Original Articles.

REMOVAL OF THE GASSERIAN GANGLION FOR FACIAL NEURALGIA: SUCCESSFUL CASE.

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THIS branch of neurological surgery is of so recent date, and the number of reported cases so small (some-what over forty, only) that each case is of sufficient importance to be reported. The dangers and difficulties of intra-cranial neurectomy are not yet fully understood, nor the results assured; nor, in fact, has the best method of operating on the ganglion in question been established, the advantages of entrance to the skull by the method of Rose (trephining at the base) being disputed by the advocates of the lateral operation (through the temporal bone), whether according to the so-called Krause-Hartley method or that of Horsley.

The latter method was adopted in the following case because a clear view of the ganglion and its branches was deemed by the operator the most important consideration for intelligent and safe removal. The operation of Rose certainly involves, as Keen has commented, working more or less in the dark through a very small opening, thus adding not only to the difficulty of removing the parts desired, but also to the dangers of injury to, if not destruction of, contiguous important structures, notably the internal carotid artery, the cavernous sinus, and the ocular nerves. The middle meningeal artery can hardly be expected to escape injury by either method.

The operation was even more difficult than was anticipated, principally on account of hemorrhage, both arterial and venous, which could be controlled only by temporary gauze packing. The procedure was thus much delayed at the outset; indeed, complete postponement seemed unavoidable at one time, as in the case reported by Keen and Mitchell in which packing was left for three days in the cranial cavity before the operation was resumed.

CASE. Mrs. S. C., aged sixty-three years, has suffered from severe facial neuralgia for about fifteen years. The onset was gradual, the attacks being at first of short duration, and with considerable intervals. Of late years the pain has been almost continuous. Confined at first to the lower jaw on the left side, pains have spread at times into the temple. The infra- and supra-orbital regions have not been invaded. There has been no pain in the teeth, which are in remarkably good condition.

Three years before (June 26, 1891) Dr. Richardson had operated extra-cranially upon the second and third divisions of the fifth nerve on the left side by avulsion at their foramina of exit. A small elliptical incision was made in the left temporal region, with its convexity upwards. The zygoma was sawed through and turned down over the ascending ramus of the jaw with the origin of the masseter muscle. Without cutting the temporal muscle, the second and third divisions of the nerve were isolated, the one in front of and the other behind the temporal tendon. By alternately dissecting and packing, anteriorly and posteriorly, a clear view of the field was obtained for intelligent

isolation and avulsion. Immediate healing followed, with complete relief from pain. In the course of a year and a half the pain returned, and, on entrance to St. Margaret's on August 13, 1894, the spasms were unbearable.

The second operation was performed August 15, 1894, Dr. Brewster assisting. The incision was made practically through the old scar. The squamous portion of the temporal bone was exposed, and a small trephine opening was made just posterior to the spheno-temporal suture. The skull proved to be very thin at this point, and in spite of every care the posterior branch of the middle meningeal artery was cut. The hemorrhage from this source was excessive, and could not be controlled; for some time after the removal of the trephine-button it seemed as if the operation must be temporarily abandoned. At last, after enlarging the opening, the vessel was secured. The dura mater was surprisingly thin; it was impossible, even with the greatest care, to save that portion situated directly under the trephine-button. In trying to separate it from the bone in the middle fossa the membrane was torn to shreds, though the slight force used was very carefully applied by means of blunt and smooth instruments. Such a result in trephining had never occurred in the experience of the operator. Indeed, in demonstrating the Gasserian ganglion in the dissecting room, it had been customary to expose the petrous bone and the middle fossa by tearing up roughly the dura mater. The strength of this membrane and the facility with which it may be separated from the bone was depended upon for easy and safe isolation of the ganglion.

The subsequent procedures, however, were much facilitated by going immediately into the sub-arachnoid space. The temporal lobe was lifted without difficulty by means of a spatula extemporized from a silver spoon, so that the whole length of the petrous bone could easily be seen and felt. The depression at the end of this bone, where the Gasserian ganglion is situated, could be clearly distinguished; and after the cessation of the hemorrhage the fifth nerve could be seen at the point where it leaves the dura mater to enter the ganglion. A good view could be obtained of the pons also. Having determined the exact situation of the ganglion, the dura mater was incised along the anterior edge of the petrous bone, and through this incision the membrane was carefully lifted by means of the blunt dissector. On going back very cautiously and very gradually, the mass of the ganglion was soon reached.

The situation of the Gasserian ganglion at this point rendered cutting extremely dangerous. Not that one would be apt to injure the carotid, as it winds from the canal at the tip of the petrous bone around the bases of the clinoid processes, for its position is indicated by its strong pulsations; but there is very great danger of wounding the cavernous and other sinuses. The thickness of the walls of these vessels, with the absence of pulsation, makes it impossible to distinguish them; hence one cannot cut in their vicinity without the greatest risk of wounding them. The safest way, therefore, of removing the ganglion is first to isolate it by means of blunt instruments, then to sever with scissors its proximal attachments, and finally to destroy it by avulsion between the jaws of powerful forceps. By this method the only cutting necessary is at the end towards the pons. In the sub-arachnoid operation

the nerve can be seen distinctly, and there is no danger of wounding other structures by this cut. When performed entirely outside the dura the isolation of the proximal end can still be made so complete that cutting with the scissors is safe. For the purpose of avulsion, forceps without a tapering point are best, for the usual instruments, with conical ends, while being twisted allow the nerve to slip off the point.

In our case, after isolating the ganglion as well as possible by lifting the dura mater, the portion between the ganglion and the pons was cut with blunt-pointed scissors, and the main body was grasped by means of forceps and avulsed.

With regard to the motor branches of the third division contiguous to the ganglion we think it impossible by any operation yet devised to destroy the ganglion without at the same time destroying this motor trunk. It was only with the greatest difficulty that the ganglion itself was isolated; to find and protect the motor portion would have been impossible, except, perhaps, by the merest chance.

The amount of hemorrhage after avulsion was considerable, especially from a point near the anterior clinoid processes. By letting down into place the temporal lobe, this hemorrhage would cease; on lifting the brain again from the fossa, a rapid ooze would show itself. The exact source of this hemorrhage could not be made out, but it was permanently checked by letting the brain down into place. The veins injured were not those referred to by Horsley, which pass from the temporo-sphenoidal lobe to the superior petrosal sinus.

The temporo-sphenoidal lobe was considerably lacerated superficially, in spite of every precaution. There were numerous spots of hemorrhage by which the cortex was altered in gross appearances, and several tears were visible at the close of the manipulations. The probable effect of this injury was anticipated with much interest, with special reference to aphasia.

The hemorrhage was so extensive throughout the operation that it was not deemed safe to leave the wound without drainage, though at the close the parts were dry. A small strand of gauze was therefore left in one angle of the wound extending into the middle fossa.

History after Operation.—Convalescence was perfectly normal. The stitches were removed on the sixth day. There was solid primary union. The most noticeable symptom on coming out of ether was aphasia, of which the following will serve as examples: "My coffee is not wet." "Can't you soften that pill?" meaning "loosen that bandage." "My head is all well and gone home; why can't I go?" "Can't you whistle my head?"

She wanted her coffee "dry," and an apple "salt." She called her "back" her "Baptist," and called "egg-nogg" "cake-stuff." This symptom improved on the third day, and in five days it practically disappeared. There was no headache or other special symptom. The temperature did not rise at any time above 99.5°. Examination two weeks after operation showed the following condition:

Speech is practically perfect, patient only occasionally forgetting a name; not oftener perhaps than the average person: for example, she called Dr. Charles "Dr. Richardson"; then corrected herself. Patient thinks she does not remember quite as well, and that

she is not quite as bright as before the operation; but this is not noticeable to the observer. There is numbness in the distribution of the branches of the fifth nerve, including the forehead and conjunctiva. The pupils are alike, but the left does not react quite as freely as the right. There is slight haziness of the left cornea (which existed before the operation) and moderate injection of conjunctival vessels of the left eye. The jaw opens fairly, nearly admitting two fingers. The forehead is smooth on the left (as before operation). The eye is closed partially; the lid is somewhat swollen and drooping. The wound is completely healed. The mouth is somewhat asymmetrical, but all movements of the lips are perfect. The movements of the eyes are unaffected.

The patient has had no pain since the operation.

Long-standing cases of trifacial neuralgia, especially in elderly people, prove so often intractable to other than operative therapeutics, that the tendency is growing to operate comparatively early in these cases rather than to prolong the suffering through years of unsuccessful attempts at subduing the affection by drugs.

The long course of this nerve through unyielding canals and around bony prominences, with the fact that it is exposed (through supplying the teeth) as no other nerve in the body, to external influences, adds materially to the usual causes of neuralgia, and renders this nerve peculiarly prone to irritation and disease. The second and third branches are those most liable to the intractable form of so-called epileptiform neuralgia. Internal and dental treatment failing in these cases, the final resort is removal.

Operations on the more accessible parts of these branches prove so often only temporary that it is a question if it be not justifiable to advise the deeper operations at once in cases sufficiently severe to justify operation at all; and thus avoid the discomfort of two attempts, and the suffering attendant upon long delay.

Yet when we consider the great ease with which an offending nerve may be removed at its peripheral point of exit—the infraorbital or the mental foramina, for example, with its usual complete relief, even though it be for a year only, it seems at times worth while to perform this operation first, especially in elderly or feeble patients, reserving the deep extra-cranial operations and the removal of the ganglion until they are absolutely the last resort. Peripheral operations upon these nerves in our experience have been followed almost invariably by recurrence of pain. We have then advised the deep operation upon the second and third divisions at the base of the skull; in many of these cases the pain has not returned, or its recurrence has been controlled by medical therapeutics. In others, thus far small in number, the neuralgia has recurred with its original violence. For such the avulsion of the Gasserian ganglion remains as a last resort.

In considering, therefore, what operation to choose in the beginning, we must bear in mind that the final operation of all—the one under discussion—has not as yet had time enough to show its results, though perhaps sufficient to give more brilliant promise than the others. If it should prove to be like the others, temporary only, it is evident that the greatest relief will be found in resorting successively to the peripheral, the deep, and the extra-cranial methods.

The objection to proceeding at once to the removal of the Gasserian ganglion, however, is obvious,—for, apart from the difficulties and dangers of this operation, involving entrance within the cranium and opening the dura mater, we have to consider the probable injury to, and even loss of, the eye, through destruction of the first branch of the nerve. In point of fact this operation, without previous peripheral operations, has been resorted to a few times only (for example, by Tiffany in a noteworthy case on a woman of seventy-nine, and by Finney in an operation upon a male of sixty-nine). Keen's views on this point are that if we can lessen the mortality and if we can demonstrate that no recurrence takes place, operation upon the Gasserian ganglion should be the first recommended; otherwise the last. Up to this time recurrence has not been reported, as far as we have seen, and the chances are certainly in favor of lessening rather than increasing the death-rate.

With regard to ocular injury, a study of the literature shows far less involvement of this organ than would be expected, perhaps because the first branch and part of the ganglion are often left either intentionally or on account of difficulty of detachment from the cavernous sinus. Tiffany, who has had no ocular trouble in his cases, specially recommends leaving these portions intact. The only case of absolute loss of the eye seems to have been one of Rose, in which panophthalmitis followed operation. Less marked affections have occurred, as in Lanphear's case of suppurative conjunctivitis, allayed by mild bichloride solution.

In our case the patient was willing, on account of the extreme pain, to undertake the operation, though warned of the possibility of losing the sight in the eye on the affected side.

The operation advocated and successfully practised by Rose, has been that adopted in about half the cases reported—Rose (6), D'Antona, Andrews, Park, Lanphear, Doyen, Parkhill, Kerr, Novarro, Eskridge and Baker; and in about half, the so-called Krause-Hartley cut has been made—Krause, Hartley, Roberts, McBurney, Fowler, Tiffany, Finney, Mitchell and Keen. Mr. Horsley undertook in one case removal through a trephine opening in the temporal region, elevation of the brain, after cutting through the dura mater, and detachment of the root from the pons.¹ In this case the patient (already in poor condition) died of shock in seven hours, a fact which, with theoretical objections advanced by Rose, seems to have deterred surgeons from following Horsley's method, the Krause-Hartley method being preferred by those opening through the temporal region. The method followed in the operation here reported, however, was practically that of Horsley.

The steps of Rose's operation in brief are:

(1) Incision from over malar bone, half an inch below external angular process along the zygoma; down in front of the ear over the parotid region to the angle of the jaw; then along the lower border of the horizontal ramus to the facial artery; the flap sutured to the upper part of the chin by catgut.

(2) Section of zygoma and coronoid processes and detachment of masseter and temporal muscles.

(3) Exposure of the base of the skull and search for foramen ovale.

(4) Opening the base of the skull.

(5) Removal of the ganglion.

¹ For details see Brit. Med. Journ., Dec. 5, 1891.

(6) Reposition of displaced structures.²

The Krause-Hartley operation is made through an omega-shaped incision from in front of the tragus to the external angular process of the frontal bone, the cut being carried to the bone, and continued through it by the chisel, the bone being broken off at the base just above the zygoma. The second and third branches are found and divided, and the ganglion destroyed as far as possible.³

Rose's objections to Horsley's operation in brief are: (1) The difficulty of the operation; (2) The double opening of the dura mater; (3) the removal of bone; (4) the disfigurement; (5) the injury to the brain; and (6) intra-cranial hemorrhage, for example, from the veins passing from the sphenotemporal lobes to the superior petrosal sinus (which Horsley himself states must be ruptured) and from probable injury to the sinus itself.

A consideration of these objections shows that the difficulty of operation and the danger of hemorrhage are by no means wanting in Rose's method. The removal of bone and the disfigurement are inconsiderable objections in comparison to the seriousness of the symptom for which the operation is undertaken (in point of fact, the disfigurement is by no means necessarily great). The danger of the double opening into the dura mater, under antiseptic precautions, and in a fair field of operation, would seem counterbalanced by the dangers from curretting and removing the ganglion in pieces without a clear view of a region filled with vital structures. The injury to the brain is hardly likely to extend beyond the speech centres, which experience has proved will bear a great amount of pressure, and even laceration, with only temporary impairment of function.

That contiguous structures may be injured in curretting is shown by the oculo-motor paralysis (temporarily, it is true) in Andrews's case.

The danger of injury to the closely lying internal carotid is common to both operations, but probably lessened in the lateral operation on account of the better view of the parts. The danger of injuring the cavernous sinus through its attachments to the first branch is also common to both, and the suggestion of Rose might perhaps be followed with advantage, that is, to avoid removal of this branch, though Horsley states that he has been able to separate these structures in the cadaver.

Among the advantages of the lateral operation may be mentioned the fact that the mobility of the jaw is retained; that the zygoma need not be removed; that the ganglion can be perfectly exposed and removed, including its root on emerging from the pons; that the danger, however great, of injury to important contiguous structures is minimized; and lastly, that we avoid the danger of sepsis from the pharynx.

With regard to the prognosis, Keen's table, collected early in 1894, shows six deaths out of forty cases, nineteen of which were operated upon by Rose's, and nineteen by Hartley's method. Two deaths are credited to each method. One of the other deaths was Horsley's case, and one of unknown method. A death reported by Eskridge (a male of fifty-two, Rose's method) is not mentioned in Keen's table.

In persons of fairly good condition and without

² Full details are found in the Lancet, 1892, page 295.

³ The details will be found in Hartley's report in the Annals of Surgery, May, 1893, page 511.

other disease, it would probably not be far out of the way to expect a mortality not exceeding ten per cent., though the actual death-rate has been higher.

Certain valuable measurements have been made by Taylor, which are worthy of inserting at length to show the variations to be expected in the situation of the foramina and the contiguity of the carotid artery. Distance from the middle of the foramen ovale to the middle of the foramen spinosum, 3 to 13 millimetres; ovale to rotundum, 9 to 18; spinosum to rotundum, 11 to 24; ovale is anterior to foramen spinosum by 3 to 9 millimetres; internal to it by 3 to 9 millimetres; the foramen rotundum is anterior to the foramen spinosum by 13 to 20 millimetres; internal to it by 6 to 16 millimetres. The foramen rotundum is distant from the fossa for the Gasserian ganglion by 11 to 23 millimetres; the foramen ovale is distant from the same by 3 to 13 millimetres. The distance from the foramen ovale to the carotid canal varies from 1 to 13 millimetres. The diameter of the foramen spinosum is 1 to 4 millimetres; of the foramen ovale, 4 to 9 millimetres; of the foramen rotundum, 1 to 4 millimetres.

An important point to be noted is the occasional contiguity of the carotid canal to the foramen ovale; also the fact that the middle meningeal artery is in some cases so placed as to render it impossible to remove the third branch without injuring it, on which account Taylor recommends tying the middle meningeal artery at once in case the nerve proves difficult of access.

A noteworthy peculiarity from the neurological point of view is the persistence of taste at the tip of the tongue after these operations, a fact hard to reconcile with our views of the course of the taste fibres through the trigemini.

No trophic changes occur in the skin of the face, and the area of anesthesia becomes greatly narrowed in time. The paralysis of muscles of mastication affords some discomfort, though not material, compared with pain, and one who performs or sees this operation will appreciate the impossibility of isolating and sparing the motor root.

Temporary aphasia may be expected in lateral operations, and temporary injury to the ocular nerve may occur in all (perhaps less in the lateral), but if the patient survives the immediate effect of the shock and compression upon the respiratory centres, the chances are against any lasting injury to the brain.

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ACUTE INFANTILE ARTHRITIS IN THE HIP.¹

BY AUGUSTUS THORNDIKE, M.D.

A CASE OF ACUTE ARTHRITIS.

J. C., age fourteen months, was brought to the Children's Hospital May 9, 1893, where he was seen by Dr. R. W. Lovett and myself. His condition was as follows:

Small child with pinched and wasted expression of countenance, much emaciated; the left thigh, semi-flexed, was fluctuant and swollen to twice its usual size from the knee to the crest of the ilium. The lower half of the abdomen was quite prominent and the skin red-dened. The tenderness was so excessive that the least handling caused great pain. The mother said that two weeks before there had been some pains in the stomach, and a doctor had been summoned; that these had been partially relieved, but that three days ago the child was in pain and another physician had been called, who discovered a deep-seated swelling about the hip and advised immediate removal to the hospital, but that yesterday she was not able to come and the pain and swelling had grown rapidly worse; that for two days he had not nursed much, but there had been no vomiting and the napkins were of good color.

The child was at once sent to the West End Infant Hospital and Nursery where, at Dr. Lovett's request, I opened the abscess two hours later. The patient, wrapped in sterilized towels, was slightly etherized on the sterilized metal operating-table, which was warmed by hot-water tins. An incision three inches long behind the trochanter immediately opened a tense sac of milky, odorless pus. Exploring it with the finger, it was found to extend from the knee to the crest of the ilium behind, while in front I easily passed over the ramus of the pubis, one inch outside of the symphysis, into a cavity whose limits my finger was too short to explore, but a quantity of pus was pressed out by the hand on the abdomen. It was irrigated with warm corrosive-sublimate solution, 1 to 5,000, then with warm boiled water; and two rubber drainage-tubes were inserted, one running into the pelvis, the other down the outer side of the thigh. Sterilized gauze dressings were applied, together with a Cabot posterior wire frame from the ankle to the scapulæ. As the pulse was 160 and far from strong, the operation was done as quickly as possible, and two subcutaneous injections of brandy were given. The child slept fairly well. Mother and child went home six days after the operation, the patient's temperature never

¹ Read before the Boston Society for Medical Improvement, April 23, 1894.