

LESION OF THE BRACHIUM PONTIS WITH DIVISION OF THE TRIGEMINAL AND FACIAL NERVES.

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R. E. M., aged 21, enlisted as a private in C Company, 2nd Regiment, U. S. Infantry, in March, 1899, at the age of 18. On March 13, while lying in his bed, he was the subject of the following accident. A fellow private was working with a U. S. A. magazine rifle, in which happened to be a 32-calibre revolver cartridge; during the manipulation the instrument was discharged, the bullet from the cartridge striking M., in his prone position, about the centre of the chin, pierced the skin, inferior maxilla and tongue, and lodged, as found later, at the right side of the foramen magnum.

The notes made at the time of the accident are not available at the present time, and all that is here stated has been obtained from the patient and his father. Only those items which seem to be relevant to the case will be recounted.

After the effects of the shock had worn away, *i.e.*, in four or five days, the symptoms were: paralysis of the right side of the body, face, arm and leg, loss of the faculty of speech, slight loss of hearing on the right side. His right eye was turned upwards and to the left, but he still retained his vision on this side. Swallowing was performed with difficulty, and the sense of taste was disturbed from the start.

His general condition improved fairly well, and in one month's time from the accident he had recovered from the

paralysis of the right arm and leg. How complete this paralysis was could not be determined, and possibly the better way would be to dismiss it here as consequent upon effusion or hæmorrhage pressing on the crossed tract on the right side after the decussation, which effusion was afterwards absorbed. The most likely place for hæmorrhage to collect and produce pressure from such a wound as we are dealing with would be between the clivus of the pars basillaris of the occipital bone and the cord immediately over the pyramidal tracts, after their crossing.

In August, 1899, the following notes were made at the Columbus Barracks Hospital and sent to me through the kindness of Major and Surgeon G. L. Edie, U.S.A. :—

“ Gunshot wound of the face, paralysis of the right eye and side of the face, total loss of vision in the right eye and degeneration of the globe; accident, wound received at Annison, Alabama, March 13, 1899. The missile was a 38-calibre, entered the chin, passed upwards into the skull where it lodged at the right side of the foramen magnum, as shown by the X-ray picture; the latter being now on file in Washington.”

To the right of the foramen magnum is not a very definite location for the bullet, but is confirmatory in the light of what here follows.

While yet in bed he constantly rolled toward the left side, even at times rolling out of bed by turning in this way. When he was able to get out of bed in the latter part of April, 1899, he always did so by turning to the left side, and when up constantly staggered toward the left in attempting to walk; this tendency has gradually improved up to the present time, but it still continues in a slight degree, and he always desires to roll out of bed on the left side.

In October, 1899, owing to the inflammation and its results in his right eye, which had not been protected from dust and irritating particles, this was removed by operative procedure and a glass eye substituted.

The writer first saw the patient in June, 1902; at this time he presented the following condition: a little tendency in walking to move to the left side; the trunk, arms, and

legs present nothing abnormal; the right side of the face was quite immobile, and on this side the skin had a flat, thin appearance, extending just to the middle line; the right corner of the mouth drooped considerably, and saliva dribbled from it on to the chin without the patient's consciousness; the right lower eyelid drooped, and tears trickled down on the cheek without producing any sensation; he spoke with some thickness of expression; he did not close his right eye completely, and the right ala nasi moved slightly on deep respiration; the lower jaw when opened projected slightly to the right side; the head movements were normal; swallowing was performed without difficulty or apparent disturbance; the tongue was protruded slightly to the left, but its movements otherwise were not disturbed. All voluntary movements of the muscles of the right half of the face were impossible; there was complete anæsthesia of the skin for sensations of touch, pain, heat, and cold, over the right side of the face, extending from a line corresponding to a perpendicular to the angle of the jaw behind to the middle line in front, and from the anterior-posterior middle line of the head above to the lower margin of the ramus horizontalis maxillaris below; the ear was still sensitive. There was also anæsthesia of the right conjunctiva, the mucous membrane of the right nasal cavity, the right half of the buccal cavity, including the mucous membrane covering the gums above and below, the right anterior two-thirds of the tongue, the right half of the soft palate, and the right posterior wall of the pharynx. The posterior one-third of the tongue was sensitive. The mucous membrane over these parts was smooth and devoid of the small lines found on the other side; this was especially noticeable on the lips. The sense of taste was gone on the anterior two-thirds of the tongue. The sense of smell was at times impaired on the right side, but at other times was all right, depending, probably, on the dryness of the mucous membrane.

For the sense of hearing, air conduction on the right side was almost completely gone and had steadily decreased from the time of the accident to the time of the examination; bone conduction on the right side, however, remained nearly

as good as on the opposite side. Examination of the internal ears presented only some retraction of the drum on the right side.

The loss of the right eye, which has already been referred to, was not due to the loss of sight primarily, but to inflammatory processes secondary to the loss of sensation in the conjunctiva. The left eye was quite normal in vision and movements.

To sum up then we have (1) a complete lesion of the trigeminal nerve on the right side, from its very completeness evidently between the semilunar ganglion and the entrance of the root into the pons varolii, *i.e.*, during its course inwards along the middle cerebellar peduncle; (2) a complete lesion of the facial nerve, distal to its cells of origin in the medulla—a lower motor neurone lesion, from its completeness and the subsequent atrophy of the muscles; (3) possibly a lesion of the eighth nerve. Dr. L. F. Page examined the ear and reported it normal; and yet there was some deafness at first which gradually increased until at present air conduction is entirely destroyed. If any portion of the auditory nerve was injured, it must have been the anterior and mesial or vestibular branch, but as this has nothing to do with the sense of sound, one must look for some deeper lesion in explanation of the absent function of air conduction on the right side.

This would be possible in a lesion of the superior olive, the lateral lemniscus, or the trapezoid body. Only the first of these would conform in position to the course of the bullet, taking its entrance to the pons and its present position as shown by X-ray picture as the points through which to draw a little to indicate its line of travel. The lateral lemniscus would then lie too far cerebralwards, and the trapezoid body too near the median line to be affected. According to Babinsky, if the cochlea be destroyed in a newborn animal there results atrophy and disappearance of the cells and white matter of the nucleus olivaris superior of the same side; and von Bechterew has described a connection between the superior olivary nucleus and the nucleus of the sixth nerve. This latter connection might possibly

explain the muscular derangement of the eyeball in the present case in which the ball was turned upwards and inwards.

Now the only place where such a complete lesion of these two nerves could occur with the present source of injury, *i.e.*, a revolver bullet approximately three-eighths of an inch in diameter, must be at a point where they come nearly enough together to be severed by the bullet in its passage. Only one such place exists, and that is over the brachium pontis, as it sinks into the cerebellar substance. One must remember here that the lesion was practically confined to the fifth and seventh nerves. The fifth nerve as it passes inwards and backwards from the Gasserian ganglion to enter the pons lies closely enough to the seventh nerve, as it passes upwards and outwards to enter the internal meatus, to be divided by such a missile. The possibility of fractured bone causing part of the injury is negatived by the confinement of the lesion remaining.

The course of the bullet entering the chin going through the soft palate and lodging to the right of the foramen magnum admits only of its piercing the tip of the occipital bone to the right of the middle line just internal to the carotid artery as it enters the middle fossa, then severing the fifth and seventh nerves as it passed backward through the brachium pontis on this side, to lodge possibly in the substance of the cerebellum.

One or two features of interest may be noted before discussing the probable lesion of the middle peduncle. The persistence of the sense of taste in the posterior third of the tongue and its loss in the anterior two-thirds on the right side suggest strongly that either one of these two nerves must functionate in the conductions of the sense of taste from the latter region. The late work of Cushing would indicate that the fifth nerve has little to do with this duty, so that the work would be thrown solely on the nervus intermedius which must have suffered division along with the seventh nerve. The lesion of the two nerves being so complete and the function of the posterior third of the tongue being still intact, these nerves have nothing to do in this case at least with the conduction from this region.

The very completeness of the lesion of the two nerves involved by so small a missile is interesting ; that they lie so closely together at this point, and that other neighbouring structures of such vital importance should have escaped injury is worthy of emphasis.

The reasons for reporting this case as one of brachium pontis lesion are two-fold, first the similarity which the group of symptoms present in this case bear to those in other reported cases of injury to the same region, and to cases of experimental lesion ; second, the impossibility of severing the two nerves, which in this case are evidently divided, at any other point than immediately over the middle peduncle, which must then have suffered injury also.

Ferrier gives as the symptoms of such a lesion, forced movements or actual rotation associated occasionally with deviation of the optic axis. He also recounts the following cases which from their similarity to the present case in symptomatology I feel justified in repeating here. One reported by Longet in which there was softening in the right cerebellar peduncle where it enters the cerebellum, in which there was rotation from right to left. One by Freideburg of hæmorrhage into the left cerebellar hemisphere, followed by meningitis and due to traumatic lesion ; the patient suffered from vertigo, a tendency in walking to go to the left, followed by repeated attacks of rotation round the vertical axis from left to right ; the eyes were in a constant state of oscillation. One by Bernhardt of a tumour implicating the right middle peduncle in which the patient lying in bed had a tendency to turn from right to left, the eyes looked upward and to the left with some nystagmus, and in walking he had a tendency to fall to the left. One by Nouat of hæmorrhage into the right peduncle, in which the patient assumed a forced position on the right side, with head strongly turned to this side, eyes immovable, right eye looked downward and outward, and the left eye upward and inward. These it will be seen resemble very closely the symptoms in the case of M., reported here, which are referred to the brachium pontis lesion.

In experimental section of the middle peduncle rolling

round the long axis and deviation of the eyeballs are the chief features observed, with, however, a controversy as to the direction of the rotation. The direction of rotation probably depends on the structures injured in the operation, one group of experimenters effecting the lesion from the dorsal, and the other from the ventral surface of the pons.