

Clinical Lecture

ON

PARALYSIS OF THE FIFTH CRANIAL NERVE.¹*Delivered at King's College Hospital on Dec. 5th, 1887,*

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GENTLEMEN,—I desire to call your attention to-day to a case of considerable interest, both from a clinical and physiological point of view. It is an instance of an affection occasionally met with, but still comparatively rare, being an uncomplicated case of paralysis of the fifth nerve, practically equivalent to a precise physiological experiment. And it has this advantage over an experiment on any of the lower animals in that, so far as subjective functions are concerned, we are able to obtain direct testimony as to the existence or absence of states of feeling, whereas in the lower animals we are obliged to infer these from external manifestations more or less intelligible. And it is astonishing to find, in respect to questions of this nature—e.g., the sense of taste,—how, apparently with the same facts before them, different observers have come to diametrically opposite conclusions. Let me first give you briefly the chief facts as to the previous history and present condition of the case which I have chosen as the subject of my remarks.

Abel S—, aged forty-eight, railway guard, was admitted into the Craven ward on November 25th, 1887. He stated that three years ago he was thrown out of a truck on which he was standing on to the ground, and rendered unconscious for about a quarter of an hour. By his fall he had received several cuts about the head and body, and was obliged in consequence of his injuries to remain off duty for about three months. He states that ever since the accident he has suffered from severe paroxysms of pain over the right side of the head and face. About nine months ago he began to attend the Middlesex Hospital as an out-patient, when he had some teeth drawn from the right upper jaw. No anæsthetic was administered, and yet he felt no pain during the operation. This was the first knowledge he had that he had loss of sensation of that side of his face. Six months ago he began to suffer from inflammation and impaired vision in the right eye, for which affection he has been undergoing treatment up to the present time. His general health has been otherwise good. He admits occasional intemperance and a slight attack of gonorrhœa when eighteen years old, but denies ever having had syphilis. The patient is a healthy-looking man, of a ruddy complexion. The right temporal region and the right cheek appear somewhat thinner than the left, and there is a slight drooping of the right upper eyelid. The ocular movements are normal, as also are the movements of the muscles of expression. He is unable to open his mouth widely, and when it is open the chin deviates very decidedly to the right side. He cannot move the lower jaw from side to side alternately, nor can he protrude the lower beyond the upper incisors. When he closes the jaws, the right temporal and masseter muscles do not become hard like those on the left, and a similar difference is observed in respect to the depressors of the lower jaw when he opens the mouth to its fullest extent. Faradic stimulation of the left temporal and masseter muscles causes instantaneous closure of the open mouth, whereas no effect is produced by faradisation of the same muscles on the right side with as strong a current as can be conveniently borne by the patient. The tongue is protruded straight, and both sides react equally to the faradic current. On examination of the palate it was found that there is a perforation to the left of the uvula which causes a slight deformity and deflection of the uvula to the left side, but the arches of the

palate rise normally and equally during inspiration and phonation. There is complete anæsthesia and analgesia on the right side of the forehead and temporal region, the right eyelids and eyeball, the right side of the nose and right cheek, and anæsthesia, with perhaps slight sensibility to severe pinching, along the course of the lower jaw up to the middle line. There is also complete insensibility of the right nostril and the mucous membrane on the right side of the mouth as far back as the tonsil, and a similar condition over the whole of the right side of the tongue. There is also slight superficial ulceration of the mucous membrane of the inside of the cheek, and he says that he cannot feel his food when he chews it on the right side. Smell is slightly diminished in the right nostril; but he is able to recognise the smell of menthol, though less distinctly than with the left nostril. On examination of the right eye Professor MacHardy reported as follows:—The right cornea somewhat hazy; the right tension distinctly, though only slightly, greater than the left. Ophthalmoscopic examination reveals no change in either fundus. There is absolute anæsthesia of the right cornea and conjunctiva. The right pupil is almost universally adherent to a ring of inflammatory effusion, some two millimetres in diameter, in front of the lens. The action of atropine has failed to break down any of these adhesions. The patient is subject to severe paroxysms of pain in the right eye of a burning character, referred to the back of the eyeball. After examination of the ears, Professor Pritchard reported:—The hearing distance for a watch on the right is $\frac{5}{30}$, on the left $\frac{3}{30}$. After syringing and inflation with Politzer's bag, the condition as to hearing was: left $\frac{6}{30}$, right $\frac{5}{30}$. Tuning fork, medium C, on right mastoid O, left $1\frac{1}{2}+$; O equalling normal length of time. The high notes of Galton's whistle not heard; lower ones heard equally by both ears. Conclusion: Nerves of hearing fairly normal for age. Middle ears very slightly affected by old catarrh, and probably partly specific; right meatus partially blocked with wax. On removal, right equals left ear. On examination of the sense of taste on Nov. 29th, it was found that neither sugar, nor salt, nor citric acid, nor quinine was appreciated on the right anterior two-thirds of the tongue; whereas on the posterior third on the right side, as well as over the whole of the left side of the tongue, the taste of these substances was easily perceived. Perhaps the power of taste on the posterior third of the right side of the tongue was not so acute, relatively, as that of the left. On Dec. 1st the sensibility of the lower facial region, both externally and internally, had undergone some improvement; and the same was true as to the common sensibility and sense of taste on the right side of the tongue. The positive pole of the galvanic current was distinctly felt on the right side of the tongue, especially at the tip; less so further back. Quinine was not tasted on the anterior part of the right side of the tongue at all; other substances, such as citric acid, sugar, and salt, were now capable of being perceived on the right side, but less distinctly than on the left. A few days later tactile sensibility had almost completely returned in the lower facial region as well as on the right side of the tongue; and at this time sapid substances seemed to be tasted equally well on both sides. The area of anæsthesia in the other parts of the face was also receding, but still very marked in the region of distribution of the first and second divisions of the fifth, and absolute in the right side of the palate and upper jaw and mucous membrane adjoining. Sensation has continued to improve from day to day on the right side, but the eye still remains absolutely anæsthetic, and continues to be the seat of severe pain. The muscles of mastication remain in the same state of paralysis as at first.

The symptoms in the case which I have just read are such as can be only caused by some lesion which has impaired the continuity of the trunk of the fifth nerve, both sensory and motor divisions—at first absolutely, and now in process of being recovered from. Recovery has first taken place in the third division of the nerve. In favour of the peripheral nature of the lesion is the atrophy with loss of faradic contractility of the muscles of mastication. For though, theoretically, a similar condition might be caused by destruction of the motor and sensory nuclei of this nerve, such a lesion could not exist without causing other and far-reaching disturbances, which are here entirely absent. What has been the exact cause of the lesion is not altogether free from doubt. The fifth nerve is not unfrequently implicated in tumours, inflammations, syphilitic

¹ From notes [revised and amended] by Sir Hugh Beevor, M.B., Medical Registrar.
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and otherwise, and injuries affecting the middle fossa of the skull. As a rule, the lesion which destroys the fifth also implicates other of the adjoining cranial nerves. In favour of the traumatic origin in this case is the fact that the symptoms began directly after the receipt of a severe injury to the head; and that such an injury may cause paralysis of the fifth is proved by one or two similar instances on record. A typical one of the kind has been reported by Rigler, quoted by Romberg. There is no evidence of intra-cranial tumour in this case; but syphilis, such a fertile source of disease of the cranial nerves, must be considered as a possible cause, even though denied by the patient, and this more particularly on account of the existence of a suspicious perforation of the soft palate. It may be that both factors have been at work—viz., a predisposition induced by syphilis, with the traumatic injury as the exciting cause.

Considering the complete paralysis of all the muscles supplied by the fifth nerve, which are accessible to direct investigation, it is probable that the whole of the motor division has been destroyed. Therefore the case has an important bearing on the question of the innervation of certain other muscles which are supposed to derive their motor supply directly or indirectly from the fifth. It is usually taught that the motor division of the fifth nerve supplies the azygos uvulæ, as well as the tensor palati and the tensor tympani. If this were so, it would have been reasonable to expect indications of abnormal position or action of the palate. In particular, the right arch of the palate should have been higher than the left, owing to the unantagonised action of the levator. The perforation on the left side of the palate made it difficult to determine what position the uvula would have assumed had this not existed; but no abnormality in the position or action of the soft palate could be detected.

This case, therefore, lends no support to the usually accepted doctrines respecting the innervation of the palate by the fifth nerve; nor are these in accordance with the facts of recent experimental research. Vulpian² has found in dogs that no movements are induced in the palate by irritation of the roots either of the fifth or facial nerve. But, on the other hand, movements of the soft palate are produced by irritation of the spinal accessory or accessorio-vagus. That the spinal accessory is a motor, if not the only motor, nerve of the palate is also supported by similar experiments by Beever and Horsley on monkeys. It is clear, therefore, that the whole subject of the motor innervation of the palate, and the current theories respecting the affections of the palate, in relation to disease of the fifth and facial nerves, require reconsideration and revision. Similarly with regard to the tensor tympani. It is said by Lucae that when the tensor tympani is paralysed there is in the affected ear abnormal acuteness to high notes and subjective deep roaring sounds. Neither of these conditions exists in this case, and we are therefore bound to conclude (supposing the whole of the motor division to be destroyed) that the tensor tympani is not supplied by the fifth nerve, or that the symptoms described by Lucae are not necessarily present in such cases.

You will remember that the sense of smell was somewhat defective in the right nostril. But this is to be attributed not to any direct lesion of the olfactory nerve proper, but to the affection of the mucous membrane of the nostril associated with total loss of common sensibility. The condition is somewhat like that which led Magendie to regard the fifth nerve, and not the first, as the true nerve of smell.

The state of the right eye is one which deserves special consideration. There are signs of old keratitis, general vascular congestion, and adhesions of the iris which do not give way to repeated applications of atropine. From notes obtained by Professor McHardy from Mr. Lang, under whose care the patient was for some time, the keratitis undoubtedly preceded the iritis. At the time of his first examination there were no traces of previous iritis; and this is an important fact which serves to show that the iritis in this case is not a relapse of an antecedent, probably specific, iritis, but a further stage of the same affection which manifested itself first in inflammation of the cornea. The condition is therefore more than probably an example of what is termed neuro-paralytic ophthalmia—an affection which has been frequently observed, both in animals and in man, as the result of lesion of the fifth nerve. As to the

proximate causation of this ophthalmia, several theories have been advanced. According to some, the inflammation of the eye is the result merely of the anæsthesia of the cornea, and due to external influences acting on a part unaware of, and therefore unable to guard against, the irritation to which it is liable. But this theory is opposed by many facts. The eyeball may be perfectly insensible, as in cases of cerebral hemi-anæsthesia, and yet no inflammation occur. And similar inflammation of the eyeball has been known to occur in cases of lesions of the fifth nerve insufficient to produce complete loss of sensibility. Nor even when the anæsthesia from lesion of the fifth has been complete does inflammation necessarily ensue. Thus, a case has been reported by Mr. Hutchinson,³ in which, notwithstanding entire insensibility of the eyeball from paralysis of the fifth nerve, no inflammation of the eye occurred during the period of observation (twelve weeks) that had elapsed from the commencement of the affection. On the other hand, in some cases panophthalmitis occurs with such rapidity after lesion of the fifth as to be comparable only to the acute bed sore which is seen in connexion with certain forms of spinal and cerebral disease. Nor can the inflammation be explained by mere paralytic dilatation of the bloodvessels of the eyeball. Indeed, it has been shown by Sinitzin that not only does the paralytic dilatation of the vessels of the eyeball, caused by the section of the cervical sympathetic, not induce ophthalmia, but actually prevents the ophthalmia which would otherwise result from section of the fifth. We are obliged, therefore, to regard the neuro-paralytic ophthalmia as dependent upon a direct influence of the ophthalmic division of the fifth nerve on the nutrition of the eyeball itself, altogether apart from vascular or other conditions. The inflammation of the eye after lesion of the fifth nerve is, in fact, generally appealed to as a proof of the existence of special trophic nerves. These are supposed to run in the inner side of the nerve, inasmuch as lesions in this region are more apt to result in the trophic disturbances described. I am of opinion that the direct influence of the nervous system on the nutrition of the parts to which they are distributed has been abundantly demonstrated. But I am not prepared to admit that there are any trophic nerves, as such, distinct from those which minister to motion, secretion, or sensibility. Trophic disturbances are well known in connexion with lesions of sensory nerves in various parts of the body. But the facts are in favour of the theory that these are in all cases associated with irritative or inflammatory lesions of the nerves in question. Partial injuries of a nerve are more apt to cause irritation than complete section; and inflammatory disturbances are certainly more frequently seen in such cases than in those in which the nerve has been completely severed. There is evidence in this case that the fifth nerve is the seat of acute irritation. We have, in fact, a typical example of what is termed anæsthesia dolorosa. The patient is subject to continual paroxysmal darting pains in the region of distribution of all three branches, and particularly in the eyeball, which he describes as being the seat of intense burning pain in the back part. Indeed, you can easily see that the patient's account is correct, for he is constantly in the habit of starting suddenly and wincing each time a paroxysm of pain shoots through his eye and the right side of his head and face. This condition has lasted throughout the whole course of the affection. We have therefore good reason for supposing that the neuro-paralytic ophthalmia consequent on lesions of the fifth nerve is, as in the case of the other sensory nerves, specially caused by irritative or inflammatory conditions, and not by the mere cutting off of the parts from the influence of special trophic centres. For if the latter were the case, neuro-paralytic ophthalmia ought to result invariably from complete paralysis of the fifth; whereas Hutchinson's case, as well as others that might be quoted, is distinctly contradictory of such a hypothesis.

We come now to the consideration of a much-debated question on which this case has an important bearing—viz., the origin and course of the nerves which minister to the sense of taste in the anterior two-thirds of the tongue. That the glosso-pharyngeal is the special nerve of taste of the posterior third of the tongue and neighbouring regions has been abundantly proved both by the facts of disease and experiments on the lower animals, and it has been

² Comptes Rendus, ciii., 1886.

³ Ophthalmic Hospital Reports, vol. iv., p. 191.

found that the circumvallate papillæ undergo atrophy when the glosso-pharyngeal nerves have been divided. A curious case, however, has been recorded by Gowers⁴ of anæsthesia of the fifth nerve (supposed to have been caused by a lesion near the pons), in which the sense of taste was abolished, not only in the anterior two-thirds, but also in the posterior third of the tongue and neighbouring region—a case which would seem to show that all the nerves of taste may occasionally run in the trigeminal nerve. If we assume it as proved that the loss of taste over the whole of one side of the tongue was due to uncomplicated lesion of the fifth nerve in this case, we must regard it as certainly an exception to the ordinary rule. But while it is certain that in cases of paralysis of the fifth nerve there is loss of common sensibility in the right side of the tongue and mouth, and in a large proportion of cases, in addition to the anæsthesia of the mouth and tongue, also complete loss of taste in the anterior two-thirds, there are other cases on record which seem to show that this is not universal. Even those who hold with Erb and others that the nerves of taste of the anterior two-thirds of the tongue ultimately join the trunk of the fifth nerve, are nevertheless of opinion that the lingual division of the fifth nerve does not contain gustatory fibres until after its junction with the chorda tympani. And it is believed that the chorda tympani is, in reality, the path of the gustatory nerves in question. In favour of this view, many facts, both of experiment and disease, have been adduced. Section of the chorda tympani in animals has been said by Bernard, Lussana, and others to impair, if not entirely to abolish, taste in the anterior two-thirds of the tongue. Bernard, however, was of opinion that this was only an indirect consequence of the paralysis of the papillæ induced by the lesion. But this explanation has not been adopted by all, and Schiff, among others, holds that the chorda tympani in reality contains afferent gustatory fibres. In favour also of the relation of the chorda tympani to the sense of taste in the anterior two-thirds of the tongue are the facts of facial paralysis—more particularly when the lesion—as in disease of the middle ear—is such as to impair the continuity of the facial nerve between the geniculate ganglion and the origin of the chorda tympani. Many such cases have been reported, so that we can scarcely question the accuracy of the observations. You will then naturally ask how the fibres of the chorda tympani ultimately join the trunk of the fifth nerve? The path indicated by Schiff certainly seems of a very roundabout character. You will be able to follow it in the diagram before you. Schiff believes that these fibres pass from the geniculate ganglion through the greater superficial petrosal nerve to Meckel's ganglion, and thence to the infra-orbital or second division of the fifth, and so to the general trunk of the nerve; while other fibres, perhaps, pass through the lesser superficial petrosal to the otic ganglion, and thence to the lingual nerve or third division of the fifth. If Schiff's views are correct, it ought to follow that extirpation of Meckel's ganglion, or section of the second division at the foramen rotundum, should cause abolition, or at least considerable impairment of the sense of taste in the anterior two-thirds of the tongue. But this has been denied by Prevost, Alcock, and other experimenters on the lower animals, and it is also contradicted by cases in which the second division of the fifth has been divided and Meckel's ganglion extirpated for obstinate facial neuralgia. In illustration of this I may mention a case recently under the care of Dr. Hughlings Jackson and myself at the National Hospital for the Paralysed and Epileptic. In this patient the second division of the fifth was divided just outside the foramen rotundum, Meckel's ganglion more or less completely extirpated, and subsequently some of the descending palatine nerves also divided. Yet in this patient there was no affection of taste on that side of the tongue. In corroboration also of this, it may be stated that in the patient before us at the time when taste and tactile sensibility began to return in the anterior two-thirds of the tongue, there was still almost absolute anæsthesia of the first and second divisions of the nerve, indicating that conduction was still blocked in these branches—a condition practically equivalent to experimental section. There would still, however, according to Schiff's view, be a way open from the chorda tympani to the otic ganglion, and so into the inferior division of the fifth. The facts of this case would seem to require either this route for the gustatory fibres to the

anterior two-thirds of the tongue, or a direct course in the lingual nerve itself. Lussana, Duval, Vulpian, and others hold that the course of the gustatory fibres of the anterior two-thirds of the tongue is through the chorda tympani, and thence directly into the nerve of Wrisberg or pars intermedia of the seventh nerve. The case before us is not in harmony with this view; for there is no indication of affection either of the portio dura or of the portio mollis of the seventh nerve. Nor does it appear that lesions of the seventh nerve between its point of origin and its entry into the internal auditory meatus cause any impairment of taste in the anterior two-thirds of the tongue. And yet we can scarcely suppose that the pars intermedia would escape when the other two divisions have been destroyed. There is still another view respecting the course of the gustatory nerves of the anterior two-thirds of the tongue, which has found considerable acceptance among physiologists. This is the view propounded by Carl—viz., that all the gustatory fibres are derived primarily from the glosso-pharyngeal:—those of the base of the tongue directly, and those of the anterior two-thirds of the tongue indirectly, through the anastomoses which the tympanic or Jacobson's nerve forms with the facial and with the lingual through the otic ganglion. This view, which seems to be supported by the facts of his own case, has the merit of simplicity, inasmuch as all the nerves of taste are thus brought ultimately to one nucleus; but it is not in harmony with the facts observable in this patient, or in the other recorded cases of loss of taste in the anterior two-thirds of the tongue from lesion of the fifth nerve alone, apart from all discoverable affection of the glosso-pharyngeal nerve. Nor does it seem necessary, though the nerves of taste all proceed ultimately to one cerebral centre, that the primary nuclei should be united; for the distinctness of the medullary nuclei may be subservient to different physiological combinations in relation to the secretion of saliva, the movements of the tongue, and the act of deglutition. Such are a few of the considerations suggested by the case before us; and you will not fail to recognise that there are still many questions which demand further careful investigation when similar instances present themselves before you.

[*Addendum note.*—December 23rd: Under the influence of iodide of potassium in twenty-grain doses, three times a day, and faradisation of the right side of the face, the patient has continued steadily to improve, and the area of total anæsthesia has become circumscribed to the eyeball and eyelids. Everywhere else tactile sensibility has returned more or less completely, but difficulty of localisation and a considerable amount of analgesia remain, especially in the frontal region. Paroxysmal pains still shoot through the eyeball, but the eye is less congested, and there are some indications that the adhesions of the margins of the pupil are giving way, partially at least, to the daily use of atropine. Should they still resist, the question will arise as to the advisability of performing iridectomy; but my colleague, Professor MacHardy, thinks it better to wait for the present.]

Clinical Lecture

ON

CASES OF SARCOMA.

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GENTLEMEN,—As I have had occasion recently to operate upon some remarkable cases of sarcoma, I take the opportunity of making a few remarks upon this form of disease. And, first, what is meant nowadays by sarcoma? Modern pathologists regard as examples of sarcoma tumours consisting of embryonic cells embedded in a matrix, but not contained in alveoli like the true cancers, the bloodvessels running between the cells themselves. This is all very well when the tumours are removed and submitted to microscopical examination, but it will be necessary for you to make a diagnosis, if possible, before employing the knife, in order to guide you as to the treatment to be employed.

Clinically, sarcomata differ very much from cancers,

⁴ Journal of Physiology, vol. iii.