

plates are increased in number and there is also increase in the amount of red marrow with good evidence that the number of giant cells in the blood forming organs are relatively and absolutely increased in number.

In so-called myelogenous leukemia the blood plates are also increased in number, and in the cellular accumulations of this disease giant cells do not seem to be an uncommon finding, although but little attention has been paid to them by pathologists. In view of the enormous increase in the marrow elements in this disease it must be obvious that the presence among them of a relatively small proportion of giant cells means a great absolute increase in the number of such cells in the body.

My acknowledgments are due to Dr. Oscar Richardson, assistant pathologist, for relieving me of much of the regular work of the laboratory during the period in which I have carried on this study.

#### DESCRIPTION OF PLATE.

The photomicrographs were made by Mr. L. S. Brown in the Pathological Laboratory of the Massachusetts General Hospital from sections of the bone marrow, spleen and lung of the cat, the blood plates of which animal are especially large. The magnification in all the figures is approximately 1500 diameters.

Fig. 1. Giant cell with a pseudopod projecting into a small blood channel of the bone marrow. A blood plate in process of pinching off is seen at the free extremity of the pseudopod. The granular portion of the cytoplasm is densely stained. The hyaline margin of the pseudopod is only faintly shown.

Fig. 2. Giant cell with a pseudopod projecting into a blood channel of the bone marrow. Other pseudopods either free or attached to the cell are also shown. Two small rounded bodies near the pseudopods in the vessel are either blood plates or cross sections of pseudopods.

Fig. 3. Detached pseudopod in a capillary of the lung in process of segmentation into blood plates.

Fig. 4. A small pseudopod segmenting into plates and still attached to a nearly naked giant cell nucleus in a blood vessel of the spleen.

Fig. 5. Blood plates and detached pseudopods in a blood vessel in the spleen.

Fig. 6. A giant cell with pseudopods, two of which stretch far into a small blood channel of the marrow. The continuity of one of them is not visible in the figure.

Fig. 7. Blood plates and a detached pseudopod in process of segmenting into blood plates. The vacuole-like unstained areas in the central portions of the pseudopods and of the plates are shown. Two leucocytes are present.

Fig. 8. Detached pseudopods showing segmentation and transitions to blood plates. These lie in a small blood vessel of the marrow.

Fig. 9. Small detached pseudopod showing indications of segmentation in a lung capillary.

Fig. 10. Giant cell in the marrow with pseudo-

pod protruding into a blood vessel through its thin wall. The free portion of the pseudopod has segmented so as to form a short chain of three blood plates connected together by their hyaline marginal portions.

Fig. 11. Thrombus-like mass of blood plates in a vessel of the marrow. Among the plates two detached pseudopods, one of which shows signs of beginning segmentation. Vacuole-like unstained areas are seen in some of the blood plates and in one of the pseudopods.

Fig. 12. A detached pseudopod, several blood plates, a few erythrocytes and three leucocytes in a blood vessel of the spleen. The hyaline marginal zone, both of the pseudopod and of some of the plates, is fairly well shown.

Fig. 13. A giant cell of the spleen with a pseudopod projecting into the lumen of a small blood vessel through its wall. At the free extremity of the pseudopod two plates are seen in process of formation.

Fig. 14. Giant cell in a blood vessel of the spleen with its cytoplasm nearly all arranged in pseudopods and more or less detached from the nucleus. Some blood plates are seen either free or in continuity with the pseudopods. Vacuole-like unstained areas are shown in the mass of cytoplasm at the left of the nucleus.

#### INFLAMMATION OF THE FRONTAL SINUS.\*

BY HARRIS PEYTON MOSHER, M.D., BOSTON.

HEADACHE is a symptom which in a great many instances receives the most off-hand diagnosis as to its cause and the most off-hand treatment. The case is much like that of the crying baby and the soothing syrup. There is a sure remedy always at hand. It is on every dressing table and on the show case by every soda fountain. We are taught that cause and effect always go together and so should be studied together. In the common symptom of headache, however, the effect often engrosses our attention to the exclusion of the cause. It is a truism, of course, but one which I shall take the liberty of repeating, that an eliminating diagnosis of the cause of recurring and chronic headache requires a most thorough, sustained and systematic physical examination plus a keen cross examination of the patient's personal and family history and a judicial weighing of the testimony thus secured. This means that the broad knowledge and sound good sense of the general practitioner must at times be supplemented by the examinations of the man doing special work, and it means that both should work together; and that the specialist in medicine like the specialist in finance should try to keep out of "fads and fancies."

The subject of this paper is acute and chronic inflammation of the frontal sinus. The chief symptom of disease of the frontal sinus is headache. I ask your permission to make what I have to say a little informal and in the line of a demon-

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Charts and specimens from the Anatomical Laboratory of the Harvard Medical School.

stration. I shall discuss the subject in the following order: The development and the anatomy of the frontal sinus; the surgical routes to the frontal sinus; acute inflammation of the frontal sinus, its diagnosis and treatment; chronic inflammation, its diagnosis and treatment.

The frontal sinus is one of a chain of accessory cavities which surround the nasal cavity and enlarge its capacity. All the sinuses are formed in the same way. The nasal mucous membrane possesses the peculiar ability of growing in various directions into cartilage and into bone and there expanding to make the cavities which we know as the sinuses. The antrum alone is present at birth. The formation of the other sinuses begins soon after birth, but active growth does not take place in them until the period of second dentition. The reason for their formation is a little problematical. The best explanation for their presence is that they serve to lighten the bones of the face. The reason that they increase in size at the time of the second dentition is that they do so in order to give the permanent teeth enough room. At this time the superior maxilla enlarges and with it the antrum. The frontal sinus enlarges in order to keep the symmetry of the face. This theory accounts nicely for the enlargement of the antrum and the frontal but is not so applicable to the sphenoid. In animals all the sinuses including the sphenoid contain turbinates covered with olfactory epithelium. This is seen beautifully in the dog. There are no turbinates and no olfactory epithelium in the sinuses of man.

There are two frontal sinuses, a right and a left. They are separated by a median partition which corresponds to the sagittal suture of the skull. The sinuses are placed in the middle and inferior part of the front face of the frontal bone. All recent studies demonstrate that the sinuses are anterior ethmoid cells which have grown upward from the ethmoid region and separated the two plates of the frontal bone. There is always an intimate relation between the frontal sinuses and the ethmoid region since one is but the continuation of the other.

#### SIZE.

The development of the sinus begins after birth. At eight years it extends above the root of the nasal bone one quarter of an inch. The adult sinus measures vertically from three fourths of an inch to an inch, and horizontally from the median line one inch, that is, it reaches to the middle of the upper rim of the orbit. The capacity of the adult sinus is about one dram and a half. Owing to deviation of the septum between the sinuses the two are seldom of the same size. The prominence of the superciliary ridge is but a poor guide to the size of the sinus.

#### VESSELS.

The veins of the sinus are in relation with the superior longitudinal sinus of the brain, and the lymphatics connect with the sub-arachnoid space. There is a plentiful supply of nerves which makes the sinus very sensitive.

#### THE FORM OF THE SINUS.

There are two varieties of the frontal sinus,—the small sinus and the large.

#### THE SMALL SINUS.

The small frontal sinus is one where the ethmoidal cell which makes it has developed but little, but, instead, has remained at the top of the ethmoid labyrinth as the highest ethmoid cell, without pushing further upward and separating the two layers of the frontal bone. Such a sinus is contained within the upper inner angle of the orbit just above and a little behind the inner canthus of the eye.

#### THE LARGE SINUS.

What may be taken as the normal sinus is one which comes out of the orbit on to the brow. Normally in the median line the height varies between three quarters of an inch and an inch. In large sinuses the vertical measurement may be two inches.

The large sinus is often still further enlarged by prolongations,—a prolongation outward over the superciliary ridge and a prolongation backward over the orbit.

#### THE OUTWARD PROLONGATION.

Usually the sinus extends outward from the median line one inch, that is, to the middle of the orbit. Where there is a large outward prolongation the outward limit may be two inches, from the median line, or the malar bone.

#### THE BACKWARD PROLONGATION.

The backward prolongation runs back over the orbit on the inner side of the sinus to end blindly about one-half inch from the rim of the orbit. Usually it is one eighth of an inch high.

#### THE SEPTUM OF THE SINUS.

Normally the septum of the sinus is a thin triangular plate of bone placed vertically between the two sinuses. Very rarely are there perforations in it. I have found but one undoubted perforation in at least four hundred heads. No matter how much the upper part of the septum may deviate the base is nearly always in the median line.

#### INCOMPLETE OR PARTIAL SEPTA.

In addition to the median septum which is complete, the frontal sinus often has partial or incomplete septa. These have two seats of predilection,—at the summit of the sinus and in the backward or the orbital prolongation. Partial partitions are found in about 10% of all sinuses. In about 5% of cases there is found a nearly complete partition. I have never seen but one of these at a time. Such a partition must be recognized or it will vitiate the operation which is undertaken for the cure of disease of the sinus.

The study of the relations of the sinus is the study of the sides which compose it. There are three such sides and the canal which connects the sinus with the nose.

#### ANTERIOR WALL.

Taking bodies as they run in the dissecting room in one third of them, the frontal sinus is of the undeveloped variety; that is, it does not come on to the brow at all but is confined within the upper inner angle of the orbit as the highest ethmoid cell. For surgical purposes such a sinus has no anterior wall. In two thirds of the cases the sinus comes on to the brow from three fourths to one inch. If, therefore, you do not know the size of the sinus, the only sure place to reach it is within the orbit at its upper inner angle, and next to this place you are surest to find the sinus at the root of the corresponding nasal bone.

#### THE POSTERIOR OR THE CRANIAL WALL.

The posterior wall of the sinus is the front wall of the cranial cavity.

#### THE FLOOR OF THE FRONTAL SINUS.

In surgical anatomy, next to the anterior wall the floor of the sinus is the most important wall. Given a normal sinus of the large variety the floor is in relation from without inward with the roof of the orbit, the roof of the ethmoid labyrinth and the roof of the nasal fossa.

The relationship with the roof of the ethmoid labyrinth is constant. If the sinus is small the relationship with the roof of the orbit and with the roof of the nasal fossa may disappear.

The relationship between the floor of the frontal sinus and the ethmoid cells is very important. The anterior ethmoid cells make the floor of the sinus, and often mound into it. By this they may obstruct the drainage of the sinus. When an ethmoid cell mounds into the floor of the sinus it is easy to break through the roof of this and make a large opening down into the ethmoid region of the nose. The floor of the frontal sinus is either funnel shaped or saucer shaped.

The dangerous area of the sinus is the posterior internal angle of the floor, since here the cribriform plate comes into close relationship. All strong curetting of the sinus, therefore, should be done in an outward and downward direction, never backward and inward.

The sinus empties into the middle meatus of the nose by a canal about half an inch long. This starts from the posterior part of the floor from an eighth to a quarter of an inch from the median septum. In trying to find it from within the sinus, the tendency is to hug the septum of the sinus. If the floor of the sinus is funnel shaped the probe is guided at once into the duct, but if the floor is of the saucer shape variety the probe must be moved outward away from the septum before it will drop into the duct.

#### CATHETERIZING THE SINUS.

The duct of the sinus empties into the middle meatus to the outside of the anterior end of the middle turbinate. It is usually impossible to

catheterize the sinus without first gaining room by the removal of the anterior end of the middle turbinate. Not only does the turbinate hinder catheterization but any enlargement of it tends to block the canal. All intranasal work for the purpose of bettering the drainage of the frontal sinus is focussed about the anterior end of the middle turbinate. The frontal sinus is placed directly over the antrum so that in one half of the cases a probe can be passed from the frontal sinus into the antrum below. Pus, of course, could find its way more readily than the probe. From its anatomical position, therefore, the antrum is often only a cesspool for the frontal.

#### THE PULLEY OF THE SUPERIOR OBLIQUE MUSCLE.

The superior oblique muscle is attached just within the upper inner angle of the orbit to the inside of the supra-orbital notch. This muscle lies in wait for the operator in all operations on the sinus within the orbit. If it is disturbed it gives temporary double vision, and occasionally permanent trouble. It is attached to the periosteum of the orbit. If it is necessary, this can be elevated carefully without giving lasting inconvenience, but the pulley of the muscle will not tolerate rough dissection.

#### THE MUCOUS MEMBRANE.

The mucous membrane of the frontal sinus is a continuation of the mucous membrane of the nose, but is not as thick. This difference is due to the fact that the mucous membrane of the sinus has few glands and no cavernous tissue.

I have given the anatomy somewhat in detail because the surgery of the sinus has undergone complete revolution in the last few years owing to the increased knowledge of the surgical anatomy.

#### THE METHODS OF ENTERING THE SINUS.

1. In a fair proportion of cases, after removing the anterior end of the middle turbinate, a catheter, can be passed into the sinus. This may follow the canal, but in the majority of instances it enters an ethmoid cell which mounds into the floor of the sinus and breaks through the roof of this into the cavity of the sinus. To pass a larger instrument than a catheter into the sinus by this route is to my mind unsurgical, because it is working in the dark.

2. Where the sinus comes on to the brow, it can be entered just above the root of the corresponding nasal bone. The nearer the nasal bone the opening is made the greater the resulting deformity from pitting of the scar.

3. The third method of entering the sinus is from the upper inner angle of the orbit. The incision for this starts from the inner end of the eyebrow and runs down the side of the nose along its outer border. The linear scar which this leaves is, of course, visible, whereas the scar of the second method is confined to the eyebrow and is hidden by it unless it is sunken. This third method of entering the sinus is very valuable because it enables the operator to remove the

inner part of the floor of the sinus thus making a large opening from the sinus into the nose and at the same time to deal with any or all of the ethmoid cells. Chronic disease of the frontal is practically always associated with chronic disease of the ethmoid region, and the two have to be dealt with at the same time.

#### X-RAY PLATES.

X-ray plates give very valuable information in dealing with sinus disease. The first thing which must be known in operating on the sinus is its location and size. In other words whether the sinus is of the small type and confined within the orbit or whether it is of the usual large type and comes on to the brow. The plates show this and show further how far above the root of the nasal bone the sinus can be entered without opening the cranial cavity. If it is possible to enter well above the root of the nasal bone the deformity which results from pitting of the scar is reduced to a minimum and at times entirely obviated.

The plates show further how many septa the sinus has and their position, they show the presence and size of the orbital prolongation, the extent of the basal relationship between the floor of the sinus and the ethmoid cells, and so settle the question of the possibility of making a large opening from the sinus into the nose; and finally the plates will in a majority of cases show the presence of pus. In settling these points transillumination is unreliable.

#### ACUTE INFLAMMATION OF THE FRONTAL SINUS.

Acute inflammation of the frontal sinus is very common after a cold or the coryza of influenza. The bacillus of influenza has been demonstrated in acute and chronic inflammation of the antrum so that it is highly probable that the same would be true of the frontal in disease of sinus could we get at it as readily as we can the antrum. Acute inflammation of the frontal sinus does not as a rule go on to the formation of pus. The conditions in the sinus are probably the same as the conditions in the nose, namely, congestion and edema of the lining mucous membrane with an exudation of serum and a blocking of the drainage duct. These conditions persist for a few days or for a few weeks. Complete resolution generally follows.

*Symptoms.* — The symptoms may be simply a feeling of weight and uneasiness over the brow, something like the feeling in the temporal region when the Eustachian tube is closed; or, in addition, there may be dull persistent pain which is increased on lowering the head and tenderness under the upper inner angle of the orbit. Anything more than a very transient edema over the brow or over the inner part of the upper lid indicates that pus is forming. A few cases have been reported where the upper lid has dropped from involvement of the third nerve. I have had one such case.

*Diagnosis.* — In making the diagnosis of acute inflammation of the frontal sinus supra-orbital

neuralgia must be ruled out. Occasionally, the two conditions cannot be separated with certainty. In neuralgia the tenderness usually extends up on the brow in the course of the nerve to the scalp, and there is a history of neuralgia in other branches of the fifth nerve or in other parts of the body. In the nervous neuralgic patient, one should be slow in operating, especially should be slow in resorting to any external operation. In all cases of sinus disease, sometimes in acute cases, but always in chronic cases, syphilis is the "nigger in the wood pile." In my house-office days, it used to be said that every negro should be treated first for syphilis. In acute inflammation of the frontal sinus due to syphilis, if the history does not give the clew, the increase of the pain at night may furnish it.

*Treatment.* — The frontal sinus must be made to drain. This can be done in many cases by the use every three hours of a spray of adrenalin oil. Unless the patient has an idiosyncrasy to this drug it will keep the middle turbinate in a shrunken condition and make the lower opening of the duct as patent as possible. In addition it is very useful to pack the middle meatus with cotton saturated with the oil hoping that by leaving the tampon in place a short time the astringent effect of the drug will penetrate further along the course of the duct, perhaps into the sinus itself. If the middle meatus is roomy enough air, preferably warm, can be blown into the sinus; this gives great relief.

Combined with the use of adrenalin or rather preceding its use the nose should be cleansed with warm normal salt solution from a Birmingham douche. Cold or heat applied to the brow over the sinus will dull the pain. In the beginning of the trouble, pnenacetin, bromide, or morphia are required for the severer paroxysms. Unless this line of treatment lessens the symptoms in a short time the anterior end of the middle turbinate should be removed.

The theory of this is, that it allows the sinus to drain. In acute cases it is only rarely that pus flows from the sinus after this is done, but the clinical fact remains that this procedure quickly brings improvement. Often it is the only thing which will. If the acute inflammation does not resolve but passes into the tedious course of chronic suppuration of the sinus, if you have taken off the anterior end of the middle turbinate early you have the satisfaction, such as it is, that you left no stone unturned which might have prevented the disease from becoming chronic.

#### CHRONIC SUPPURATION OF THE FRONTAL SINUS.

Chronic suppuration of the frontal sinus gives a much darker picture than the one given by acute inflammation of the sinus. Acute inflammation may be an affair of a few days and a trivial complaint; chronic suppuration, on the contrary, is an affair of months, years or a lifetime and can never be classed as trivial. Its tedious course and the increasing invalidism which it produces gain for it a dignified standing among diseases.

There has been a great revival of interest in chronic suppuration of the frontal sinus of late owing to the trying out of certain new operations for its cure. For many years disease of the frontal sinus has masqueraded as supra-orbital neuralgia. For many years also, pus which had broken into the orbit from the frontal sinus was classified as orbital abscess. If any part of the nose or its accessory cavities was assigned as the origin of the pus it was the ethmoid region. In many cases this was true, but in many more cases the unrecognized source of the pus was the frontal sinus.

We have operations enough and to spare for dealing with suppuration of the frontal sinus; just what ones can be spared for good will be settled in the near future. Our knowledge of the etiology of chronic suppuration of the frontal sinus is not in this prosperous condition. More knowledge along this line is needed sadly. All that we know is this: The serum poured out in acute inflammation of the sinus may not absorb but become infected by the ordinary pus producing bacteria. The pus infects the mucous membrane so that in certain places the mucous membrane becomes thicker and in other places not only thickens but becomes polypoid. If the duct is sufficiently plugged, the pus seeks an outlet by way of the brow or by way of the orbit. Cultures of the pus secured at operation from my cases were either sterile or full of unrecognizable detritus. In three of my cases the report read: "No tubercle bacilli, no bacilli of influenza, the meningococcus not present." In a case of one of my colleagues the report came back, "A pure culture of the pneumococcus." I feel that someday the tubercle bacillus will be found to play a part here as elsewhere in the body. Tuberculosis and syphilis are the two great systemic diseases which claim every region of the body. One of the things longest known and best known about the etiology of sinus disease is that syphilis causes it in many cases. It is a striking fact that disease of the bony walls of the sinus is rarely found. I know of but two instances. A sequestrum is practically never found unless trauma was the starting point of the suppuration. Recent work goes to show that the periosteum is not involved any oftener than any of the other layers of the mucous membrane.

The other layers of the mucous membrane may be extensively changed so that the sinus is filled with polypi and yet the periosteum show but little if any alteration. This would seem to rule out periostitis as a cause except in cases of syphilis and to confine the seat of the disease to the mucous membrane, and make the probable cause some infection of the mucous membrane.

**Symptoms.** — The chief symptom is brow pain over the affected sinus. The pain may be neuralgic, but generally it is of a dull, heavy throbbing character. At first it may be intermittent but later it becomes practically constant. Usually there is pus in the nose, but it may be absent until catheterization of the sinus is successful. Along with the pain there are gastric symptoms.

One case of mine had persistent gastralgia, another had for months morning nausea for some days before her period and was constantly uncertain as to whether or not she was pregnant. In severe cases dizziness is present. Trouble with the vision of the eye of the affected side often is a very early symptom and sends the patient to the oculist.

I have found that cases of chronic suppuration of the frontal sinus are divided into two distinct groups:

1. A group where the chief features are the eye symptoms.

2. A group where the prominent features are pain and nasal discharge. The first group of cases come first to the eye clinic; the second as a rule come first to the throat and nose clinic.

**First group.** The characteristic of this group is exophthalmos or ethmoid tumor or both. The exophthalmos is due to pus gaining the orbit by perforating the floor of the sinus and displacing the globe of the eye. The ethmoid tumor is due to pus coming into the orbit by perforating the lachrymal bone. Ethmoid tumor is seen as a rounded swelling just above the inner canthus of the eye. In half of the cases of the first group there is no pus in the nose. Pain is not prominent.

**Second group.** In the second group there may be edema of the inner half of the upper eyelid but no ethmoid tumor or exophthalmos; instead pus and polypi are usually present in the nose and there is very marked pain.

**Diagnosis.** — Where there is ethmoid tumor or exophthalmos if the x-ray plates do not locate the disease in the frontal sinus only exploratory operation will rule out the various new growths of the orbit, or affections of the tear sac. Pus in the nose would point to the frontal sinus or to the ethmoid region or antrum. Where there is brow pain and pus in the nose with tenderness under the upper inner angle of the orbit and edema of the upper lid or of the brow plus gastric disturbance or perhaps dizziness the diagnosis is practically certain. It can be made positive by the x-ray or by getting into the sinus from the middle meatus and withdrawing pus through the catheter or along the catheter. Pain giving by suppuration in the antrum is occasionally located over the brow. The pain given by inflammation of the frontal sinus is occasionally in the occipital region as well as in the frontal.

**Treatment.** — Only a very few cases of chronic suppuration in the frontal sinus can be cured by passing a catheter from the nose into the sinus and irrigating with astringent or antiseptic solutions. This method is tedious in the extreme and unreliable. To attempt to enlarge the duct of the sinus from below and to insert a tube to be retained in the duct is dangerous, because you are working in the dark. All methods like these two leave out of account the extensive disease of the mucous membrane of the sinus. No wash can irrigate the sinus thoroughly if it is half full of polypi or is divided into recesses by septa. An operation to have any chance of success must

thoroughly eradicate the mucous membrane and the polypi and remove all the septa. An opening into the sinus should be made large enough to accomplish this. This means in a small sinus that the whole front wall must be removed, and in a large sinus the greater part of the front wall or occasionally the whole of it. When this fundamental step has been taken the methods of finishing the operation open to the operator are as follows: First, he can enlarge the opening of the sinus into the nose; second, he can let the duct alone, except to clean it of diseased mucous membrane and polypi, and pack the cavity of the sinus through the brow incision until it heals by granulations, and is obliterated; in the third place, after the frontal sinus has been opened well above the orbital margin and the diseased mucous membrane, the polypi and the septa removed, the operator can make an opening along the side of the nose and resect the ascending process of the superior maxilla, thus exposing the ethmoid labyrinth from the front. By working from the ethmoid region upward and from within the sinus downward, the internal part of the floor of the sinus can be removed and a larger opening made into the nose than it is possible to make in any other way. If there is extensive disease of the ethmoid region, the tear sac is pushed aside and part of the inner wall of the orbit taken out so that the whole ethmoid region can be curetted. Not only the ethmoid region can be thoroughly dealt with in this way, but this is the most direct route to the sphenoidal sinus.

No one operation is suitable for all cases. It requires judgment to fit the operation to the case. The ideal operation is to open the sinus through an incision in the eye brow which is hidden by the eye brow later, to open well up on the forehead and to enlarge the opening sufficiently to clean out the mucous membrane and polypi and septa and then to make a large opening down into the nose. This method will occasionally succeed. The trouble with it, however, is that the duct tends to close and give a return of all the symptoms. If an attempt is made to keep the duct open by a tube passed through it into the nose just as soon as the tube is taken out the granulations caused by the irritation of the tube shut off the duct again. Temporary packing of the duct with gauze is even worse. Unless the anatomical structure of the sinus allows the making of a sufficiently large enough opening into the nose so that granulations will not bridge across the duct and close it, the operation just described will do nothing more than relieve the surgical indications for the moment. Even if the major surgical symptoms do not return, the discharge into the nose may continue. From the standpoint of the specialist no case of sinus disease is classed as cured if there is any considerable amount of pus in the nose. As this operation leaves no deformity, and does not interfere with other procedures if they become necessary, it is often the operation of first choice. By this operation I had the satisfaction of curing a physician who wished

of all things to avoid a scar and did not care if he had to wash out his sinus himself at intervals. When he last reported, some six months ago, there was no discharge. By this method also I operated on both sinuses of a boy of seventeen. The sinuses were very large. By a little intranasal work the openings which were made into the nose were easily kept open. The boy reports for washing of the sinuses periodically. The discharge is decreasing, the boy is comfortable. The deformity which would have been caused by the granulating method of treating these sinuses would make the boy an object of comment among his companions.

#### THE METHOD OF OBLITERATING THE SINUS BY GRANULATIONS.

The bone cavity left after a mastoid operation is allowed to heal from the bottom by granulations. When healing is complete the cavity is obliterated and in proportion to the original size of the cavity there is pitting or sinking of the scar. The great advantage of this method when applied to the frontal as well as to the mastoid is that the cavity operated upon is obliterated; the disadvantage is the sinking of the scar. A sunken scar back of the ear is noticed but little; a similar scar is very conspicuous on the brow. A sunken scar, however, is often a moderate price to pay for a cure of chronic suppuration of the frontal sinus. The injection of paraffin will better the scar to a certain extent. The granulating method is simple. It is done as follows:

Enough of the front wall of the sinuses is removed to allow the mucous membrane to be thoroughly cleaned from every part of the sinus. Great care is taken on this point. The mucous membrane is removed from the duct of the sinus but the duct is not enlarged as the object is to obliterate it. After the sinus is cleaned a part of the incision is left open and the sinus packed with gauze. Some men report sinus obliterated in this way in six weeks. In my experience the time has been between eight weeks and four months. This prolonged packing is tedious. Great care is necessary that parts of the sinus do not catch across and form pockets instead of closing steadily from the bottom. If this occurs the pain returns. In a large sinus the sinking of the scar often produces marked deformity. This method leaves behind it the satisfactory feeling that the sinus is obliterated and out of the way forever.

The third method of treating chronic suppuration of the frontal sinus is the most radical. It is a strong rival of the granulating method. It is a combination of two operations requiring one skin incision and two bone incisions. A wide strip of bone is left along the rim of the orbit and at the root of the nasal bone. This bridge makes it possible to take off the whole of the anterior wall of a large sinus and yet have very little if any deformity afterwards. The skin incision runs through the middle of the whole



length of the eyebrow and then down the middle of the side of the nasal bone. The first bone incision is in the brow well above the root of the nasal bone, so that a good bridge of bone is left after the second bone incision is finished. The second bone incision is made at the outer border of the nasal bone. Through this the ascending process of the superior maxilla is resected. Through these two bone incisions the inner angle of the floor of the frontal sinus can be thoroughly removed. In the seven cases which I have done in the last year, I have proved to my own satisfaction that in a small sinus there is absolutely no deformity and in a large sinus very little,—less deformity in the large sinuses than after the granulating method. By the Killian method, as this third method is called, not only the inner angle of the floor of the sinus is taken away, making as large an opening into the nose as the sinus will possibly allow, but the ethmoid cells are opened from the front and can be cleaned out more thoroughly than by any other route.

This operation requires more skill than the other operations because the pulley of the superior oblique must be avoided and the lachrymal sac must be turned from its bed without injury and the bridge at the root of the nose be preserved at all costs. Three fourths of the incision is in the eyebrow and so is hidden by it. All that is visible is a half-inch linear scar along the outer border of the nasal bone. It is a long operation to do, but the healing is short. The whole incision is closed and firmly healed in a week. It is a great relief after the tediousness of the granulating method. As the whole ethmoid region can be cleared out and the inner part of the floor of the sinus taken away so that the sinus is left as the dome of the nasal fossa, it would seem as if operative procedures could go but little if any further. So far I have gotten better results with this method than with any other. The last case but one where I used this method contrasts the method of Killian and the granulating method very strongly. About a year ago, I attempted to obliterate a large left frontal sinus and packed it at intervals, which were never longer than three days, for eleven months. A sinus running well back over orbit in the deep orbital prolongation of the sinus persisted until the patient was thoroughly tired. I was equally so. About a month ago I reoperated this case by the Killian method. Healing was complete in a week, there has been no drawback, and there is practically no pus in the nose. The relief of ending this dragging case was very great.

In the cases of chronic suppuration which have exophthalmos or ethmoid tumor, nature attempts to do this operation for herself. In two such cases I found the inner angle of the floor of the sinus necrosed away as well as the greater part of the anterior half of the inner wall of the orbit. All that was left for me to do was to clear out the ethmoid cells and to leave a bridge at the root of the nasal bone.

## SUMMARY.

The x-ray plate is the only means of telling whether the frontal sinus remains in the orbit as an undeveloped ethmoid cell or whether it comes on to the brow. The x-ray in very many cases will show whether the sinus contains pus. Acute inflammation of the frontal sinus responds readily to treatment. In any except the most trivial of the acute cases the removal of the anterior end of the middle turbinate produces more benefit than any other form of treatment. In chronic suppuration of the frontal sinus syphilis should be ruled out at the start. With the exception of syphilis and trauma, very little is known of the etiology of chronic suppuration of the frontal sinus. The mucous membrane is the seat of the disease as the bony walls of the sinus are rarely involved. The prognosis is increasing invalidism from pain, from gastric disturbances and dizziness and inability to use the eye. Occasionally in neglected cases the pus will necrose its way into the cranial cavity, but as a rule it breaks into the orbit or into the nose. Thus, suppuration of the frontal sinus is not as dangerous as suppuration of the mastoid. But curiously enough when the meninges are exposed to pus in the region of the frontal the liability of fatal infection is much greater than when the same thing happens in the mastoid.

The three chief symptoms of chronic suppuration of the frontal sinus are interference with sight, pus in the nose, and chronic frontal headache. The pain may, however, be in the occipital region. Treating suppuration of the frontal sinus by catheter through the nose into the sinus is only palliative, seldom curative. The rational method of treatment is to open the sinus through an incision in the eyebrow and to see what the conditions are within it. Then remove all the mucous membrane, polypi and septa, and make as large an opening into the nose as possible, and maintain this by intranasal work. This method will cure in a certain number of cases. If it does not cure it does not interfere with other procedures. It will always give relief to stormy symptoms. The granulating method is long but more successful than the method just described. The granulating method would seem to be best suited to sinuses of moderate size. In these it gives little or no deformity. The same thing is true, however, of Killian's method. This does away with a small sinus as completely as the granulating method; but in another way, it turns the sinus into a widely open recess of the nose. A granulated sinus can reinfect and then everything has to be done all over again. If trouble follows the Killian operation there is a good prospect of dealing with it through the nose. In all cases where there is exophthalmos or orbital tumor it is wasting time to use any operation except that of Killian, because nature has partly done this operation for you. In all cases where there is a very large sinus with many septa and marked evidence of ethmoiditis the combined ethmoid and frontal operation or the operation of Killian is the operation of choice.

It is useless to expect a cure of suppuration in the antrum when there is disease of the frontal sinus above which is dropping pus into the antrum. Many uncured cases of antral disease are due to this cause. The x-ray plate is very valuable in clearing up these cases.

### THE TESTIMONY OF THE FATHERS.

BY A. E. P. ROCKWELL, M.D., WORCESTER, MASS.

THE machinery of life has become so complicated and the rumble of it so fills the air that vital fundamental issues are many times obscured. We are deceived on the one hand as to the precise nature of the basic principles involved, and distracted from their proper application on the other. So deeply concerned are we with the superficial questions which impede our progress through the world that the real problems are neglected. I have seen a bear so worried by thorns in a thicket that the continued pursuit of his quarry no further interested him. There is nothing so difficult of suppression or so rapidly contagious as the right. Any effort to stifle its expression or limit its sphere of action but reacts upon the forces which seek to compass its undoing.

If we will but carefully scrutinize and intelligently interpret history, we may easily find ample argument and precedent for almost any righteous act. Arguments and precedents founded upon fundamental principles are not poorly conceived make-shift remedies for the various ills, real or fancied, which we intermittently believe beset every department of human activity. The fathers saw more clearly because their training was more simple and direct; they judged more correctly because life was less complex, and, therefore, the causes for distraction fewer. And we need not always penetrate very far the shades of the past to mold aright our views and draw sound conclusions. If, then, we undertake to approach temperately and inspect with sagacity some of the problems which through earlier misdirected effort have returned to us for re-solution, let us review a few expressions of opinion from gentlemen eminent in their profession, and distinguished for their sense of justice, catholicity and mental grasp of basic facts.

I quote, therefore, in this connection largely from "An Ethical Symposium," G. P. Putnam's Sons, 1883, to which Alfred C. Post, William S. Ely, S. Oakley Vanderpoel, Lewis S. Pilcher, Thomas Hun, William C. Wey, John Ordronaux, Daniel B. St. John Roosa, Cornelius R. Agnew, Abraham Jacobi and H. R. Hopkins were illustrious contributors.

Twenty-four years ago William S. Ely, M.D., wrote: "There is no difference between physicians but such as results from their personal talents, medical acquirements or their experience. . . . The pursuit of truth, justice and humanity are alone enjoined and each individual is to determine whither that pursuit shall lead him.

"Between those who believe in the creation of the world by cataclysms and those who believe in orderly evolution there is as wide a difference as between sugar pills and castor oil. Yet I never heard of one body of scientific men refusing to sit down and compare views of creation with the other."

At the same period Lewis S. Pilcher, M.D., wrote: "Any remarks upon the nobility of the profession of medicine would be trite; it claims for itself, and the willing tribute of others accords to it, the pre-eminence among the callings that men give themselves to, for the devotion to humanity, the high courage in the face of danger, the self sacrifice for the relief of others, the public spirit, the liberality of views and the general culture which the duties, the studies and the influences of the profession tend to develop, and which its members as a class display.

"A physician is not a member of a guild or corporation, the rules of which he must comply with in order to retain his membership therein and to enjoy its benefits, but a member of a liberal profession, the rules of which are the unwritten law of humanity and the special requirements of which must vary much according to the peculiarities of his environment."

Thomas Hun, M.D., expressed himself almost a quarter of a century ago with reference to this subject as follows:

"Dr. Austin Flint, Sr., who seems to have studied carefully the whole question and who has published in the *New York Medical Journal* an admirable commentary on the code of medical ethics, says in the April number, 1883, page 372: 'The objectionable point of the code is that which makes a practice based on an exclusive dogma' the ground of a refusal to meet practitioners in consultation. This is not a valid objection. Any physician has a right either to originate or adopt an exclusive dogma, however irrational or absurd it may be."

On page 373: "Opinions held by members of the regular profession, however at variance with those generally entertained, and however absurd, may fairly give rise to criticism and ridicule, but they cannot be made occasions for professional discipline.

"It is pleasant to find one's views coinciding with those of one who has carefully considered the whole subject, and who has brought to its study distinguished ability and high personal and professional character. When we remember that Dr. Flint is a prominent leader of a party in the profession, to most of whom these liberal and just views must be extremely distasteful, we cannot but admire his candor and fairness. The views he has presented are eminently sound and commend themselves to the judgment of those who understand the conditions which underlie all scientific progress, to wit: the largest toleration and freedom of discussion. Under their influence new truths are brought out and examined and errors eliminated, for error is most dangerous when driven into obscurity. No man or body of men can lay claim to absolute truth;