 16, 1916, at St. Agnes Hospital, in consultation with Dr. H. J. Hahn. Her statement was that she was awakened suddenly about 2 a. m. the same morning and intending to go into an adjacent room, which is at the head of a staircase running from the first to the second floor, for some medicine, she stepped, as she thought, into the room but really into space; the first thing that she knew afterwards was that she lay swooning in a puddle of blood; she thinks that she was unconscious only a few moments.

She must have struck upon her nose, chin and right side of the face, judging by the injuries received; there was an oblique cut across the bridge of the nose from the inner end of the right eyebrow to the termination of the bony nose, also a cut from a little to the right of the middle of the upper lip to the angle of the mouth, making a triangular flap; similarly a cut from about the middle of the lower lip running outward and nearly meeting the previous one; the lower lip was torn from the jaw bone, and five lower teeth were knocked out. There was also a long cut (2 in.) to the bone, on the left side above the frontal eminence at about the hair line.

Her appearance was described to me as being a horrible sight.

Dr. Hahn was summioned in the emergency and conveyed the

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patient to St. Agnes Hospital where the cuts in the face were sewed up with inner and outer sutures, and temporary dressings applied to the nose. A number of radiographic plates were also taken, which showed fractures of both nasal bones and nasal processes, left outer orbital wall, and an oblique fracture across the anterior wall of both frontal sinuses.

It was nearly twelve hours after the accident before I saw the patient (about 2 p. m.) at the hospital, and preparation for operation had been made.

After etherization, examination revealed a fracture of both nasal bones, the left one being dislocated and lying loose in the tissues, the right comminuted into small splinters.

The bony nasal septum was fractured from its upper articulation and partly destroyed, so that a periosteal elevator could be inserted through the external wound into the nose and out through either external naris.

The nasal septum was also fractured and dislocated at the vomeral articulation forming a large ascending ridge obstructing the left nostril. The floor of the right frontal sinus was fractured and missing, so that the little finger could be inserted through the external wound and up into the sinus.

There was distinct crepitus of the right malar bone, but no depression. The wound and the nostrils were cleansed with extreme care. The nasal bones were replaced and sutured with catgut, even small splinters being sutured by their periosteum to the adjacent tissues. In view of possible contingencies, however, the septal ridge was not removed but was left as a resource for plastic work. Nor was any special treatment of the malar and orbital fractures deemed necessary.

A drain was inserted into the frontal sinus, and a separate strip of iodoform gauze into each nostril.

The skin wound was closed with fine silk sutures, except a small opening which was left temporarily at the inner angle of the right eyebrow for the sinus drain; this was covered with a gauze pad, but the rest of the wound was sealed with collodian and silver foil.

No external support was applied to the nose, as it was not considered necessary, in view of the ease with which fragments of the nasal bones usually remain in position, nor safe in view of the doubtful extent of the cranial injury.

Considering the extensive injuries and the possibility of an undetectable fracture of the base of the skull, an extremely guarded prognosis was given the husband, both as to disfiguration

and as to life. Fortunately, this was not warranted by subsequent experience; the following day the temperature was 103° and while slightly dazed the patient presented no evidence of cerebral complications, nor did any subsequently develop.

Usual after treatment was carried out by Dr. Hahn, Dr. Stewart or myself.

On April 24 (8 days) the stitches and dressings were removed.

Primary union was obtained except a small sinus at the lower end of the incision; this caused some apprehension but promptly healed; the sinus left above had been previously sewed up, at this time the bridge of the nose was firm.

On April 28 the patient was able to leave the hospital.

All wounds had healed, but she was suffering from general prostration and a marked paralysis of the right side of her mouth and face.

Dr. Hahn assumed charge of the case and I did not see her again for about a year, May 1, 1917.

The patient having regained her health and vitality and danger of collapse of herself or her nose having passed, it was deemed desirable to remove the thick septal ridge, badly obstructing the left nostril. This was done at this date with Hajek's chisel and a mallet, and ultimately resulted in decided increase in breathing capacity.

Present condition, May, 1918.—General health and spirits fine.

The bridge of the nose is firm and but slightly flattened at the root; there is a scar about $1/16$ inch wide which is readily concealed with a little powder.

The scars of the chin and lips are scarcely noticeable, the one of the scalp is covered by the hair and very slight.

The movements of the upper lip and mouth are practically normal.

In general, the disfigurement is wonderfully slight. (Photographs.)

Two features in the treatment of this case seem deserving of emphasis:

1. The early dispensing with dressings for the facial wounds, none having been employed after the first few days.
2. The preservation and re-implantation of bone fragments, even loose splinters.

The fact that the small bones of the face have unusual vitality has been known clinically for years, and was impressed upon me as an interne at the University Hospital by the late L. McLane Tiffany, Professor of Surgery.

Comparatively recently this fact has been given a scientific explanation, and in a much wider applicability, by animal experimentation.

Very recently, a report of a series of experiments upon bone transplantation and implantation has been made by Callie and Robertson (*Jour. Am. Med. Ass'n*, Apr. 20, 1918) and seems to me to be of such value that I feel justified in quoting from it quite extensively:

"The conclusions deduced from these experiments may be thus outlined:

When a piece of *living bone* has been separated from its circulation and implanted elsewhere in the body of the same patient, the immediate result, as indicated in specimens recovered within a

Figure 1.

few days of the operation, is the coagulation of all cells and vessels to which the surrounding lymph is unable to percolate. This means the *death* of all the cells in the lacunae and most of those in the haversian canals. This is indicated by the immediate change in the staining property of the protoplasm and nucleus, and is later proved by the complete absorption of these structures after the lapse of from three to four weeks.

On the *surfaces* of the graft and in the open mouths of the haversian canals, however, are many *osteoblasts* which are in a position to absorb nutriment from the bathing lymph, and these cells are capable of living and proliferating and of producing those changes that make the autogenous graft so valuable in reparative surgery. At the end of the *first ten* days after the implantation of

the graft, the proliferation of these osteoblasts is well established on the periosteal and endosteal surfaces, and within a few days *new bone* formation can be plainly seen on these surfaces. In addition to forming new bone about the transplant, these proliferating osteoblasts proceed to attack the *dead* bone of the grafts and rapidly produce *excavations* about the edges which are at first filled with proliferating cells and later by new bone laid down by these cells on the walls of the excavation..

While these changes are occurring on the surface, a *re-establishment* of the *circulation* has been taking place as the result of the ingrowth of new blood vessels into the mouths of the haversian canals. This proceeds with extraordinary rapidity, and in small.

Figure 2.

porous transplants is complete in approximately *two weeks*. Along with these blood vessels the osteoblasts spread inward from the surface, and at the end of *two weeks* the same changes that have been described on the surface are occurring *within the substance* of the bone. At first cavities are excavated along the course of the haversian canals, not far below the surface of the bone. Later, this cavity formation, which appears to be a solution of the bone by a secretion from the proliferating osteoblasts, spreads into the transplant until ultimately the whole graft is permeated by blood vessels and osteoblasts that are occupied in the absorption of the dead bone. A few days after the formation of a cavity by these proliferating osteoblasts, the older cells return to their adult func-

tion of bone production, and soon the older part of the cavity becomes lined with a layer of new bone. This layer increases in thickness, and trabeculae develop from wall to wall until the whole cavity is filled with living cancellous tissue except in those areas in which the proliferating cells are continuing the work of excavation. (Fig. 2.)

The rapidity with which these changes occur depends on three factors: The *size* of the graft, its *density*, and the *abundance* of the supply of osteoblasts that survive on the surface. Of the greatest importance, however, is the abundance of the supply of living osteoblasts on the surface. Thus, if the transplant is cut in such a way that the endosteal and periosteal surfaces are undisturbed and exposed to a good supply of lymph, the changes described above occur with certainty and rapidity.

When the grafts are placed in good contact with living bone, the changes described occur much more rapidly, evidently because of the additional supply of osteoblasts arising from the bone in which the graft is embedded.

Here the vexed question of the periosteum presents itself. The results of these experiments agree completely with those of Macewen, indicating that the periosteum as viewed by the surgeon is only a limiting membrane composed of fibrous tissue, and that the great majority of the sub-periosteal osteoblasts cling to the bone when the periosteum is removed. This view has been further substantiated by a series of experiments in which bone was transplanted *with* and *without* periosteum into the muscles of the back, and the amount of osteogenetic activity on the periosteal surface compared. These experiments showed that the value of the graft from the standpoint of osteogenesis was the same in the two cases. We are therefore in the habit of transplanting the bone without its periosteum, using the reflected periosteum to cover up the space left by the removal of the graft."

A Case of Frontal Empyema with Extensive Bone Necrosis and External Fistula, Operated upon Externally in Several Sitzings. Cure of Condition with Excellent Cosmetic Result: A. M. W., a white youth, aged 20 years, was referred to me by Dr. Henry F. Hill, April 28, 1914, with the following history: In June of the preceding year (1913) he had an itching of the upper angle of the left eye, succeeded in two days by great swelling over the eye, diagnosed as erysipelas.

After a week this was incised by Dr. Hill, followed by the discharge of a large amount of pus.

The patient was desperately ill with high temperature and an autogenous vaccine was employed as a part of his treatment.

Ever since his recovery he has had a small fistula in the forehead of left side to the left of the median line, usually covered by a crust. He is now in good general health and feels as well as ever; has no pain nor cerebral symptoms.

Says that there is a slight nasal discharge at times bloody from the left nostril.

Examination: The interior of the nose looked normal, there was no pus, and the probe did not discover diseased bone. After removal of a small crust, an external fistula the size of a knitting needle was found above the root of the nose to the left of the median line; a probe inserted through this detected bare bone and entered a large cavity, the left frontal sinus.

Operation was determined upon and performed April 29, 1914, at the University Hospital.

A curvilinear incision was made along the left eyebrow (not shaved) and a vertical extension made from the inner end of this through the fistula, producing a triangular flap.

The fistula was surrounded by granulations and bleeding was profuse. The bone fistula was enlarged with chisel and forceps, and a sequestrum of the intersinus septum was removed, so that a probe could readily be passed into the opposite sinus.

The left sinus was filled with pus and large granulations resembling brain tissue, which were removed with a spoon.

The right sinus was also opened at its inner angle by a limited incision and looked healthy.

Both sides were packed temporarily with gauze strips, but the right side was closed in two days.

At the dressing on May 7, the left sinus seemed to be granulating and the outer portion of the incision was sewed up.

The patient was discharged from the hospital and treated ambulatory. The left sinus was dressed at appropriate intervals, either by myself or various hospital residents.

At first iodoform gauze strips, later Peruvian balsam were used for packing.

Despite these measures, continued for nine months, bare bone presented on the posterior (cerebral) sinus wall and at the floor of the sinus, and it became evident that further operation was required.

On January 9, 1915, I performed a modified Killian operation on the left sinus at the Baltimore Eye, Ear and Throat Hospital.

This was a very extensive and tedious performance, lasting over three hours and complicated by the collapse of the patient on the table.

The entire sinus floor was removed, the inter sinus septum and the upper portions of the nasal process and nasal bone were curetted with a bone spoon.

All of these bones were bare but very dense.

The anterior half of the left middle turbinal and adjacent ethmoid cells though apparently healthy were removed through the wound for good drainage.

The usual drains and dressings were applied and the patient was able to leave the hospital in ten days' time.

Subsequent dressings were carried out at the dispensary and on February 1 (3 weeks), the bone was seen to be covered with healthy granulations, there was free drainage into the nose, and the greater part of the external wound was closed by secondary suture.

The patient was furnished with a syringe for home irrigation, and directed to report to the hospital for treatment and inspection, at increasing intervals.

Uneventful progress ensued until June 14, 1916, (18 months) when the patient returned with a painful swelling over the *right* eye and pus in the *right* nostril.

The tip of the right middle turbinate was resected with Sluder's knife under local anesthesia, and a hot compress and nasal douche employed; it became necessary, however, to reopen the sinus externally and apply drainage.

It shortly became manifest that something further must be done to cure this patient.

On July 11, 1916, I undertook what I had determined should be my final operation, under ether anesthesia at the Baltimore Eye, Ear and Throat Hospital.

Both sinuses were reopened externally—on the left side scar tissue had to be loosened up and dissected out of the depressed fistula.

While the left sinus had largely healed, bare bone could be detected with the probe, at the root of the nose and on the posterior sinus wall.

All granulations were removed from both sinuses with a curet, and the left posterior (cerebral) wall curetted as vigorously as seemed safe. The nasofrontal openings upon either side were enlarged to the fullest extent with a burr.

2. The posterior (cerebral) sinus wall was denuded but was hard and seemed devitalized rather than necrotic (osteosclerosis?). It took a very long time for it to regenerate, but my own judgment and the advice of colleagues was that it was better to delay than to assume the risk of removal.

3. Marked anesthesia of the operative field; the packing was for a long time painless, doubtless due to the devitalized bone.

4. Excellent cosmetic result.

A Case of Fracture of the External Bony Framework of the Nose and the Nasal Septum by the Kick of a Mule, Causing Depression of the Tip of the Nose and Great Disfiguration. Restoration of Appearance and Function by Operation: James C., a country lad, aged 19 years, was admitted to my service in the University Hospital, July, 1917, with the history of having come into conflict with the business end of a mule two days previously, in consequence of which he presented a broken and badly lacerated nose. The median third of the lower end of the nose was cut out into a tongue shaped flap and mashed down upon the face; the upper and lower lateral cartilages were cut through and left erect, thus forming a trough at the end of the nose.

The left nasal bone and the edge of the pyriform aperture were fractured. The bony septum was fractured and the cartilaginous septum was smashed to smithereens.

In consequence of these injuries both nares were practically obliterated by a red pulp like swelling.

The nose was thoroughly cleansed, and under ether, the septum and nasal bone were elevated with septum forceps.

The depressed triangular flap was elevated and sutured, then covered with iodoform collodion.

As the nose looked infected, it was at first packed with iodoform gauze; later a metal splint was inserted into the nares, and a metal support over the bridge of the nose.

The stitches were removed within a week's time, when primary union had occurred and the patient was left with a nose fully as beautiful as the one which he originally possessed.

This belonged to that underdeveloped, shortened variety termed "snub" nose.

Whether or not this type is usually associated with low mental development or degeneracy, as has been stated, it certainly was in this case. It was impossible to impress upon the patient the importance of his treatment and he insisted upon leaving the hospital without my consent and at his own risk.

The basal remnant of the intersinus septum, the anterior frontal spine, and the uppermost portion of the nasal septum, were removed with forceps (Citelli) and burrs.

This seems to be approximately what is known as Lothrop's operation, which I was not familiar with at that time.

I determined to close the left wound by a plastic operation and leave a small opening at the inner angle of the right wound for a drain.

A gauze pad was put over each eye, but permanently removed from the left side the following day.

On July 14, 1916, the stitches were removed and healing per primam had occurred; there was a fistula the size of a slate pencil on the right side and of a knitting needle on the left.

No further external dressings were applied, only a small drain on the right side.

On July 20 he was thoroughly examined. A probe could be passed into either sinus and across into the opposite one, also down into either nostril.

Fluid introduced into either sinus ran out of both nostrils.

All drains were removed, the patient furnished with a syringe and directions for self-treatment.

Subsequently he was seen only at long intervals and had no trouble until October 31, 1916 (3 months) when he returned with a moderate yellow discharge from a minute pin size fistula in the left side, through which the patient was unable to irrigate the sinus successfully.

The opening upon the right side had completely closed.

I irrigated the sinus a number of times with weak iodine solution, by means of a fine Devilbiss irrigating syringe, and then furnished the patient with a gold dental root syringe for home use.

There was free drainage through both sinuses into and out of each nostril.

The minute fistula caused no disfigurement and it was thought best to leave it as a safety valve.

Since this period I have not treated the case, but have seen him on several occasions.

He has meanwhile married and was well when last seen, June 30, 1917.

Several interesting points were presented by this case:

1. Lack of intra nasal pathologic conditions. A virulent infection (erysipelas) seemed to have attacked the frontal sinus and uppermost portion of the bony framework of the nose, without involvement of other nasal tissues.

At this time he was breathing well and the cosmetic result was good.

In January, 1918, he was seen at work by a patient of mine, and *seemed* to be all right.

This case illustrates the remarkable vitality of the nasal tissues and how much can be accomplished even in apparently bad conditions. The tissues looked infected, and I greatly feared their destruction with terrible deformity.

A Case of Fracture of the Right Nasal Bone and Nasal Process and a Portion of the Orbital Process, by an Iron Rod; Formation of Sequestra and Abscess, with Secondary Infection of the Right Antrum. Operation and Cure, with Good Cosmetic Result: James W., aged 14 years, was referred to me by Dr. Albert T. Chambers, with the history of having been struck upon the chin and face four or five months previously by an iron rod of a revolving merry go round. For several months he has had an ovoid swelling along the right side of the nose, presenting a fistulous opening at the lower extremity, discharging pus.

On probing through the fistula bare bone was detected, and the probe entered the right naris.

The right eyelids were much swollen, nearly closing the eye.

Operation was performed November 20, 1917, under ether, at the Franklin Square Hospital, Dr. Furneyhaugh assisting.

The abscess was incised along its extent and a lateral rhinotomy done, removing the necrotic right nasal bone and a portion of the nasal process of the superior maxillary bone, also a sequestrum comprising the inferior inner rim of the orbit.

The right antrum was opened through the nose, irrigated, and a drain inserted.

The external nasal wound was sewed up, except at its uppermost extremity which looked suspicious, and a small drain was inserted.

This was covered with a dressing, but the greater part of the wound was closed with collodion cotton.

The wound was dressed and nose irrigated at appropriate intervals by Dr. Furneyhaugh until November 28, when the patient left the hospital.

December 4 the external wound was healed by primary union except a small fistula at the uppermost extremity, the edges of this were scraped with a knife and the patient sent home.

December 14 the patient's mother reported by letter that he "was doing finely and the wound had closed."