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THE ANATOMICAL AND CLINICAL RELATIONS OF THE SPHENOPALATINE (MECKEL'S) GANGLION TO THE NOSE AND ITS ACCESSORY SINUSES.

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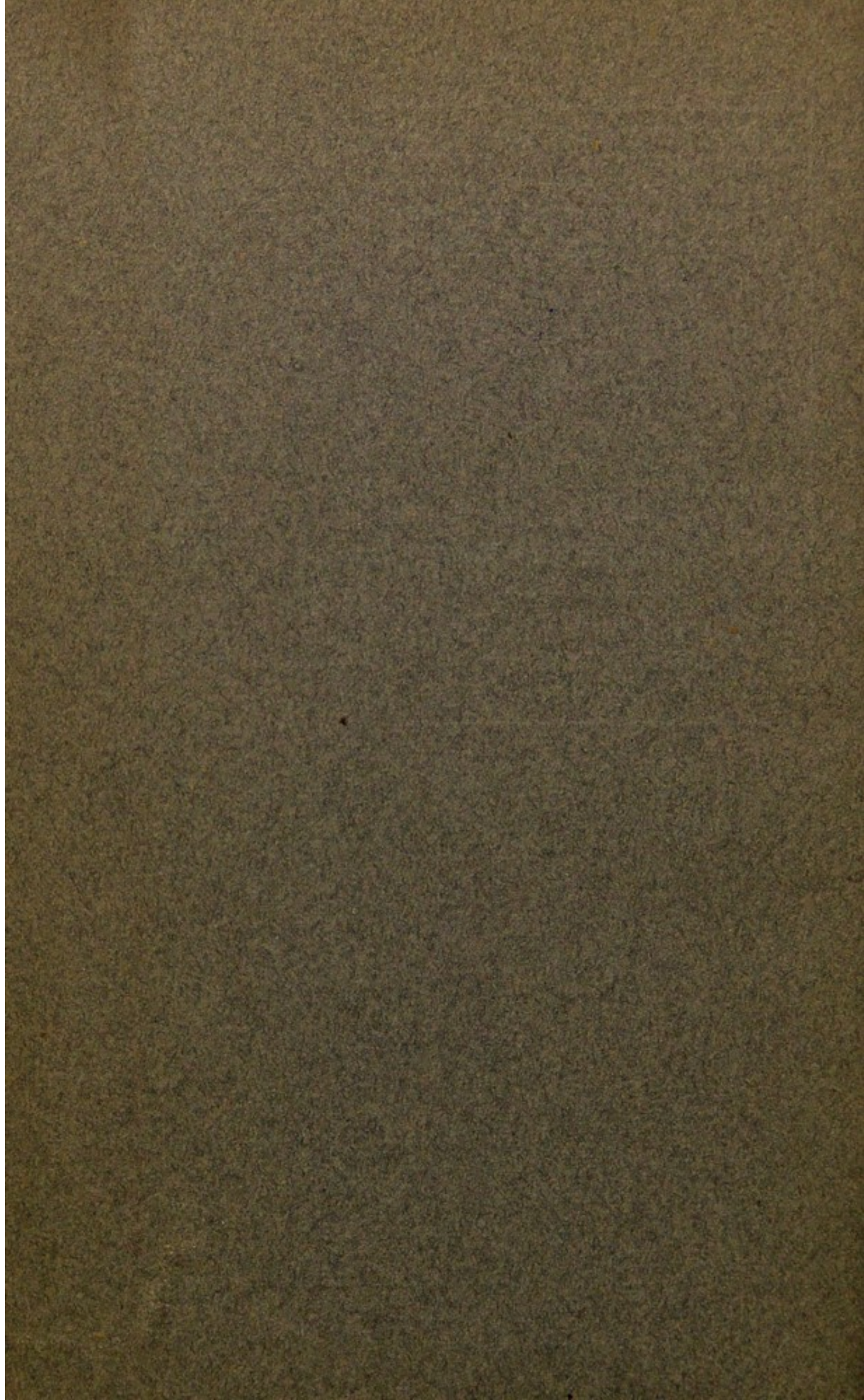
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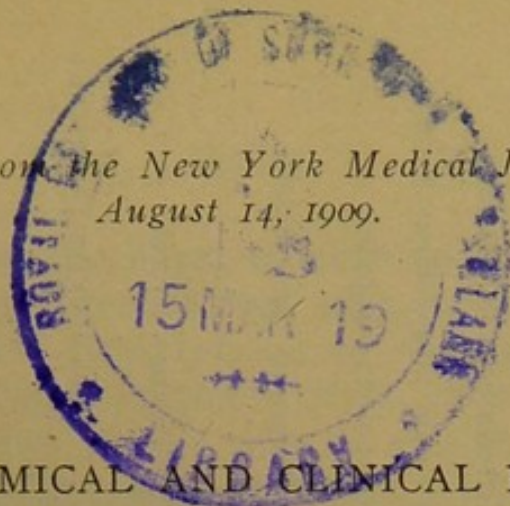
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THE ANATOMICAL AND CLINICAL RELATIONS
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St. Louis, Mo.

Anatomical Relations.—The treatises on anatomy describe the sphenopalatine (Meckel's) ganglion "as lying in the pterygopalatine fossa close to the sphenopalatine foramen." (Quain, Bardeleben, Piersol, Sobotta, and others.) The pterygopalatine fossa is described as "formed above by the under surface of the body of the sphenoid and the orbital process of the palate bone; in front, by the superior maxillary bone; behind, by the anterior surface of the base of the pterygoid process and lower part of the anterior surface of the great wing of the sphenoid; internally, by the vertical plate of the palate."¹

Neither this description nor any found in other textbooks on anatomy suggests any close relation of Meckel's ganglion to the nose or its accessory sinuses; nor do the special treatises upon the nose make mention of such relation. As a fact, however, Meckel's ganglion lies very close to the external bony wall of the nose, in which the sphenopalatine foramen occurs as a small deficiency at its upper posterior part. By actual measurement Meckel's ganglion frequently lies as close as one or two mil-

*Presented as "Candidate's Thesis" to the American Laryngological Association, May 5, 1909.

¹This description is taken from *Gray's Anatomy*, 1896.

Sinus frontalis.

Cellulae ethmoidales (anteriores).

Cellulae ethmoidales (posteriores).

Nervus opticus.

Sinus sphenoidalis.

Arteria palatina descendens.

Ganglion sphenopalatinum.

Arteria sphenopalatina.

Canalis pterygoideus [Vidui].

Fossa pterygopalatina.

Processus pterygoideus

Paries lateralis cavi nasi.

Tuba auditiva [Eustachii].

Saccus lacrimalis.

Sinus maxillaris.

Palatum durum.

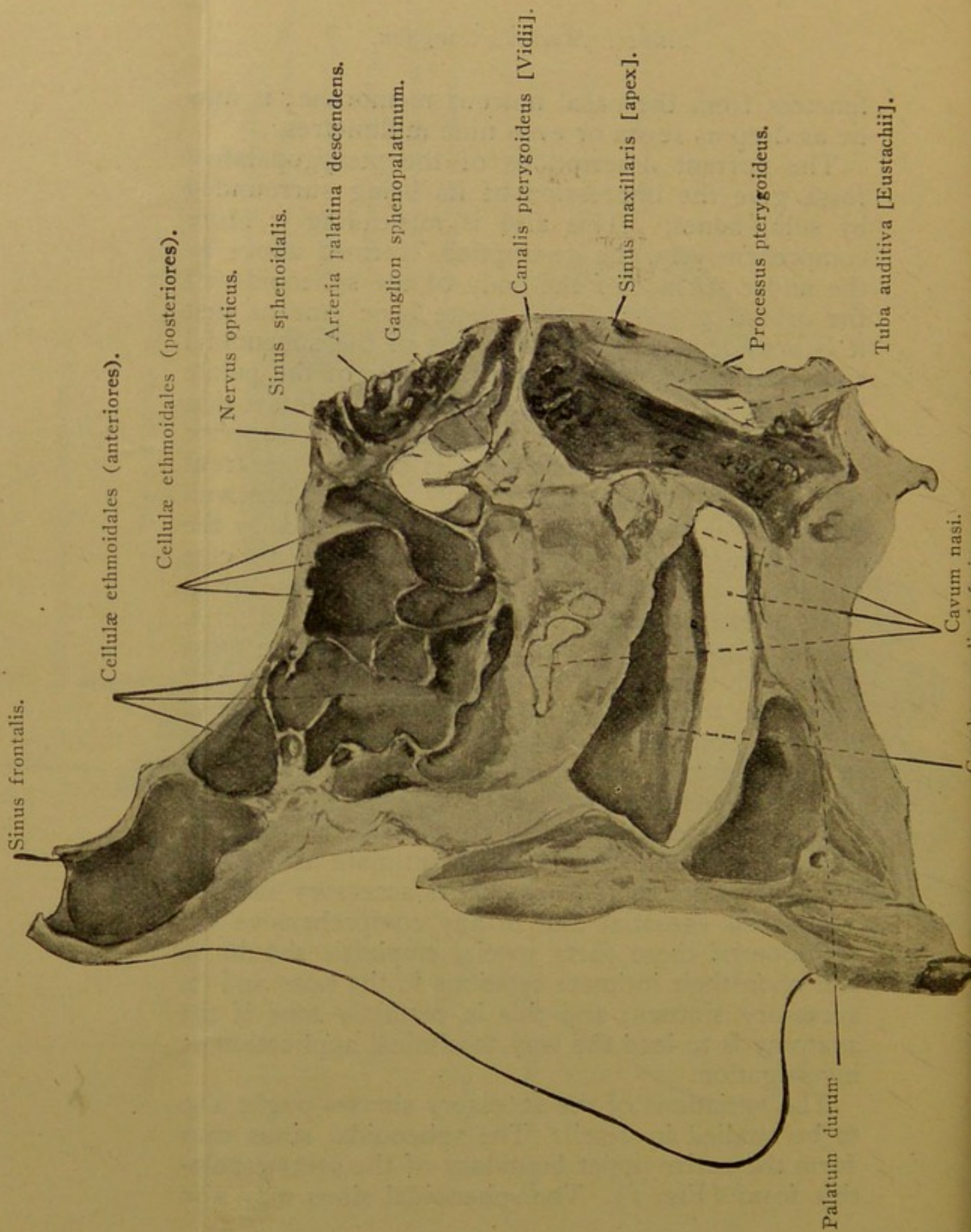
limetres from the nasal mucous membrane; it may lie as deep as seven or even nine millimetres.

The current descriptions of the pterygopalatine fossa give the impression of its being surrounded by solid bones. This also is misleading. More comprehensively, the description "formed above by the under surface of the body of the sphenoid and the orbital process of the palate bone" means that it is bounded above by the walls of the sphenoidal sinus, including the pterygoid process of the palate bone closing it, and that the separating wall is a thin one. The description "in front, by the superior maxillary bone," means that it is bounded in front by the wall of the maxillary sinus and that this wall too is of thin bone. The description "behind, by the anterior surface of the base of the pterygoid process and lower part of the anterior surface of the great wing of the sphenoid" means that this wall also is, in some cases, only a thin plate separating the fossa from a downward prolongation of the sphenoidal sinus into the pterygoid process and into the great wing; a condition which is not uncommon, although in the great majority of cases the pterygoid process is of solid bone.

The outer aspect of the pterygopalatine fossa is then the only one that is not in intimate association with the cavity of the nose or its accessory sinuses.

It seems essential that in any comprehensive description of these parts special emphasis should be laid upon their intimate relations to the nose and its accessory sinuses; and this is certainly true if the anatomy is to lead the way to clinical application or investigation.

The variations of the accessory sinuses ought also to be studied in detail: The sphenoidal sinus may form the entire upper boundary of the pterygopalatine fossa (Fig. 1). The sphenoidal sinus may also



form the posterior boundary of the pterygopalatine fossa as a result of its being prolonged downward into the pterygoid process and great wing. (Fig. 3.) A post ethmoidal cell may bound the anterior half of the upper part of fossa. (Fig. 3.) The wall of the nose may curve so sharply outward as to form a part of the anterior boundary of the fossa.

Meckel's ganglion lies high up in the pterygopalatine fossa. It is apparently prolonged backward into the Vidian (pterygoid) nerve. (Quain, *Anatomy*, 1897.) There is usually a marking upon the bone corresponding to this; a well modelled funneling at the anterior end of the canal.

Relations of Meckel's Ganglion in the Pterygopalatine Fossa. The ganglion lies close to the top of the pterygopalatine fossa. (All textbooks are agreed upon this point). In front the ganglion is in relation with the arteria palatina descendens and arteria sphenopalatina and with the corresponding veins. These vessels, with some surrounding connective tissue, form a separation of 3 or 4 mm. from the wall of the maxillary sinus,—the anterior boundary of the fossa.

The Relations of Meckel's Ganglion to the Walls of the Accessory Sinuses of the Nose. When the upper boundary of the fossa is made wholly by the sphenoidal sinus (Fig. 1) the ganglion lies in close relation to the sphenoidal sinus. When the upper boundary of the fossa is made by the sphenoidal sinus in its posterior half and by a postethmoidal cell in its anterior half (Fig. 3) the ganglion lies in close relation to both. When the sphenoidal sinus is prolonged downward into the pterygoid process (Fig. 3) the ganglion will then lie posteriorly in close relation to the sphenoidal sinus.

Anteriorly the fossa is formed by the wall of the maxillary sinus. But the ganglion can never lie in

Cellulae ethmoidales (anteriores).

Cellulae ethmoidales (posteriores).

Nervus opticus.

Ganglion sphenopalatinum.

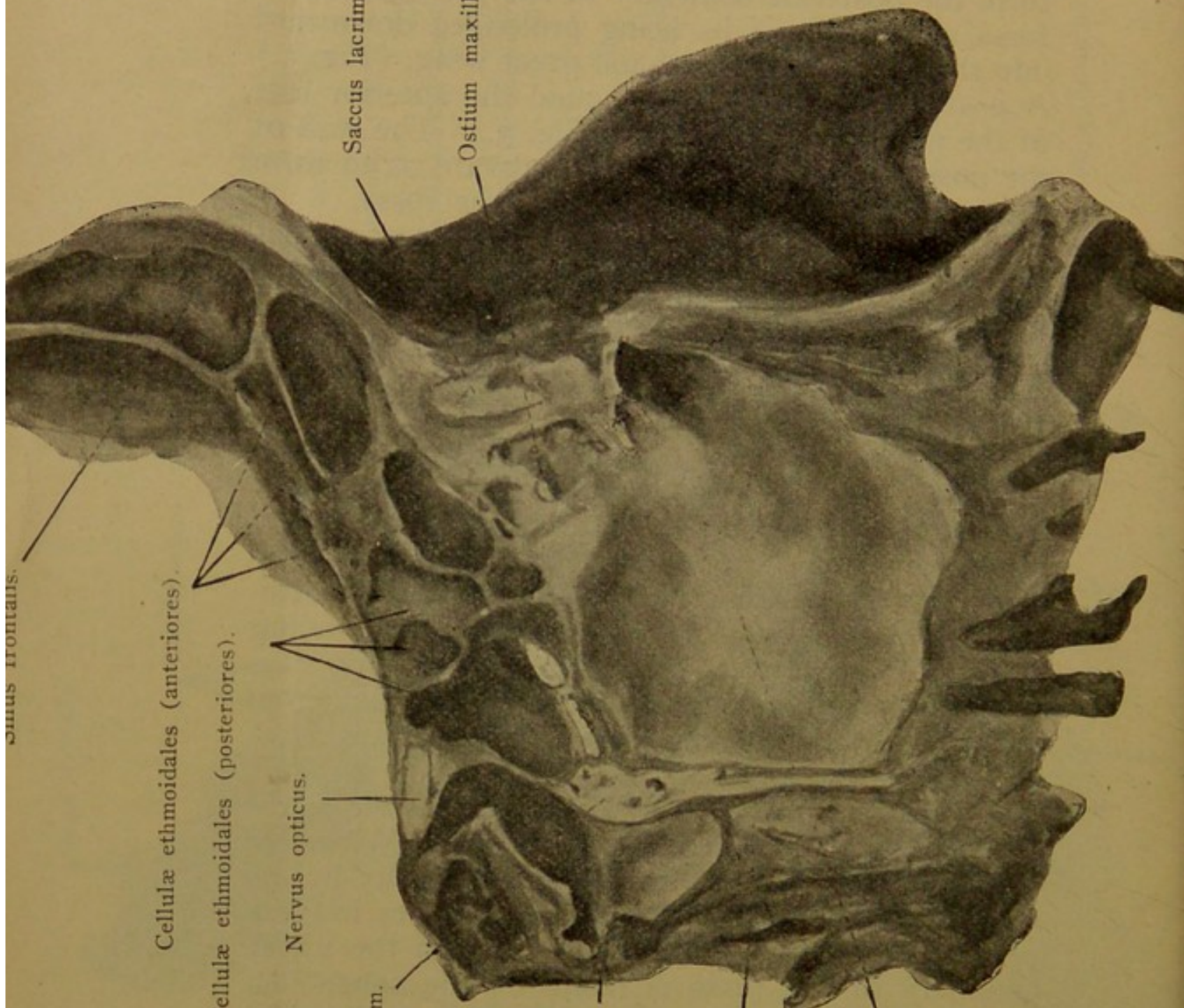
Sinus sphenoidalis.

Processus pterygoideus.

Sinus maxillaris.

Saccus lacrimalis.

Ostium maxillare.



close relationship to this wall because of the pad formed by the arteria palatina descendens and the arteria sphenopalatina with their accompanying veins and surrounding connective tissue. (See above).

The Relation of Meckel's Ganglion to the Common Wall of the Nose. The sphenopalatine foramen seems to be accurately placed at a point just posterior to and immediately above the posterior tip of the middle turbinate. All authorities are agreed that the ganglion lies close to the plane of this foramen.

The ganglion, however, does not always show the same relation to the foramen. I have found it as close as one or two millimetres from the general membrane of the nose, and as far as nine millimetres. I believe the variation in the position of the ganglion, whether higher or lower, to be very slight. It varies more as to whether deeper or shallower in relation to the membrane of the nose.

The pterygopalatine fossa considered from this point of view is seen to resemble an accessory sinus of the nose. It is, however, not closed externally or below by nasal tissues and is filled by the before mentioned structures with their accompanying connective tissue instead of air.

Clinical Relations. With such intimate anatomical association, clinical manifestations from the extension of inflammation or its products would seem of almost necessary occurrence. Meckel's ganglion is, in fact, in quite as close relation to the nose and its accessory sinuses as is the optic nerve. It has long been recognized that inflammatory processes in the sphenoidal, postethmoidal, and maxillary sinuses extend to the optic nerve, and the fact has been demonstrated post mortem (Birsch-Hirschfeld). It is therefore altogether reasonable to as-

Sluder: Meckel's Ganglion.

sume that these processes also pass over to Meckel's ganglion, although the clinical picture is very much less striking than the blindness produced by involvement of the optic nerve.

According to my observations, characteristic dis-

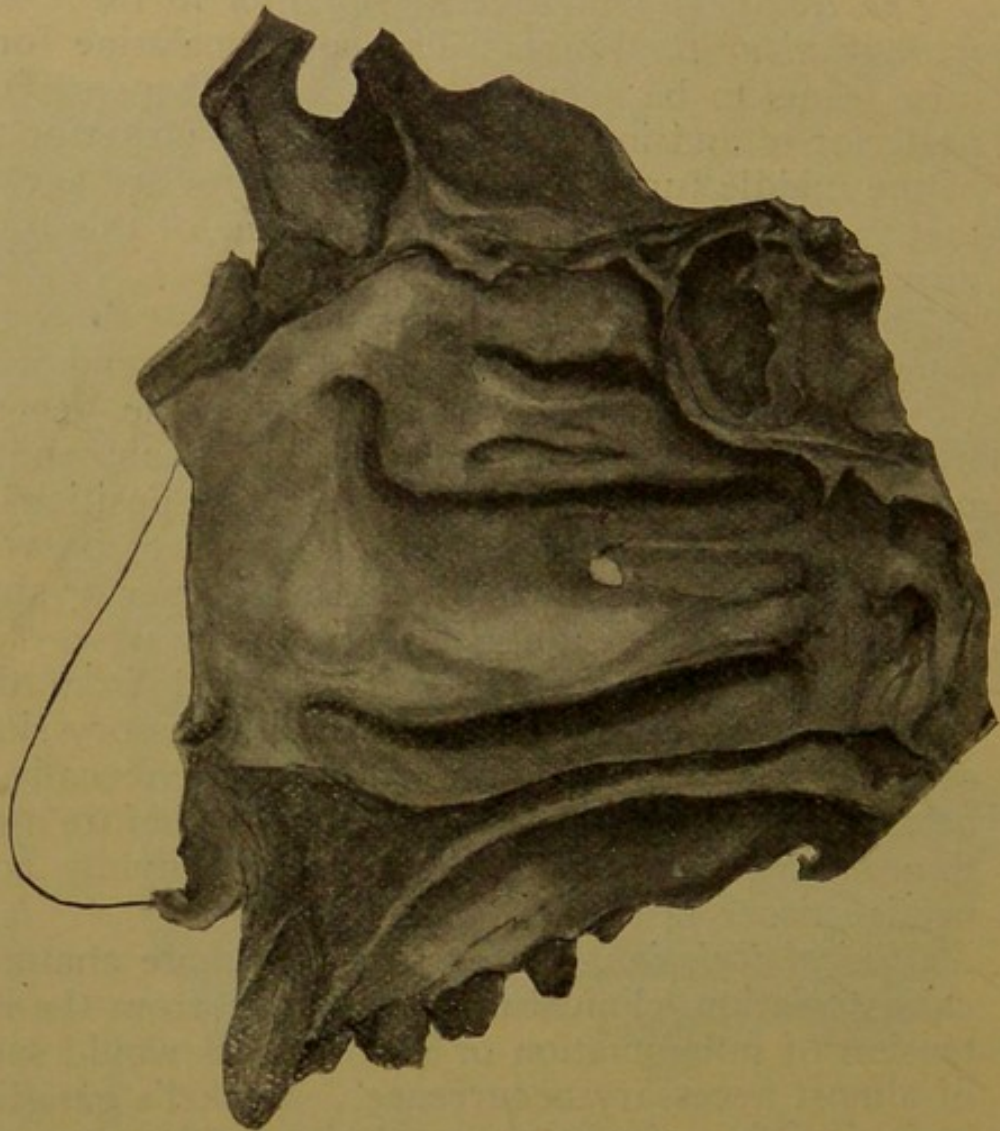


FIG. 4.—General cavity of nose. Deeper portion of this specimen is shown in Fig. 1.

turbances have followed postethmoidal and sphenoidal suppurative inflammations which cannot be explained otherwise than by assuming that Meckel's ganglion has become involved by extension; some

of these disturbances have been transitory, and some have persisted for many years. In other cases the conviction has been equally positive that the extension has been from the nose proper. Thus far I have not seen anything that I could interpret as

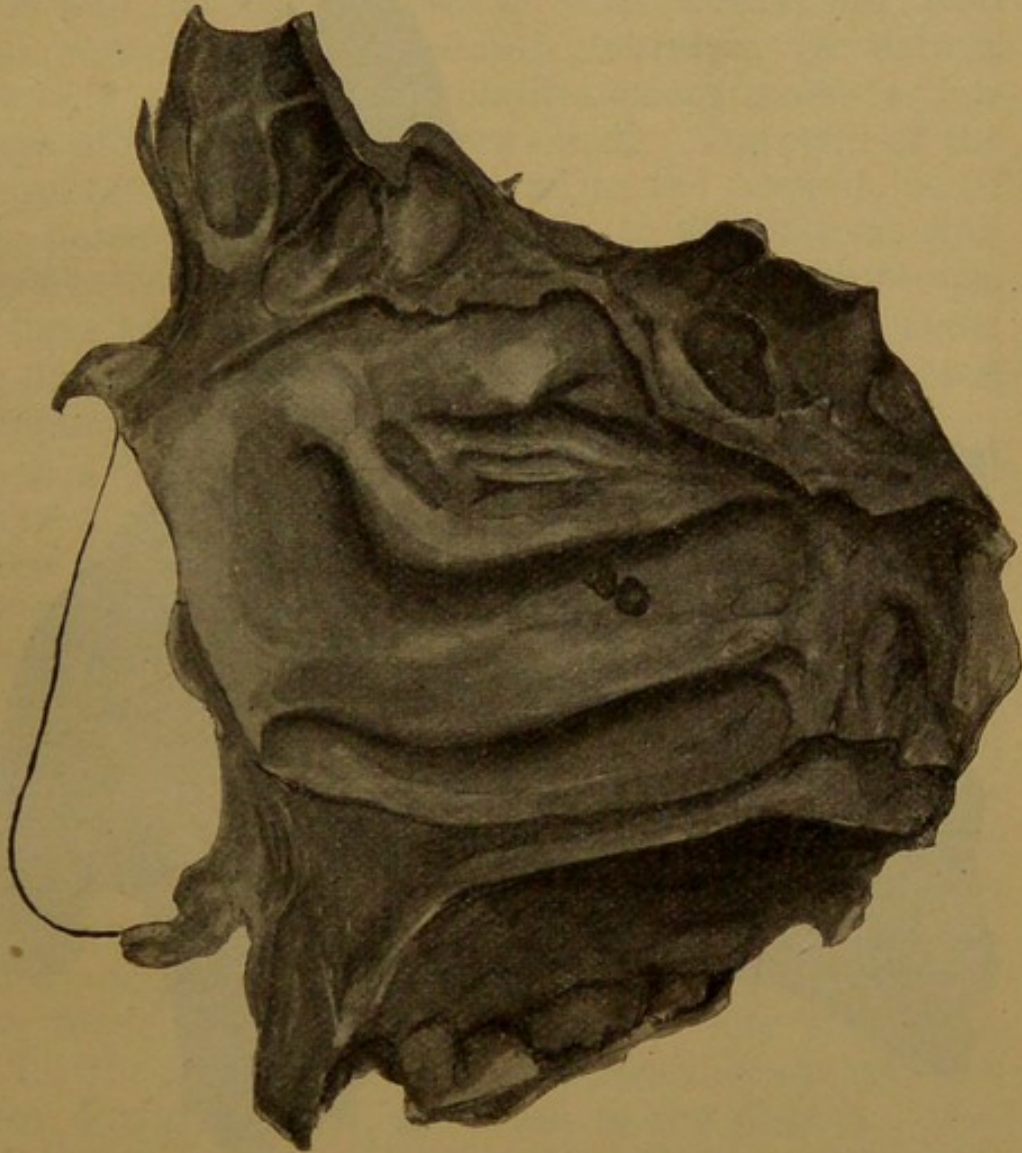


FIG. 5.—General cavity of nose. The deeper portion of this specimen is shown in Fig. 2.

an extension from the maxillary sinus. From the anatomical relations of Meckel's ganglion to the anterior boundary of the pterygopalatine fossa, *i. e.*, to the posterior wall of the maxillary sinus (see Fig. 1),

I do not believe that it is very likely to be involved by extension of an inflammatory process from that sinus, inasmuch as the arteria palatina descendens and the arteria sphenopalatina, together with their accompanying veins and the surrounding connective

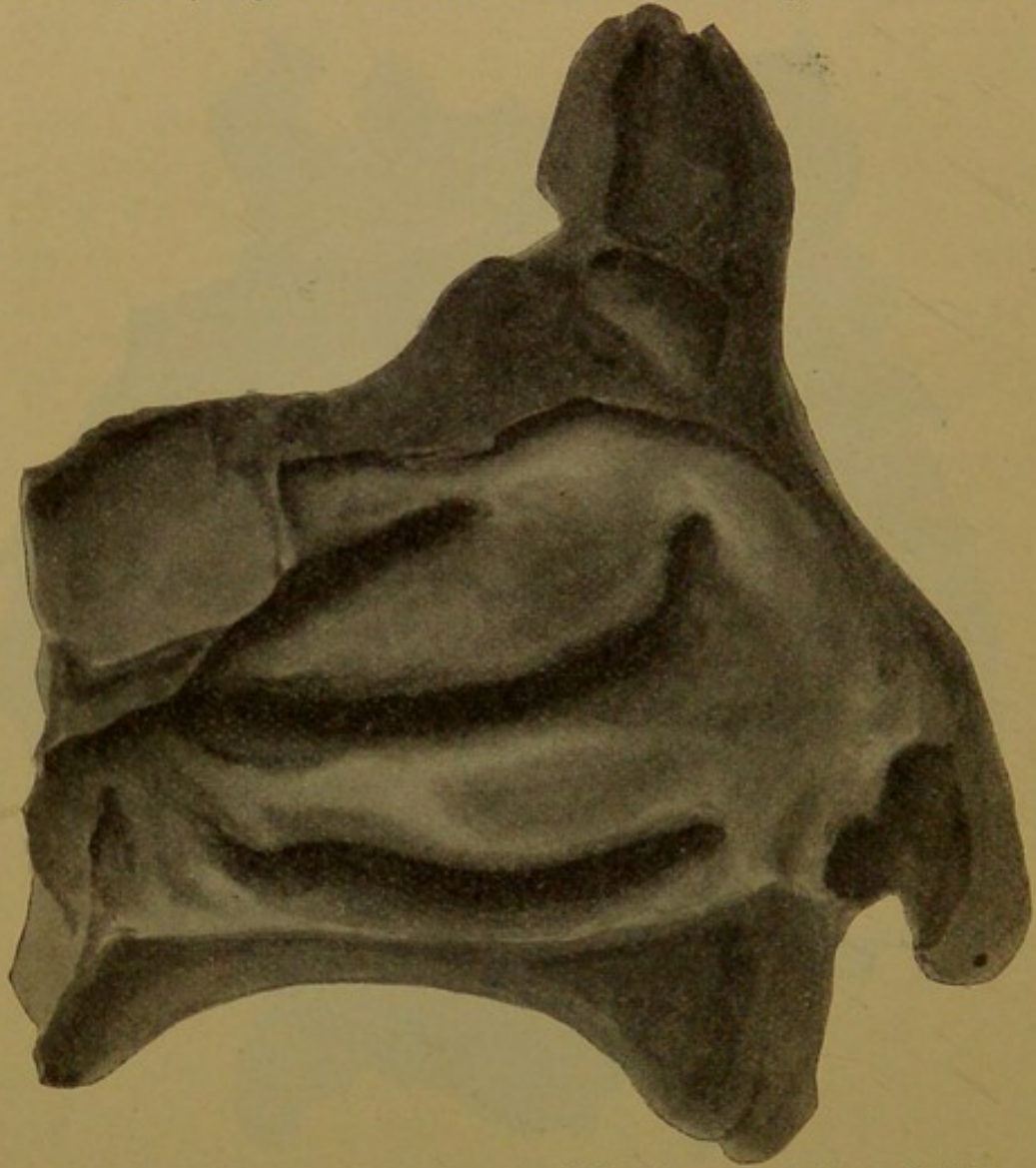


FIG. 6.—General cavity of nose. The deeper portion of this specimen is shown in Fig. 3.

tissue, lie between the ganglion behind, and the wall of the maxillary sinus in front. This relation appears to be constant; and, I believe, explains why clinical manifestations referable to the ganglion do

not ordinarily follow inflammatory processes in the maxillary sinus.

During 1907 I saw a number of cases of acute suppurative inflammation, of grippe origin, in the sphenoidal and postethmoidal cells. The patients got well in from three to four weeks, but pain still remained which seemed neuralgic in nature. Usually the neuralgic manifestations arose a few days after the inflammatory onset. The pain of the suppurating sphenoid referred to the occiput, or of the postethmoidal cells referred to the parietal eminence, usually preceded these neuralgic symptoms. I have seen, however, similar neuralgic phenomena in an ordinary coryza of moderate severity without suppurative involvement of any of the sinuses.

In a preliminary report,² based on ten cases, I have already described certain of these manifestations; now, after an observation of forty-seven cases, it is possible to draw a more complete clinical picture.

The typical picture of these neuralgic phenomena (or at least the picture oftenest presented) is of pain which begins at the root of the nose, extends downward over the maxilla, and backward on the mastoid to become severest about 5 cm. posteriorly to its tip; thence extending backward to take in the entire occiput, and downward into the neck, shoulder blade, shoulder, and sometimes into the axilla. With the severest attacks it extends down into the arm, forearm, hand, and even to the fingers. According to my observations this pain very rarely invades the upper part of the head. When very severe it may extend a little way into the brow, or somewhat above the line of the zygoma. I have seen

²The Rôle of the Sphenopalatine (or Meckel's) Ganglion in Nasal Headaches. By Greenfield Sluder, M. D., *New York Medical Journal*, May 23, 1908.

this picture complicated by or associated with other headaches; but the distinctive "neuralgic phenomena" as outlined before, and which have proved uniformly amenable to treatment (cocainization from the nose), have not extended to the upper part of the head. I have observed also concurrent salivation and perversion of the sense of taste (described as metallic), referred to the affected side, and, not infrequently, earache, toothache, or pain behind the eye.

I have observed also, in some cases, a sore throat, described as on the affected side, of which no visible explanation was found in the throat, and in which prompt relief was afforded by the application of cocaine in the neighborhood of the sphenopalatine foramen.

I have on four occasions thought I detected motor disturbances in the soft palate, but of this I am not sufficiently sure to permit a positive statement.

I have never seen trophic changes. By way of experiment I anæsthetized the ganglion in a case of convulsive motor tic, and in one of sensory tic, without result.

I herewith submit some reports of cases, each of which seems illustrative in its way.

CASE I.—Miss S., twenty-seven years old, consulted me June 13, 1906. For many years, "off and on," she had suffered from pain in the head, which she described as paroxysmal, beginning at the root of the nose, involving the upper jaw and teeth (occasionally also the lower jaw and teeth), extending backward to the tip of the mastoid, and becoming intensest about 5 cm. posterior to this point.

These paroxysms recurred sometimes two or three times a week; and, when at her best, at intervals of two or three months. Examination of the nose was negative in every particular. She made the observation, however, during an attack, that the cocaine which had been sprayed into the nose, a four per cent. solution, had relieved her of the pain.

In the absence of a definite diagnosis, but continuing the spraying of the nose with cocaine, it was found that each application appreciably mitigated the pain. Under this treatment, in apparently much improved condition, she passed from observation. About three months later she returned for treatment of a severe coryza, which in two days localized itself in a suppurating inflammation of the post-ethmoidal and sphenoidal sinuses of both sides. Almost simultaneously the old pain reappeared, on the left side, involving the root of the nose, the cheek, the mastoid tip, and a little behind it, the neck, shoulder blade, shoulder, and arm—all in great severity.

Remembering the position of Meckel's ganglion, in close proximity to these sinuses, and the widespread distribution of its branches and connections, I felt that this distribution of pain was possibly due to the inflammation or its products extending to or acting upon the ganglion; and, if this was true, that cocaine applied (soaked) over the sphenopalatine foramen might probably prove effective in at least mitigating the pain.

The experiment was tried, and succeeded even beyond expectation. Since then I have applied the cocaine for her at the same site in severe recurrent attacks, probably twenty times; always relieving the pain and usually aborting the attack.

I have also done some experimenting in these cases, but particularly in this case. During an attack an application of a single drop of dilute solution four per cent. cocaine, through the nose to the region overlying the ganglion, was followed by only the faintest relief. This dilute solution was then replaced by a drop of a ten per cent. cocaine solution, with more relief. A drop of a twenty per cent. solution was then applied, with further lessening of the pain. A drop of a saturated solution (about sixty-seven per cent.) was then applied, when the relief would usually become complete. Applications to other areas gave negative results. In very severe attacks the pain would stop except at the point 5 cm. posterior to the tip of the mastoid, where, although greatly mitigated, it never quite disappeared; a very slight pain always remained here. The applications were allowed to remain twenty minutes in position.

This patient suffered greatly from repeated attacks until December 1, 1908, when I began injections of alcohol; making the attempt to put the alcohol in direct contact with the ganglion. A straight needle directed upward and outward under the posterior fourth of the middle turbinate

Sluder: Meckel's Ganglion.

will reach the sphenopalatine fossa, just where the ganglion lies. The needle must, however, be passed obliquely through the lateral wall of the nose, which in this case was so hard as to make the procedure impossible. I thereupon drilled through the bone, thus removing the obstacle to the passage of the needle into the pterygopalatine fossa and opening an easy route for subsequent injections. The injection of the alcohol aggravated the characteristic pain already described, but the exacerbation was transitory and was followed by relief.

After a course of ten injections the relief seemed complete; but, after somewhat more than three weeks of freedom from pain, the patient contracted another severe coryza, with suppurative inflammation of the postethmoidal and sphenoidal cells of both sides, rekindling the old pain now for the first time also on the right side, although with less severity than on the left side. One application of saturated cocaine solution on the right side, posterior to and slightly above the posterior tip of the middle turbinate, stopped the pain, and it did not recur. On the left side relief was more tardy.

Miss S. had recently had another "explosion," which was relieved by one drop of saturated cocaine solution to the ganglion with the exception of a rather severe pain, which persisted in the shoulder blade of that side. On the next day the cocaine application was repeated, with complete relief of the pain.

CASE II.—Mr. B., thirty-five years old, came to me September 24, 1907, with a high grade deflection of the septum, which I resected. The operation was in every way uneventful and satisfactory. May 14, 1908, he returned with an acute suppurative inflammation of the postethmoidal and sphenoidal cells of both sides, accompanied by a headache referred to the parietal eminence and occiput of both sides, which lasted seven days. Three days later pain developed, which he described as beginning in the root of the nose, taking in the maxilla, extending backward into the occiput, and downward into the neck and shoulder blade. It improved under applications of 0.4 per cent. formaldehyde solution over the sphenopalatine foramen. Patient was completely well June 23, 1908, and has remained so.

CASE III.—Mr. S., forty-five years old, came to me November 23, 1903. For ten years he had suffered much from headache which incapacitated him for business two or three days of almost every week. Nothing in his general health or life was at fault. He defined the distribution of the pain

as beginning at the root of the nose on the right side, taking in the upper jaw, and extending backward to become emphasized at the tip of the mastoid and for a distance of 5 cm. posterior to it. The attacks were not always of equal severity. During a milder attack he could continue his business. In severe attacks the pain extended to the neck, shoulder, and shoulder blade of the same side, and was so intense as to compel him to go to bed. They were accompanied by vomiting. These severer attacks lasted from twelve to twenty-four hours.

Examination of the nose showed a dusky red swollen area in the right olfactory fissure about 1.5 cm. in diameter, roughly circular, beginning on the anterior wall of the sphenoidal cells and extending forward.

Applications of a two per cent. silver nitrate solution were made to the affected area two or three days a week for about three months. It finally became normal in appearance. With the improving appearance of this area went hand in hand a lessening of the frequency and severity of the attacks of pain, until they ceased. Since that time he has enjoyed freedom from painful attacks except at the time of a coryza. Coryzas of medium severity were accompanied by a moderately severe attack of pain, as described before. He had one severe coryza which was accompanied by great pain.

After I had learned to associate these neuralgic manifestations with Meckel's ganglion, and to apply the anæsthetic in its immediate neighborhood (October, 1907), I was always able to stop the pain during coryzas. With this patient anæsthetizing the ganglion aborts the attack.

CASE IV.—Mrs. N., sister to Mr. S., whom I had seen many times in acute coryzas, came February, 1909, with what appeared to be a coryza of ordinary severity; she complained, however, of pain as in a typical case of Meckel's ganglion neuralgia. One application of cocaine afforded complete relief, and there has been no recurrence of pain. The coryza was otherwise commonplace and uneventful.

CASE V.—Mrs. L., forty-two years old, came to me August 3, 1908, complaining of pain behind the right eye and in the upper jaw; (all sinuses normal). She described the pain as constant. She stated that she had for thirty years been subject to violent headaches, ending in vomiting. This was diagnosed as migraine by Dr. F. R. Fry, who sent her to me. A little later I saw her in one of her "bad spells." The pain was very great. It took in the entire half of the right side of the head and ran down into the neck, shoulder,

Sluder: Meckel's Ganglion.

shoulder blade, axilla, arm, forearm, and hand. A drop of a saturated solution of cocaine (sixty-seven per cent.) was then soaked into the site of the sphenopalatine foramen with marked relief except of the pain in the upper half of the head. A second application was then made with complete relief of all the pain except that of the upper half of the head, which remained unchanged. The relief afforded in this attack lasted about one hour, at the end of which time the pain had returned just as it had been. I saw her in two more "bad spells," the histories of which were identical with the one given. Each time cocainizing over the ganglion stopped all the pain except that of the upper half of the head, and the relief lasted about an hour.

Applications of one half per cent. formaldehyde were continued over a period of four months; the pain behind the eye and in the jaw having stopped at the end of four weeks, for the most part. It occasionally returned in a lesser degree. The intervals between the "bad spells" became longer and their severity lessened.

In addition to these cases, I desire to call special attention to a case of an acute access of glaucoma reported by Dr. A. E. Ewing:³

In this case the area of the sphenopalatine foramen was inflamed. One application of one drop of a fifty per cent. solution of cocaine to the sphenopalatine foramen stopped the violent pain. It did not return. The attack aborted. Applications of one half per cent. formaldehyde were continued daily in conjunction with the proper eye treatment for three months. Four months have now elapsed since the onset with no return of pain. In this case the other eye had been lost by glaucoma, three years previously. The pain had been relieved only by iridectomy. But despite this there had lingered always a little pain in this eye. An injection of alcohol into Meckel's ganglion aroused this pain to great severity, which lasted about three hours and then began to subside, requiring a week to stop altogether. But when the reaction was finally over the old pain had stopped. Two months have now elapsed with no return. (The idea of associating glaucoma with Meckel's ganglion was Dr. Ewing's. This case was treated throughout in accordance with his ideas and instructions.)

³Pain of Acute Glaucoma relieved by Cocaine Applied to Meckel's Ganglion. By A. E. Ewing, M.D.: *American Journal of Ophthalmology*, December, 1908.



