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LECTURES.

LECTURES ON INTRACRANIAL SURGERY.

III—REMOVAL OF THE GASSERIAN GANGLION.

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Tic douloureux (prosopalgia, epileptiform neuralgia or Fothergill's neuralgia) usually is due to some disease of the trigeminal nerve in front of the ganglion of Gasser—frequently a low grade of neuritis, sometimes an atrophic process dependent upon an obliterative endarteritis of the vessels supplying the nerves. Occasionally the disease may be traced to trouble in the alveolus, when it can be easily remedied; but commonly no local cause can be discovered, internal medication proves useless and life becomes a burden to the sufferer. Under such circumstances, removal of the ganglion is justifiable.

Three methods of reaching the ganglion have been proposed:

1. Opening the middle fossa through the temporal region;
2. Ablation of the superior maxilla and trephining the base of the skull;
3. Entering the cranium through the pterygoid region.

Before discussing these methods it is well to recall the anatomic relations of the ganglion. The fifth or trifacial nerve arises by two roots: a small anterior or motor nerve for the muscles of mastication and a large posterior root which constitutes the great sensory nerve of the face, giving origin to the ophthalmic and superior maxillary nerves (both nerves of sensation only), and supplying the inferior maxillary with its sensory fibers; these two roots do not join immediately after leaving the pons Varolii, but pass side by side, forward to an oval opening in the dura on the upper border of the petrous bone and thence between the bone and dura to the apex of the petrous where is formed the semilunar or Gasserian ganglion upon the sensory root, the motor fibers passing beneath the ganglion to join the third (inferior maxillary) division just outside the skull. In its passage under the ganglion this motor root is accompanied by the superficial petrosal nerve. The ganglion itself is intimately adherent upon its upper surface to the dura, which is here divided into two layers to cover the ganglion; and hence is difficult of removal. From its anterior border there proceed:

1. The ophthalmic division which continues forward along the outer wall of the cavernous sinus, making its exit through the sphenoidal fissure as three distinct nerves to supply the orbit and upper part of the face; just after leaving the ganglion it receives its communicating filaments from the cavernous plexus of the sympathetic—a most important surgical point, as otherwise there would be inevitable

destruction of the eyeball after removal or destruction of the ganglion.

2. The superior maxillary division which passes out of the cranium through the foramen rotundum to be distributed to the middle portion of the face in numerous branches.

3. From the lower angle the sensory part of the inferior maxillary which leaves the cranium by the foramen ovale and joins the motor root; immediately afterward it divides into two large trunks (anterior and posterior) the various divisions of which give sensation to the lower part of the face and the mouth; the posterior or larger trunk gives rise to the auriculo-temporal, the lingual and the inferior dental—the latter especially of interest, as it must be the guide to the foramen ovale—hence it must be remembered as lying beneath the external pterygoid in its upper relations, but later between the internal lateral ligament and the ramus of the jaw, finally entering the dental foramen.

It may thus be seen that the ganglion lies in an almost inaccessible location, surrounded by vital structures and contiguous to the great vessels at the base of the brain. What is the best route to follow?

Victor Horsley practiced the first mentioned method in a case that died seven hours after operation, presumably from shock. He opened the skull in the temporal region, low down; incised the dura and lifted up the temporo-sphenoidal lobe so as to see the base of the skull in the middle fossa, illumination being secured by means of a small incandescent light; he then cut the root of the nerve near where it emerged from the pons, followed it through the dura and removed the ganglion from above. From a number of experiments upon the cadaver I am convinced that this is an operation of great difficulty as well as severity. Unless a large portion of bone be removed it is impossible to reach the root of the nerve behind the ganglion, or even the ganglion itself. In every attempt made there was so much compression of the brain in exposing the point of attack that I believed much harm might result in the living subject—at least in hands less skilled than Mr. Horsley's. And it appears to me that there is great danger of hemorrhage from the contiguous sinus or artery; to which point I will refer later.

The second method has been followed by Mr. Rose, of London, with success in one case. But while by excision of the superior maxilla upon one side the foramen ovale may be quite readily reached, the disk of bone removed and the ganglion destroyed, the mutilation is too great to justify the procedure provided any other route can be utilized.

The third plan—known as the Rose operation—has proved, experimentally, to be decidedly the best. And the results in actual work have thus far been entirely satisfactory. Rose of London, Andrews of Chicago, myself, Park of Buffalo, and Parkhill of

Denver have, in the order named, operated successfully; and lately a number of other operators have recorded brilliant results, bringing the cases up to the neighborhood of twenty with only one failure.

In this operation two things must be especially remembered: the ganglion lying just above and external to the internal carotid artery, by the slipping of an instrument fatal hemorrhage may occur; an assistant should therefore stand ready to tie the common carotid upon the same side in case of accident while the operator prevents bleeding by gauze pressure. Second, since division of the fifth nerve (or its branches) *just in front of the ganglion* is said to give rise to destruction of the parts supplied by it and subsequent death, the ganglion must be totally extirpated without traction from the front, or the nerve must be cut *behind* the ganglion.

THE ROSE OPERATION.

The instruments required are: one scalpel of medium size; two scissors, one large, one small; half inch trephine with a long handle; one periosteal elevator; Hey's saw; bone drill and silver wire; dissecting forceps; one small curette (Volkman's sharp spoon); two hooks to catch the nerve-blunt; one Liston bone forceps; twelve hemostatics. All should be metal so as to permit boiling. Last: needles and sterilized catgut.

After the usual preparation by bath, catharsis, etc., the head and face are carefully shaved; the parts thoroughly scrubbed with soap and water, dried and washed with sulphuric ether. The eye upon the affected side is irrigated with bichlorid solution, 1 to 3000, and the lids stitched together with fine catgut; the ear is cleansed and packed with a little gauze. At this point the hands of the operator and his two assistants must be again thoroughly scrubbed, the nails cleaned, and sterilization effected by washing the hands and forearms in saturated solution of potassium permanganate until a deep brown, decolorizing with strong solution of oxalic acid and final rinsing in sublimate solution 1 to 1000. The field of operation is again washed with antiseptic soap and water and then with the bichlorid solution; and the surrounding parts covered with towels wrung out of hot bichlorid solution.

Beginning just below the outer angular process of the frontal bone, an incision is made along the upper border of the zygoma to its posterior extremity, and curving sharply downward, descends just in front of the ear and over the parotid to the angle of the jaw, thence along the horizontal ramus to the vicinity of the facial vessels. This flap of skin is dissected up, care being taken not to injure Steno's duct and the facial nerve. By making the incision in this manner there is gained a maximum of space with a minimum of disfigurement and no paralysis of the portio dura. A long silk ligature is passed through the flap and held by an assistant, the retracted flap being wrapped in bichlorid gauze for protection. The periosteum is now stripped from the zygoma and four holes drilled through the bone; two through the zygomatic process of the malar, and two close to the root of the zygoma; these drill holes should be about one-third of an inch apart and are to provide passage for silver wires to hold the parts in place after trephining. With the Hey's saw the zygoma is divided between the holes at either end, the anterior saw cut being directed obliquely downward and forward, the posterior one as far back as possible. The bone is turned

down with the masseter muscle attached, care being taken not to injure the muscular attachment on the inner surface, as future nutrition of the bone must for a time come through the muscle. The coronoid process of the inferior maxilla being thus exposed it may be cut away with the Liston bone forceps or the saw; the bone removed should be thrown away after separating from the temporal muscle, as no attempt is made to restore it to its position because atrophy and cicatricial contraction would interfere with movements of mastication. The temporal muscle is now turned up out of the way, exposing the pterygoids. The external pterygoid muscle is separated from the skull by the periosteal elevator and drawn downward. Search is made for the third division of the fifth nerve (the inferior maxillary) as it is the guide to the foramen ovale through which it makes its exit. When this can not be found dependence must be placed upon the bony landmarks; an assistant wholly unconnected with the operation should be at hand with a skull which can be carefully observed and corresponding points located upon the patient. It should be remembered that the foramen ovale lies about one-fourth of an inch anterior to and the same distance internal to the foramen spinosum through which passes the middle meningeal artery, and a little more than a half inch behind and a trifle external to the foramen rotundum; so that any of these foramina is a guide to the others; further, the fossa for the ganglion lies about five-sixteenths of an inch internal to and slightly behind the foramen ovale, the carotid canal being the same distance from the foramen, directly toward the median line.

The situation of the foramen ovale having been determined, a half inch trephine with a long handle is introduced with the center-pin a little behind and external to the foramen. When the disk of bone is removed the hemorrhage must be checked by pressure for a moment, and the cavity cleaned from all blood, when the dura can be cut with scissors. A small incandescent light is now almost indispensable; by its aid a part of the ganglion can be seen. A small blunt hook is introduced, the nerve caught just where it *enters* the ganglion and strong traction made; when well in the opening it may be divided with small scissors and the ganglion torn out with dissecting forceps or a small curette. Hemorrhage is now quite severe but must not agitate the operator; it can be controlled by pressure or the application of a bichlorid gauze compress wrung from water of a temperature of 120 degrees. Bleeding having been arrested the wound is irrigated with hot sterilized water (or carbolic solution 1 to 40), the temporal muscle is tucked into the fossa and the zygoma replaced and wired. As no drainage can be employed the wound is now made as dry as possible, iodoform dusted in very freely, the incision rapidly closed with a continuous catgut suture, the face washed, the wound hidden in iodoform and much sublimate gauze applied. The head and affected side of the face must be covered with several layers of bichlorid gauze (1 to 2000), enveloped in cotton and bandaged tightly.

The most strict attention to even the minutest detail of asepsis is necessary at every step of the operation. There must be no break in the chain of ideal surgical cleanliness, regardless of any exciting incident which may arise.

Both eyes must be bandaged for four days and the

one on the affected side for two weeks. The catgut stitch in the lids is removed at the completion of the operation.

AFTER TREATMENT.

When put in bed the usual methods to combat shock must be instituted. Whenever much restlessness appears with the reaction, the hypodermatic injection of morphin (gr. .02) is indicated. Absolute quiet must be enjoined and vomiting prevented if possible. After the subsidence of nausea—probably in twenty-four to thirty-six hours—a liquid diet should be ordered and kept up for at least two weeks, at the end of which time articles easily masticated may be substituted.

About the sixth day the patient may be allowed to sit up, and on the twelfth or fourteenth to go about the house.

If (as is frequently the case) the subject has acquired the morphin habit it is best to stop the drug at the time of operation; surprisingly little discomfort will result, the disappearance of the pain giving partial relief from the craving. The hypodermatic injection of .005 doses of strychnin, three or four times daily, for a few days will greatly lessen the desire for the drug.

CASES.

That removal of the ganglion of Gasser does give permanent relief from the terrible pain is proved by the following case:

James S., of Chanute, Kan., age 54, came to me for examination in March, 1892. The family history and previous health were good; he was of strong constitution and non-syphilitic. Eighteen years ago he began to have paroxysms of pain in the right side of his face; the pain was thought to be neuralgic, and one by one all his teeth were extracted; morphin was used for the pain but gave no relief even in doses of a grain and was finally discontinued. During the two years preceding examination the local spasms had increased in frequency and severity until existence seemed unbearable and the patient had contemplated suicide to end his misery. All the coal-tar derivatives and other anodynes had been tried in vain. His appetite had been poor for some months, and as attempts at chewing caused recurrence of pain, he had for a long time been confined to his bed, principally on account of weakness. He was admitted to All Saints Hospital, of Kansas City, March 18, 1892. At that time the following entry was made: "Status præsens—Patient pale and anemic; emaciated; lines of pain upon face; heart, lungs and abdominal organs normal; no disease of ear, eye, nose or throat; no trouble in antrum (examination by electric light in mouth) nor alveolus to account for pain; while talking paroxysms came on—typical trigeminal tic. Put to bed and ordered forced feeding and

R Quininae hydrobromat 1.5
Ferri sulphat. exsiccata 1.
Hyoscyaminæ sulphat01

"Misce et ft. capsul No. xvi. Sig.: One every four hours."

There was no improvement under this, so far as concerned pain, but the general condition was slightly better on March 28. On March 29 I made Rose's operation, being assisted by Drs. J. D. Griffith and J. F. Binnie, of Kansas City. The third division of the nerve could not be found on cutting away the pterygoids, so the location of the foramen ovale was determined by comparison with the dry skull. The trephine was applied a little too far behind the foramen so that it cut into the foramen spinosum, wounding the middle meningeal artery; the bleeding was very severe for a moment, and it seemed as if the carotid would have to be tied, as has been advised for such an accident, but by persistence the vessel was secured; no further difficulty was experienced except that the patient seemed ready to die from a combination of weakness, anesthetic and shock; so the operation was hurried and completed in fifty-five minutes. An ideal convalescence followed. The shock was easily overcome; the temperature rose to 100.5 degrees on the day following operation, but rapidly declined—pure surgical fever; freedom from pain was complete; there was little nausea, and the appetite speedily improved. There was a gain of

ten pounds in weight in two weeks. The wound healed by primary union. He was discharged from the hospital April 12, 1892.

Here was a typical case for operation. And the result has justified the apparent severity of the remedy. For nearly three years have now passed since the operation, and there has been no return of the pain. The severe conjunctivitis which followed and which at one time I feared might destroy the eye finally disappeared, though for several months the eye had to be protected. Considerable difficulty in mastication was at first experienced from the stiffness of the jaw and from accumulation of food upon the insensitive side of the mouth, but the man finally learned to overcome this and at the present time has no trouble whatever.

Was the ganglion destroyed in this case, or was the good result due simply to cutting the nerve outside the skull? Senn and others have insisted that it is impossible to remove the ganglion by this route and that the benefits arise simply from division of the second and third branches of the fifth nerve during the attempts at removal. Whether it is taken away in its entirety or only partially destroyed, or whether it is not even touched during this operation, are questions of more theoretical than practical interest, so long as the results are as satisfactory as in this case: relief from pain which renders life a burden. But that cure depends not upon section of the nerve instead of removal of the ganglion is certainly to be inferred from comparison of the history just given with that of the following case:

Mrs. Jacob M., of Hope, Kan., I saw in consultation with Dr. J. N. Ketchersid on July 21, 1893, at her home. She was 48 years of age. Her general health and family history good. For four or five years there has been persistent severe neuralgia of unknown cause, which affected the third division of the fifth nerve. Several sections had given temporary relief—the last being of the nerve just as it enters the dental canal. For the past six weeks prior to my first visit almost intolerable pain had continued, morphin, etc., affording little relief. For five days she had not tasted food as every movement caused a return of the paroxysmal agonizing pain. With the assistance of Drs. Ketchersid and Miles, I began the Rose operation, but upon reaching the point of trephining the base of the skull my courage failed, for the operation was in a private house and the light not good. I therefore simply cut the nerve at its exit from the foramen and removed much of it, completing the operation in the usual manner. July 22 she was resting nicely without pain, and had slept all night for the first time in many months. July 25, Dr. K. wrote: "Patient's temperature this morning normal, pulse 85. She is doing well and gaining rapidly in strength." Convalescence was satisfactory in every detail. For a little more than one year there was complete relief from pain, but at the end of that time little twinges began to be noticed and these have gradually increased in severity until recently the paroxysms have assumed great intensity and the doctor has been in correspondence with me about removing the ganglion from above.

Dr. Frank Hartley, of New York, has described a modification of Horsley's operation, the steps consisting in reflecting the tissues (including the bone) over the temple, the base of the initial curved incision being over the zygoma and the flap reflected downward; the dura is gently pushed away from the bone by means of a spatula until the foramen rotundum and foramen ovale are exposed, without opening the dura except where it divides to inclose the ganglion. The nerve is then cut behind the ganglion and the latter torn from its depression with dissecting forceps from above. Theoretically and experimentally upon the cadaver this operation is a good one, and Dr. McLane Tiffany of Baltimore has operated successfully four times with good results; but I have the

same objections as to the Horsley method: too much brain compression and danger of hemorrhage. That these objections are not based upon visionary reasons is proved by the following case:

Mrs. W., 65 years of age, married, was operated on Oct. 23, 1893, by Dr. J. D. Griffith, of Kansas City, assisted by Dr. J. F. Binnie and myself. All went well until the attempt to raise the dura to expose the ganglion. Serious symptoms: depressed heart's action and irregular respiration then arose—necessitating repeated interruptions. Finally the petrous bone was well uncovered, but the bleeding was so excessive by the time the region of the ganglion was reached as to compel cessation of operation and the application of gauze pressure. After repeated efforts we were compelled to desist, tamponing the wound with iodoform gauze to prevent death from hemorrhage. Four days later the wound was unpacked and a second unsuccessful attempt made to remove the ganglion, during which the dura was penetrated. Again recourse to the gauze tampon was necessary to save life temporarily. The patient died three days later as a result of meningitis.

Now Dr. Griffith is one of the most careful surgeons in this country and I am sure no other operator could have accomplished what he failed to do in this particular case; and I feel equally certain that had the Rose method been adopted the ending might have been more favorable.

As a result of observation, therefore, as well as experimentation, I am compelled to say that the Rose operation for removal of the Gasserian ganglion appears to me to be the one easiest of execution and safest in practice.

ORIGINAL ARTICLES.

A REPORT OF FOUR ILLUSTRATIVE ABDOMINAL SECTIONS.

Read by title before the Southern Surgical and Gynecological Association, November, 1894.

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Clinical reports possess a peculiar value to practitioners of medicine as attesting the absolute results of treatment. The four cases here reported illustrate as many distinct and separate conditions of disease, in which none other than radical surgical treatment can avail. These cases occurred in my practice during one week; the four operations having been performed within six days. In all the cases the indications for operation were absolute and urgent; they passed into easy convalescence without untoward symptoms of any kind, and have made complete and perfect recovery. In Case 4 the operation was followed by pronounced shock, from which the patient rallied in a few hours. All are now in the enjoyment of perfect health three months after operation.

The object of this report is to illustrate the indications for operation in grave conditions of disease formerly imperfectly understood, and to demonstrate the safety of operative treatment, promptly and thoroughly applied. The profession has been slow to accept the practical truth that the risk of operating in such cases as I will report is incomparably less than that of temporizing by treating symptoms. Among the increased risks to life from delay, the feeble condition of the patient and the complications resulting from rapid tissue changes demand recognition. For convenience I will report the cases in reverse order, beginning with the last case of the group:

Case 1.—Extra-Uterine Pregnancy; Rupture, Hemorrhage and Shock. Mrs. D., aged 25, on the evening of September 23, while undressing to retire, was attacked by sudden pain in the left iliac region. It did not last long and was relieved by rest and warm applications. This lady had been married six years, and about two years since suffered a miscarriage with considerable hemorrhage; since that time she had complained of pelvic pain and menstrual irregularity. At the time mentioned she had missed two menstrual periods. On the Wednesday night following she was attacked with violent pain in the same region, much more violent than before, and was given a full dose of morphia hypodermically which gave her some relief. On the following morning she got up to empty the bladder and while doing so fainted, became deathly pale and cold and was seized with nausea and vomiting. The pain was intense and for several hours she exhibited the symptoms of profound shock and internal hemorrhage—pallor, bloodless lips, surface cold, and pulse rapid, small and feeble. Under the influence of stimulants freely administered, hot applications to extremities, mustard to epigastrium, and atropia hypodermically, she gradually rallied late in the afternoon. On the following day her abdomen was swollen and tympanitic, and very sensitive to the touch. Three days afterward she passed a perfect cast of the uterine cavity. Her pulse ranged about 120, and she had an evening temperature of 101.

This description of her symptoms is a literal extract from a letter written me at the time by her father, himself an experienced practitioner of medicine. Three days later her father wrote that her symptoms were materially improved. The pulse had fallen to about 100, the temperature had come down to normal and her condition was better in every respect. Still the abdomen was considerably swollen and quite tender in the left iliac region. There was a slight bloody flow from the uterus. These symptoms it will be observed, correspond with the shutting off of the area of rupture and hemorrhage from the general peritoneum, with arrest of bleeding temporarily by blood clot. On Thursday, October 11, she was transported in a carriage to the railroad station, placed in a sleeping car, and brought to the Jennie Casseday Infirmary for Women in Louisville. She bore the journey well, and reached the infirmary without aggravation of symptoms. She was accompanied by her father and husband, both of whom are physicians. An examination of the pelvis demonstrated that the cavity was choked with effusion. The uterus was pushed to the right, and Douglas' pouch and the left lateral space packed.

Saturday morning, October 13, I opened the abdomen and found the pelvic peritoneum filled with blood clot, which was breaking down; peritonitis was active and progressive. After removing two or three pints of blood clot, I brought up into the incision the left uterine appendage, and tied it off close to the uterus. The point where the tube ruptured is very plainly seen. An examination of the uterine appendage on the opposite side demonstrated the existence of chronic salpingitis with adhesions and occlusion of the tube, evidently the result of long standing chronic inflammation. It was removed. The peritoneal cavity was flushed with several gallons of warm distilled water, a drainage tube placed, the incision closed, and the patient returned to bed. Her convalescence was uninterrupted. Her pulse remained under 100; she suffered no pain; the abdomen remained flat; the bowels were moved on the third day in response to an enema; the drainage ceased by the third day; the tube was removed, and convalescence was established without any interruption whatever. She returned home quite well at the end of the fourth week. Drs. Coleman Rogers, Mandeville Thum, and Robert Stuart were present at the operation.