Peripheral resection of fifth nerve : three cases with microscopic examination of the portions of the nerves removed and report on the later condition of patients / by W.W. Keen and Wm. G. Spiller.

Peripheral Resection of Fifth Nerve

Three Cases with Microscopic Examination of the Portions of the Nerves Removed and Report on the Later Condition of Patients

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PERIPHERAL RESECTION OF FIFTH NERVE.*

THREE CASES WITH MICROSCOPIC EXAMINATION OF THE PORTIONS OF THE NERVES REMOVED AND REPORT ON THE LATER CONDITION OF PATIENTS.

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PHILADELPHIA.

DR. KEEN'S REPORT.

CASE 1.—*Resection of supraorbital and infraorbital nerves for tic douloureux.*

Mrs. A. K., aged 53, a patient of Dr. S. Weir Mitchell, first came to the clinic of the Infirmary for Nervous Diseases, Feb. 11, 1898. She had always been healthy and of her eleven children, six were living and well.

In October, 1894, she felt a sudden, slight tingling sensation at the internal angle of the right eye. This increased in severity and finally included the entire right face and anterior part of the scalp. She had to sit up, as lying down increased the pain so much. In 1895 she was very much better. In 1896, she had scarcely any pain at all, but on Feb. 4, 1898, it suddenly recommenced and she had suffered ever since. Along with the pain there were spasmodic twitchings of the muscles about the right eye, and of the face, as long as the pain lasted. On March 3, 1898, I removed the supraorbital and infraorbital nerves, the latter by the orbital route,

*Read in a Symposium on the "Fifth Nerve in its Neurological and Surgical Relations," before the College of Physicians of Philadelphia, April 20, 1900.

dividing the nerve toward the apex of the orbit. On Jan. 9, 1899, she again reported at Dr. Mitchell's clinic. She had suffered no pain after the operation, for eleven months, then had a recurrence for two months, accompanying la grippe. In the last two weeks she had had another recurrence, but the pain was neither severe nor constant.

CASE 2.—*Resection of the infraorbital and inferior dental nerves for tic douloureux after ineffectual treatment by massive doses of strychnin.*

Mrs. M., Princeton, N. J., aged 62, first consulted me Dec. 1, 1898, at the instance of Dr. James H. Wikoff. Twenty years ago she had a very serious hemorrhage from a uterine myoma, and a sister died after a hysterectomy for the same trouble. For ten years she had been a great sufferer from hemorrhoids, attended with profuse hemorrhages. She also has a femoral hernia. Ten or fifteen years ago, without assignable cause, a sudden partial palsy of the left side came on, but yielded to treatment. For some time she has had a slight rise of temperature toward evening, and has been more or less of an invalid. The uterine myoma still persists, but has given her no trouble of late. Three years ago, without assignable cause, she began to have excessive pain in the groove between the nose and right cheek. It has now extended over the whole of the cheek and the lower jaw and also to the ear. The pain is the characteristic pain of tic douloureux and is caused by eating, conversation, etc.

Desiring, first, to test the effect of strychnin, which in several cases had enabled me to avoid operation, I commenced with 1/20 gr. t. d., adding one pill to the daily dose, so that the first day she would take three pills; the second, four; the third, five; etc. When she reached six pills a day, she was to add one pill every other day until she had reached ½ gr. a day or until the pain had ceased. Up to the time when she was taking 7/20 gr. a day, no relief from the pain had been experienced, nor had any strychnin symptoms developed. Ordinarily I have found these symptoms develop slightly at first, so as to give warning, but in this case the onset was sudden. Stooping down to pick up something from the floor, her legs were suddenly violently extended and her body was thrown some ten feet across the room. She

suffered no injury as her husband fortunately caught her. The medicine was immediately discontinued, and she decided on operation.

This was performed on Dec. 31, 1898. By a slightly curved incision at the lower border of the orbit, the nerve was exposed in the orbit as well as on the face and 3 cm. of the infraorbital resected. I then trephined the lower jaw and removed 5 cm. of the inferior dental, including the mental and incisor branches. The canal in the bone at both ends was plugged with some of Horsley's antiseptic wax. She made a typical, smooth recovery, her temperature only once reaching 100 F., and she went home on Jan. 13, 1899, two weeks after the operation.

Two days after her return she learned, by an operation on her husband, that he had an inoperable internal cancer. She nursed him through the operation and for some time afterward, when he died. She wrote me under date of Feb. 19, 1900, that after the death of her husband she was obliged to build another home and move into it in September, 1899. This involved considerable planning, anxiety and care. Up to that time she had been entirely free from the facial pain, but the moving caused great mental and physical strain, and a return of the pain followed for some weeks. Recently, she has also had another attack of about the same duration, but when she wrote she was entirely free from it. In each instance, however, she had taken cold and suffered from much irritation of the throat and from cough. The pain seems to have been limited entirely to the lower jaw, and was especially provoked by conversation or eating. She lost no sleep, however, and by keeping very quiet the pain lessened and finally disappeared. It came in spasms with a sensation "as if her jaw were in a vise and being twisted." Her relief from the pain, by the operation, was so great that she writes she would unquestionably seek relief again by another operation should it prove necessary.

Concerning the examination of her face made by Dr. Spiller, Jan. 10, 1899, after the operation, he says: "The anesthetic area begins about a quarter of an inch below the margin of the right lower lid. Complete anesthesia for touch, temperature and pain exists in the shaded area. (Fig. 1.) The anesthetic zone on the side of the face is sharply defined, as it is also

in the median line of the face below the nose. It extends over the right ala nasi. Tactile sensation in the right nasal passage is much impaired. Tactile anesthesia is present on the inside of the lips, on the outer and inner surfaces of the lower gum, extending from the median line of the face to about the angle of the mouth. The upper gum appears to be anesthetic to touch on its outer and inner aspects from the midline of the face to about the angle of the mouth."

CASE 3.—*Resection of infraorbital and inferior dental nerves for tic douloureux after failure of massive doses of strychnin.*

Miss N., aged 28, first consulted me in the early part of 1898, at the instance of Dr. Kinard, of Lincoln, Pa.,

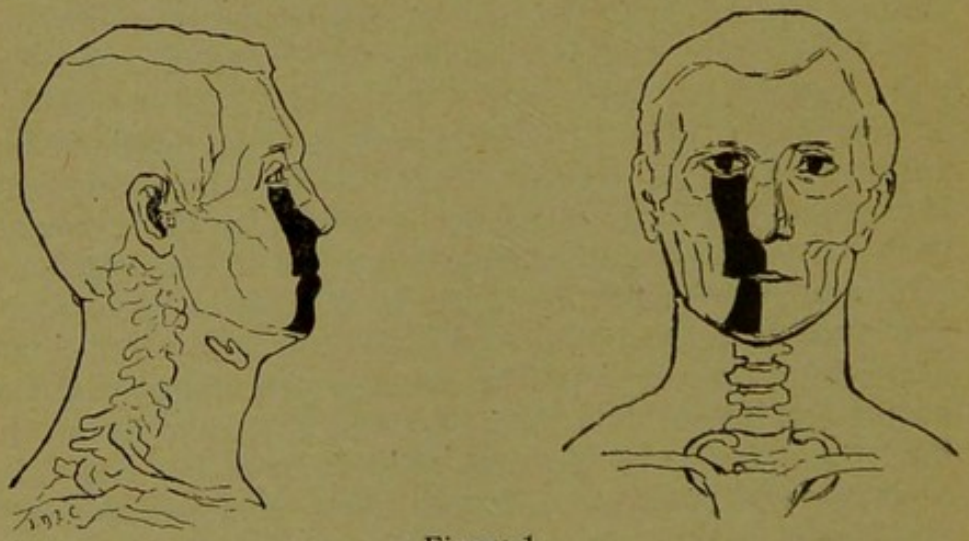

Figure 1.

for tic douloureux, limited to the infraorbital and inferior dental nerves of the right side. As in Case 2, I wished to test the effect of strychnin before proceeding to operation. She began the treatment under Dr. Kinard's direction on May 9, and continued it up to Jan. 26, 1899. She began with 1/40 gr. t. d., increasing one pill every day until she was taking 8/40 gr. As she then began to feel some of the effects of the strychnin, the dose was not increased, but she took eight granules a day for five months. The strychnin was then increased to nine, and after a week to ten, a day. After taking 10/40 gr. a day for two days, she complained that she felt very nervous and weak, and the arms and legs trembled. The number was then reduced by Dr. Kinard, first, to nine and then to eight granules up to Janu-

ary 26. Finding that the strychnin was inefficient, she then desired operation.

She entered the Jefferson Medical College on Jan. 27, 1899, when the following history was elicited: Her father and mother were both living and well, between 50 and 60 years of age; also nine brothers and sisters. She had the ordinary diseases of childhood, including diphtheria, and made good recoveries, but no other illness till the present trouble began. Menstruation began at 13, and has always been regular but painful; occasionally she had leucorrhea. There was no evidence of any venereal trouble. Nine years ago, she began to have pain on the right side of the face. At first it occurred in brief paroxysms at long intervals, being apparently caused by eating food which was either very hot or very cold, or by exposure to draughts of cold air. The pain began above the right ala of the nose, and was sharp and shooting in character. Gradually the paroxysms became prolonged and the pain spread over the entire right face, except the forehead, which has rarely been involved. For the last three years she has suffered almost constantly, though with slight lessening of severity for short intervals, but the pain has never disappeared entirely. The upper teeth on the right side were extracted three years ago and last spring the lower teeth, but without the least relief. When the pain is most severe she states that the sputum is tinged with blood and mixed with a slight amount of yellowish thick discharge, and that there is a very marked overflow of tears from the right eye. The urine was normal.

On January 29, Prof. H. A. Hare, at my request, examined her lungs and found an impairment of resonance on the right side. Respiration was so defective that nothing could be observed by auscultation. Examination of the right ear, by Dr. Klopp, gave a negative result. Dr. Jones also examined her mouth and throat and found only a slight catarrh. Dr. Jones informed me that he had examined her two years before and had then opened the antrum with a view of determining whether there was any antral disease, but found nothing. I transilluminated the antrum and found nothing abnormal.

Operation was performed on Feb. 1, 1899. The infra-orbital and inferior dental were resected as in the preced-

ing case. The portion of the infraorbital measured 2.5 cm. and of the inferior dental 5 cm. in length. After the operation, her temperature only once exceeded 99.8 F., and at the end of a week she was entirely well.

Under date of Feb. 28, 1900, she wrote that two months before she had a renewed attack of pain, but not so severe as before the operation. The attack was limited to the upper jaw, the lower one being entirely free. When the pain is severe in the upper jaw, she has pain in the right ear and she said: "The attacks are very easy to bear. I must say I had the best year this last year that I have had for long. I would accept another operation if I should find the need of it again."

Remarks.—The history of these cases is the usual history surgically that has been impressed on me by very many operations. The relief is scarcely ever permanent, but at the same time is so great that patients do not hesitate to accept a second operation in view of the great relief they have had from the intense suffering. In spite of only the transitory relief, I believe it is wise to do these peripheral operations until the mortality of Gasserian operations has been materially lessened.[1] For my reasons see a paper by Dr. Spiller and myself in the *Amer. Jour. Med. Sci.*, November, 1898. These peripheral operations ought to be done early before the disease has had time to invade the ganglion. Very early operations, say after a month or two of ineffectual medication, might even cure permanently.

The nerve is sometimes reproduced with surprising completeness. In two cases I operated on the inferior dental, for Dr. S. Weir Mitchell, on two successive days. After three years I had to operate again on one case and after six years on the other. In each patient I had removed three small buttons of bone from the lower jaw, 1 cm. in diameter, and chiseled away the intervening bridges of bone. The reproduction of the bone was so perfect that had I not done the operations myself I might even have doubted whether any operation had ever been done. In both I found a complete reproduction of the nerve of a size even larger than that found at the first operation. Both were resected again. The specimens were given to a pathologist, from whom, unfortunately, I never could obtain a report in spite of

the very unusual and interesting character of the specimens. One of the patients has had slight recurrences, but never severe enough to require another operation. The other had quite a severe return of pain, which was to some extent relieved by the constant current. Finally she died without ever having required a third operation. In another patient on whom I recently operated for the second time, the first operation having been done by another surgeon, I trephined the inferior maxilla, but found no reproduction of the nerve whatever, though the bone was entirely reproduced.

One protest I must make. In nearly every case all the teeth have been extracted. I have never seen the slightest good result from this utterly needless sacrifice.

DR. SPILLER'S REPORT.

CASE 1.—My report of the nerves resected in this case, with illustrations, was published in a paper by Dr. J. K. Mitchell,[2] in 1898, and is reproduced here for the sake of completeness:

Many, possibly most, of the nerve-fibers of the infraorbital nerve, when separated from one another by teasing and stained by a 1 per cent. solution of osmic acid, are found to contain numerous black balls, approximately of the same size. These are nearly equidistant from one another, and are located along the edges of the fibers, leaving, as a rule, the centers free from such accumulations. (Fig. 2). When the focus of the lens is changed, so as to bring other portions of the fibers into view, black balls are apparently found within the centers, but these are probably along the superficial and deep portions of the fibers. The medullary sheaths are thus broken into numerous masses of nearly equal size, occupying the normal position of the myelin sheaths. It is exceptional to find masses of degenerated myelin of a size so large as is frequently seen in degenerating fibers. Similar lesions are found in the supraorbital branch of the fifth nerve. Inasmuch as these nerves were taken from the living subject, and placed immediately afterward in osmic acid, these myelin balls can not be regarded as artefacts, or as due to surgical intervention. Such intervention causes a breaking of the fibers into irregular masses, but probably not the fragmentation of the myelin into numerous balls.

Sections cut with the microtome and stained with carmin and Delafield's hematoxylin show more or less round-cell infiltration about the small vessels. The coats of the smallest vessels are not notably thickened, but one vessel of large size,

found in some of the sections, presents a thick media and a somewhat proliferated intima. In some of the nerve-fibers pale purple bodies are found, which resemble the amyloid bodies, and lend some support to the view that the latter are degenerated nerve-fibers. Most of the nerve-fibers contain axis-cylinders, though in some these can not be seen.

The hematoxylin method of Weigert, used on transverse sections, reveals the presence of the myelin balls within the nerve-fibers in the same manner as the osmic acid shows them in longitudinal sections. They appear as a circle of beads about the axis-cylinder. The nerve-fibers in some bundles appear to be fewer than normal, though this may be due to degeneration of the myelin and therefore imperfect adaptability to the hematoxylin stain.

Case 2.—The blood-vessels, even the smallest, in the infraorbital nerve are thickened and the intima is great-

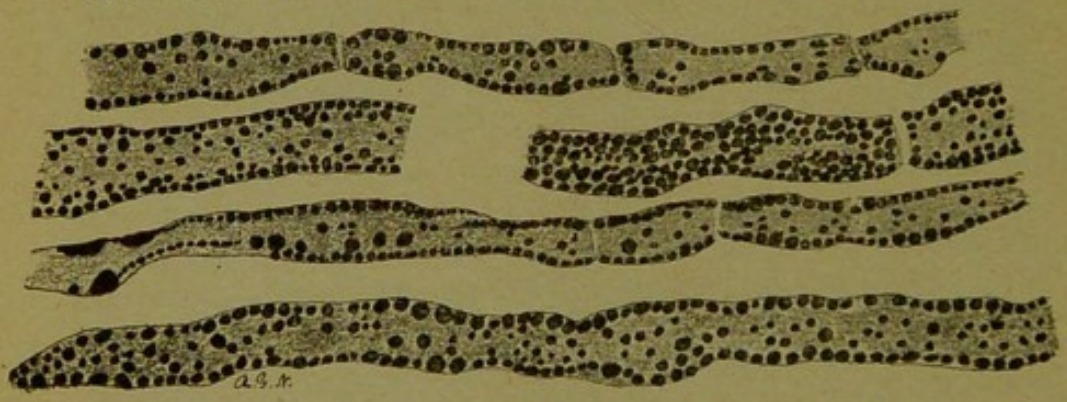

Fig. 2. Degeneration of the medullary sheaths in the form of minute balls stained black by osmic acid.

ly proliferated, considerably reducing the size of the lumen, but the proliferation of tissue is not confined to any one coat of the vessel. The elastic membrane is much thickened and, in some places, in one of the larger vessels three or more separate elastic membranes are seen. The nerve-fibers, when stained by ammonium-carmin or Weigert's hematoxylin do not appear to be much altered, although occasionally a slightly swollen axone may be seen. In pieces of the nerve teased in the fresh state and stained with osmic acid the disintegration of the myelin in the form of small black balls is found in a number of fibers, and in some nerve-fibers black balls of a little larger size exist. The description of the infraorbital nerve answers very well for the inferior dental.

This was a case in which the peripheral nerve-fibers

were very slightly diseased, although the vessels accompanying the nerves were much thickened.

Case 3.—Infraorbital nerve: Many of the medullary sheaths are greatly swollen, the axones in a number of nerve-fibers are absent, and these swollen fibers in transverse section appear somewhat granular. In some nerve-fibers the axones are very much tumefied. When stained with Weigert's hematoxylin many of the nerve-fibers in transverse sections appear unusually large, and some stain unevenly in shades of black and brown. These large swollen fibers are mingled with small nerve-fibers which stain faintly with the hematoxylin. In some of the nerve bundles the nerve-fibers are more nearly normal. The intima of the small vessels is proliferated. No very distinct round-cell infiltration is seen.

Inferior dental: This nerve is less diseased than the infraorbital. The intima in the small vessels is proliferated. The axones are distinctly swollen in a number of the nerve-fibers, but the great tumefaction of the medullary sheaths with destruction of the axones is not nearly so common as in the infraorbital nerve. Round-cell infiltration is not prominent.

In two cases of trifacial neuralgia, in one of which resection of the peripheral nerves was done by Dr. John B. Roberts, and in the other by Dr. W. J. Taylor, I have found the black balls of myelin described in the other cases. I have failed to find these black balls of myelin only in one of the cases studied by me, in which resection of the peripheral branches of the fifth nerve was done for the relief of tic douloureux. This was a case of Professor Keen's, in which the pain had existed for twenty years.

I have repeated the description of the nerves in Case 1 because of the important findings in this case. When this report was published lesions of this character had not been described. I have since seen this alteration in diseased ulnar nerve-fibers removed after the death of the patient, and this alteration may therefore occur in any diseased peripheral nerve. It is not an artefact because I have found it in several cases in which the nerves were placed in osmic acid immediately after they were removed from the living subject, and it is not due to any manipulation of the surgeon, because I have found it when the nerve was altered by disease and removed

after the patient's death. Professor Obersteiner[3] has referred to my findings, both in print and in a discussion at a meeting of one of the medical societies of Vienna.

A somewhat, but not exactly, similar condition has been described by Elzholz.[4]

Case 2 was a very favorable one for a test of the benefit to be derived from early peripheral operations. The nerves were very slightly diseased, and, as Professor Keen has shown, the operation has given relief.

The relief in Case 3, in which the nerves were so greatly altered, is also an evidence that resection of peripheral portions of the fifth nerve is a justifiable operation.

Very distinct disturbance of sensation in the distribution of the infraorbital and inferior dental nerves was found ten days after resection of these nerves in Case 2, and in my patient, who had formerly been under Dr. Mills' care, and in whom these nerves were resected by Dr. Roberts, the disturbance of sensation after the operation was in the same distribution. Sensation, however, is not always lost after resection of a branch of the fifth nerve, and if lost may soon be recovered, and the recovery is not always due to the regeneration of the nerve. An interesting paper illustrating the truth of this statement has been published by J. K. Mitchell.[5] Quite a number of investigators believe that the facial nerve contains sensory fibers—a view which has been held especially by Frankl Hochwart. Some experimental work has been done to demonstrate the presence of these fibers. I quote from a paragraph in my chapter in "Progressive Medicine."[6]

Many writers (van Gehuchten says most writers) now describe the facial nerve as in part sensory and in part motor. Retzius and, more recently, v. Lenhossêk, have shown that the geniculate ganglion is like the cerebrospinal ganglion, and that the central processes of its cells pass into the nerve of Wrisberg. Van Gehuchten finds, by the method of chromatolysis, that the facial nerve at its exit from the stylomastoid foramen undoubtedly contains a certain number of sensory fibers which arise in the geniculate ganglion. The nerve of Wrisberg is, therefore, the sensory root of the seventh nerve. Amabilino (cited by van Gehuchten) has formed a different opinion. He believes that the peripheral processes of the cells of the geniculate ganglion pass into the chorda tympani, and that none of these pass into the peripheral branches of the facial nerve. Van Gehuchten points out that Amabilino found

about one-fifth of the cells of the geniculate ganglion normal after section of the chorda tympani, and he very pertinently asks where these cells send their processes if not into the peripheral branches of the facial.

A recent case reported by Biehl[7] is further evidence that the facial nerve contains sensory fibers. A man was stabbed in front of the left ear and had, as a result of the injury, facial palsy with disturbance of sensation in the distribution of the seventh nerve. In this case an involvement of the fifth nerve was improbable.

Pain is not a rare occurrence in facial palsy from exposure to draught, and the explanation usually given is that the fifth nerve has suffered with the seventh. It is probable that in some cases the pain is due to disease of the sensory fibers within the seventh nerve.

Alteration of the peripheral branches of the fifth nerve has been detected in a number of nerves resected for trifacial neuralgia, but the cause of this alteration has not been determined. In two cases I found what appeared to be the explanation of this involvement of the nerve. One of the patients I examined told me that he had fractured his lower jaw, and that after he had entirely recovered from this injury he was attacked with diphtheria, following which pain began in the lower division of the fifth nerve. It seems possible that although the inferior dental nerve had recovered, it offered, as a result of the injury, less resistance to the poison of diphtheria than the nerve-fibers more commonly attacked in this disease; and therefore trifacial neuritis developed. In another of my patients the pain began in the portion of the face which had been the site of erysipelatous inflammation. Here it seemed as though a neuritis had been started by the erysipelas.

It is curious that the right trifacial nerve is more commonly attacked than the left. I noticed this peculiarity in reading the reports of the cases of Professor Keen and others, and at Professor Keen's suggestion Dr. M. B. Tinker has made an examination of the literature to determine the frequency of involvement of the right fifth nerve. In 108 cases in Dr. Tiffany's table, with 24 additional cases collected by Dr. Tinker and the 3 cases reported in this paper by Professor Keen and myself, making 135 cases in all, the affected side is given in 72. In 58 the right fifth nerve was diseased, and in 14 the left.

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Reprinted from
The Journal of the American Medical Association
April 28, 1900