THE NATURE OF TIC DOULOUREUX

TREATMENT BY ALCOHOL BLOCK OR SECTION OF THE GREAT AURICULAR NERVE

BY

R. WYBURN-MASON, M.D., M.R.C.P.

It was shown by Weddell (1940-1) that each unit area of the skin is innervated by multiple fibres which approach from different directions and weave themselves into a complicated network surrounding hair shafts and bulbs, and sebaceous and sweat glands. Moreover, there is a great deal of overlapping of the spinal-nerve-root supply of any given area of skin or of deep tissues. There is no reason to suppose that the trigeminal area differs from other zonal areas in this respect or that there should not be an overlap of the sensory supply of the area from neighbouring spinal nerve roots.

The Cervical Plexus and the Trigeminal Area

The anterior primary divisions of the second and third cervical nerve roots divide into two, and the adjacent parts of each root join to form the great auricular, lesser occipital, and cutaneous cervical nerves beneath the sterno-mastoid muscles. The latter appear at the mid-point of the posterior border of the muscle, where they pierce the deep fascia, usually immediately above and behind the external jugular vein, which crosses the posterior border of the muscle at the same point. The great auricular nerve then ascends towards the lobe of the ear, crossing the muscle obliquely, and, as it does so, divides into anterior and posterior branches (see Fig. 1). The

FIG. 1.—Drawing showing the distribution of some of the nerves of the cervical plexus (from *Gray's Anatomy*, reproduced by courtesy of Longmans, Green and Co.). The communications of the great auricular and cutaneous cervical nerves with the branches of the facial nerve are to be seen.

posterior branch joins the posterior auricular branch of the facial nerve behind the ear, communicates with the lesser occipital nerve and the auricular branch of the vagus, and supplies the skin over the mastoid process. The anterior branch unites with the various branches of the facial nerve as they lie on and within the substance of the parotid gland. Other branches supply the lobe of the ear, part of the posterior and lower portion of the auricle, the skin over the angle of the jaw, and the parotid gland. The great auricular nerve is purely sensory, and some of its fibres join the facial nerve and with it pass to all parts of the face. It appears, therefore, that sensory fibres from the cervical plexus are carried into the trigeminal area with the facial nerve.

The cutaneous cervical nerve crosses the neck transversely forward from the mid-point of the sternomastoid muscle and its branches supply the skin of the upper and anterior part of the neck passing on to the face. Branches from the cervical branch of the facial nerve join with it. A communication from the cervical plexus (C 1 root) joins the hypoglossal nerve and with it passes into the tongue, to which it supplies sensory fibres and in which it communicates with the lingual nerve. The cervical plexus, of course, innervates all the muscles of the neck, including the sternomastoid and trapezius, with both motor and sensory fibres. The trigeminal nerve supplies pain fibres to the trigeminal area and these enter the medulla from the nerve root and pass caudally in the descending tract of the nerve to end against the nucleus of this tract lying in the first and second cervical segments of the cord. Hence, all pain impulses in the head and neck eventually pass into the upper four cervical segments, and anatomically the sensory nerves of the cervical plexus also partly innervate the trigeminal area.

In some subjects the external jugular vein crosses the posterior border of the sternomastoid muscle well below its mid-point, and it cannot be used as a surface marking for the great auricular nerve. The course of the nerve can then only be marked on the surface by mensuration as described in most anatomy books.⁵ In such cases the surface marking is in my experience often far from accurate.

After the trigeminal ganglion has been injected with alcohol some degree of analgesia develops in the trigeminal distribution. This is assumed by most to be complete, but some degree of cephalic sensation remains, especially for pain (Harris, 1937 ; Mettler, 1948). Carmichael and Woollard (1933), in their earlier experiments, found deep pain sensibility still present in the cheek in such subjects, but a modification of their technique suggested this was not so. They found that procaine blocking of the facial nerve at the stylomastoid foramen caused facial palsy, but no alteration in deep pain sensibility over the face. At this site, of course, the communicating fibres from the great auricular and lesser occipital nerves have not yet joined the facial nerve. An occasional experience of those who have carried out a large number of trigeminal alcohol injections or root section is that successful production of apparently complete trigeminal analgesia has failed to relieve the pain of facial neuralgia or that "ghost"-like twitchings continue, though they are not painful. In other cases root section or injection of the trigeminal ganglion with alcohol results in trigeminal analgesia, but the spasmodic facial pain is replaced by a severe deep constant aching, which may involve not only the trigeminal area but also the whole side of the face and head.

Tinel (1930) described a significant case of left facial neuralgia in which, eight months after successful alcohol injection of the ganglion, the subject was injured in a railway accident and then developed head pains of a different character and distribution from the facial neuralgia. They radiated over the whole left face, jaws, scalp, occiput, and upper neck, and were burning in nature like causalgia, but there also existed paroxysmal crises, produced by eating, swallowing, and especially by emotion, and accompanied by marked flushing of the left half of the face and head. Examination showed that analgesia still appeared complete in the trigeminal distribution, but deep pain sensibility was found to be present over the face and, in fact, was much increased (hyperalgesia), though sweating was abolished over the trigeminal area. In such cases of persistent dull pain following trigeminal nerve section Carmichael and Woollard also found that blocking of the facial nerve at the stylomastoid foramen with procaine caused facial palsy, but had no effect on the pain. At this site, it must be repeated, the communicating fibres from the great auricular and lesser occipital nerves have not joined the facial nerve.

Procedure for Alcohol Block and Surgical Section of the Great Auricular Nerve

Alcohol block of the great auricular nerve can be carried out, as the nerve lies on the surface of the sternomastoid muscle, which prevents the alcohol from affecting other important structures. The patient lies on his side with the head in line with the body. The point where the external jugular vein crosses the posterior border of the muscle is determined by digital compression of the vein at the root of the neck. This makes the vein stand out. A line is drawn on the skin from this point to the lobe of the ear, and about $\frac{1}{2}$ –1 in. (1.3–2.5 cm.) along it the skin is anaesthetized with 2% procaine just to either side of the line. Through the skin a size 20 needle is passed down to the level of the deep fascia and 0.5 ml. of absolute alcohol is injected gradually, while withdrawing the needle and pointing in different directions, but taking care to keep it on the surface of the muscle and not to inject into the skin itself. The same procedure is carried out in the second area of anaesthetized skin.

When the alcohol enters the nerve it causes intense burning pain in the region of the ear and just behind it, in the temple, pre-auricular region, forehead, and sometimes in the eye. This lasts about thirty seconds, and the lobe of the ear usually looks red and hot. Within a short while—a matter of a minute or so—the lobe of the ear may feel slightly numb and may appear pale. For several days after the injection there may be some slight local ache in the region of the injection. In some cases it is impossible to find the nerve because of the obesity of the patient, because the external jugular vein takes an abnormal course, or because of some other anatomical variation. The test for whether the nerve has been entered by the alcohol is the development of the typical distribution of pain. Afterwards the lobe of the ear and the skin of the neck below it feel slightly numb to the touch.

The nerve may be sectioned surgically by making an incision transversely to the upper part of the sternomastoid muscle and dissecting down to the fascia covering the muscle, at the same time avoiding the external jugular vein lying anterior to the nerve. The branches of the nerve are then identified and cut, and as much as possible of the nerve is removed. The effect of this is to cause slight numbness of the lobe of the ear and of the skin of the neck below.

If the alcohol is injected only on the surface of the sternomastoid muscle it does not cause any damage to important neighbouring structures. The injection is very much simpler and less painful than that of alcohol block of

the trigeminal nerve or ganglion, and also entails less risk of damage to important structures. I have seen few complications from the injection, except that on several occasions the alcohol did not block, but only irritated the nerve. In some of these cases painful labial herpes developed on that side. The pain, however, passed off in a few days. The disadvantage of alcohol injection, of course, is that it is not permanent and that it causes local fibrosis, which may render identification of the nerve at operation difficult. The operation of surgical section of the nerve is, of course, simple and far less formidable than that of craniotomy and section of the trigeminal nerve root with its attendant risks. The only complications have been slight local infection of the wound on some occasions; but this has always rapidly cleared up. Unlike trigeminal block or section, there is no danger of neuroparalytic keratitis, nor any uncomfortable analgesia from either alcohol injection or section of the great auricular nerve. From anatomical considerations and the radiation of pain on alcohol injection of the nerve it is obvious that the great auricular nerve must partly innervate the trigeminal area.

Some Significant Observations on Tic Douloureux

Tic douloureux, or facial neuralgia, is always attributed to disturbance in the pain fibres of the trigeminal nerve, but there are certain observations which do not fit such a concept. Thus:

1. Tic douloureux does not result from pressure or irritation of the trigeminal ganglion or nerve root, which instead causes a dull boring pain accompanied by "trophic" changes in the skin and deep tissues in the trigeminal area. Electrical stimulation of the root at operation also does not give rise to painful tic.

2. No constant lesion has ever been demonstrated in the trigeminal nerve fibres or nerve roots in cases of tic douloureux.

3. While the pain is often found in the area innervated by the trigeminal nerve, it commonly extends beyond this (Harris, 1926). The cases are then termed "atypical." They are in all other respects identical with those in which the pain occurs only within the trigeminal area. In these "atypical" cases the tic may be felt behind the ear, in the distribution of the posterior auricular branch of the facial nerve, which receives branches from the great auricular nerve; below the angle of the jaw, in the distribution of the cervical branch of the facial nerve, which joins the cutaneous cervical nerve; or even in the occiput, in the distribution of the great occipital nerve, a branch of the cervical plexus.

4. Spasms of painful facial tic are often accompanied by flickering or twitching of the facial muscles or may be associated with facial palsy or spasm (Harris, 1926), hence the name tic given to it. When the tongue is affected by pain it may twitch. Cushing (1920) described a condition, which he called "painful tic convulsif," in which violent pain in the eye and face was accompanied by unilateral facial spasm. This was unrelieved by removal of the trigeminal ganglion, but stopped when the facial nerve was cut. Such observations suggest that the pain is mediated by fibres in the facial nerve.

5. Any movement of the facial, tongue, or neck muscles may precipitate the tic. The facial muscles receive afferent fibres by way of the great auricular nerve, the tongue muscles from the cervical plexus by way of the hypoglossal nerve, and the neck muscles by the cervical plexus, suggesting that the impulses giving rise to pain may originate in the fibres of the plexus.

6. I observed a patient who had had a left hemiglossectomy for carcinoma of the tongue carried out three years previously. Three months prior to examination he noticed a lump in the left side of his neck about the mid-point of the sternomastoid muscle, and this was followed by severe aching in the frontal, temporal, and occipital regions of the head and the side of the neck reaching to the shoulder.

He also developed sharp stabs of typical painful facial tic affecting the face and frontal and temporal regions of the head. These were brought on by eating, sleeping, moving the head, or by touching the left side of the face. During examination it was found that pressure on the lump in the neck, which was involving the great auricular nerve, would induce typical neuralgic pains in the face. Alcohol block of the nerve was carried out and the pain was completely relieved over the next four months.

7. I had under observation another patient who developed left-sided herpes of C2 and C3 zonal distributions. After three to four weeks he complained of stabs of pain in this side of the face, affecting the cheek, eye, forehead, and tongue, and identical in character with that of painful facial tic.

8. Another patient suffering from Hodgkin's disease received x-irradiation over the cervical plexus for enlarged lymph nodes. This, of course, results in irritation of the nerve fibres, including the great auricular, in the irradiated area. At the height of the reaction the patient developed typical painful tic and later facial palsy, which gradually cleared up with the inflammatory reaction to irradiation.

9. Bues (1952) reported a case of carcinoma of the parotid gland involving the facial nerve with marked tic douloureux and disturbance of sensation in the lobe of the ear, indicating a lesion of the great auricular nerve. The nervous symptoms were relieved by radiotherapy to the tumour.

10. In all cases (about 56) of tic douloureux examined by me in the past five years it was found that pressure over the great auricular nerve may either start off an attack of painful tic or cause it to cease if one was present. If the nerve was now blocked with procaine, the facial tic was relieved while the analgesic was acting, though if pain involved the tongue such a procedure did not relieve the pain in this distribution.

11. Harris (1926) described a case of thrombosis of the posterior inferior cerebellar artery with complete analgesia and thermo-anaesthesia over the trigeminal area, in which pains developed like those of tic douloureux in the analgesic area. He also mentions three cases of fracture of the base of the skull involving the trigeminal nerve and producing complete trigeminal motor and sensory paralysis. In these, pains like those of tic douloureux occurred in the analgesic area. It seems difficult to incriminate the trigeminal nerve as the pain pathway in such cases.

12. While alcohol injection into the trigeminal nerve or root section may abolish the pain of tic douloureux, in some cases after a short while the pain returns undiminished. In others, ghost-like flickerings like those producing pain persist in the previously painful area, but are unaccompanied by pain. These are precipitated by the same factors as the original pain. I have found that if the great auricular nerve is now blocked with procaine or alcohol the analgesia in the trigeminal area becomes both more profound and more extensive and the pains may cease as in the following case.

Case 1

A man aged 62 years was first examined in January, 1943. For the previous 18 months he had suffered from severe sharp stabbing pain in the left forehead, the side of the nose, and the cheek, especially in the angle of the mouth, spreading to behind the ear. The tongue and gums were not affected. Pain was induced by speaking, eating, touching the face, and turning the head, and was accompanied by flushing and twitching of that side of the face. Injection of the trigeminal ganglion with 1 ml. of absolute alcohol was undertaken and resulted in complete loss of superficial sensation over the trigeminal distribution, with relief of pain for about six months. During this time, however, there was a good deal of tingling and a swollen sensation in the face, and he noticed sudden shootings in the region where pain had previously been experienced, but these did not give rise to pain, though they were identical in other respects with the sensations present with the pain.

At the end of six months these shootings again became painful, and eventually the pain returned as severely as before. Although

analgesia seemed still complete, trigeminal alcohol injection was undertaken again with relief of pain as before, though the paraesthesiae and occasional dartings persisted. About two years later, during cold weather, he had a slight return of the painful tic, which recurred at intervals, especially when he was emotionally upset, in cold weather, and when he had a cold. He also developed persistent trophic sores in the left temporal region of the scalp, in the external auditory meatus, and by the side of the nostril, and frequent attacks of blockage and running from that side of the nose, often accompanied by sneezing, left-sided tinnitus, catarrh, and deafness.

When examined in October, 1948, superficial analgesia was still present over the trigeminal area and there was marked tenderness on pressure over the great auricular nerve. It was observed that, if he had a spasm of pain, pressure on the nerve caused it to stop suddenly, though this was followed after some minutes by increased paraesthesiae on the side of the nose and lips. The great auricular nerve was infiltrated with 2 ml. of 2% procaine, which caused the pain and paraesthesiae to cease immediately. The injection of the absolute alcohol induced burning over the analgesic area for a few minutes, but from that time the paraesthesiae and pain ceased, the trophic sores except in the temporal region healed within a week, and the blockage and running from the left nostril cleared up. When seen two months later the trophic sore in the temporal region was still present. The left lesser occipital nerve was therefore blocked with alcohol. When

FIG. 2.—Extent of "trigeminal" neuralgia: A, before, and B, after alcohol block of the great auricular and lesser occipital nerves in Case 1.

Such procedures have now been carried out on 14 similar cases. In six of these surgical section of the

great auricular nerve was necessary in order to stop the pain, as attempts at alcohol block of the nerve were unsuccessful for various reasons, such as anatomical variations in the course of the external jugular vein, the landmark for the nerve, or obesity of the neck. It appears that, while complete blocking of the trigeminal pathways exists, pain of either aching or paroxysmal character may be present over the trigeminal area and side of the head, and this is abolished by blocking the branches of the cervical plexus.

13. In cases of tic douloureux, if the great auricular nerve is exposed in the neck under local analgesia and its branches are touched with forceps, typical painful spasms can be produced in the face in the area where they occur spontaneously. This has now been carried out on numerous occasions, and was well seen, for example, in the following case.

Case 2

A man aged 49 had had typical painful tic for three years, during which time he had had periods of up to four months free from pain. When first examined the pain affected the right frontal region, eye, cheek, and upper and lower lips. It was precipitated by eating, speaking, moving the head, and by touching a "trigger" zone of skin on the upper lip. The bouts of pain were accompanied by slight twitching of the facial muscles around the eye, flushing of that side of the face, and slight lacrimation. The present attack had lasted some four weeks, during which he had been off work and was now completely demoralized.

Examination.—The patient held his head and neck taut and still, and was apprehensive of being touched, especially on the face. The only other abnormal physical sign was some tenderness on pressure over the right great auricular nerve in the neck, which gave rise to typical spasms of pain. The nerve was injected with alcohol under local analgesia. This caused transient intense pain over the whole of the right side of the face and ear, and as soon as this had died down, even with the needle still in position, the patient was able to rub his face vigorously, speak, smile, and move his head. All spontaneous pain and the facial spasm ceased.

After six months he again began to suffer from typical spasms of pain, which, however, were now restricted to the upper lip,

cheek, and side of the nose. An attempt was made to reinject the great auricular nerve. This, however, proved difficult owing to the local fibrosis, and, while the upper extent of the pain was somewhat diminished, it still persisted in the lower part of the affected area. The great auricular nerve was therefore exposed as it lay on the sternomastoid muscle, and two branches, an anterior and a posterior, were identified. On touching the latter with the forceps no pain was experienced. The posterior branch of the nerve was evidently still interrupted by the previous alcohol injection. When the anterior branch was touched, however, it produced typical pain over the cheek and upper lip of great intensity and identical with that occurring spontaneously. The removal of 1½ in. (3.8 cm.) of both branches was followed by complete abolition of the painful tic and by slight analgesia of the lobe of the ear and the region of the parotid. The patient has had no recurrence of pain over the last 18 months.

Discussion

I have now treated some 56 cases of tic douloureux either by alcohol block or by surgical section of the great auricular nerve. In all cases alcohol block was attempted first, and in about half was completely successful in relieving the pain, provided the tongue was not involved. However, in the other cases only partial or transient relief was obtained, and surgical section was carried out later. The treatment does not relieve the pain in the tongue. The patients have now been followed up for as long as five years. In cases treated by alcohol block alone the pain may return after 6 to 18 months and reinjection or surgical section has to be carried out. Of the 25 cases in which surgical section was undertaken, two have had some return of pain after intervals of two and a half and three and a half years, respectively.

From the above observations it seems impossible to escape the conclusion that, at least in a proportion of cases, tic douloureux is a disturbance of the great auricular nerve and other branches of the cervical plexus. It seems possible that the pain in the face is mediated through the fibres of the great auricular nerve, and that in the tongue through the fibres of the cervical plexus which join the hypoglossal nerve. Whether this is the basis of symptoms in all cases remains to be seen. If so, then how is it that interruption of the trigeminal nerve may give relief from the pain? It may be that this causes a local atrophy of the nerve networks in the skin and tongue mucosa, which also receive fibres from the great auricular nerve.

Summary

Reasons are adduced for believing that, at least in a proportion of cases, tic douloureux is due to a disturbance of the branches of the cervical plexus, especially of the great auricular nerve and the branch which joins the hypoglossal nerve.

A method is described for alcohol block and surgical section of the great auricular nerve, which has been used in the treatment of tic douloureux involving the face.

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Endocrinological research in Sweden is to be promoted by a donation of Kr. 1,000,000 (£68,965) from the Knut and Alice Wallenberg Foundation to the Carolinian Institute, Stockholm, the foremost medical research centre in Sweden. New buildings for endocrinological investigations are to be built with the donation. The Wallenberg Foundation was established in 1917.

IN-PATIENT CARE OF GENERAL HOSPITAL PSYCHIATRIC PATIENTS*

EXPERIENCE WITH 500 CASES

BY

R. W. CROCKET, M.B., Ch.B., F.R.F.P.S.,
M.R.C.P.Ed., D.P.M.

Senior Registrar and Tutor, Department of Psychiatry,
University of Leeds

In the accompanying table is given an analysis of 500 consecutive patients seen personally for diagnosis and treatment in the Department of Psychiatry at Leeds University. Apart from the psychosomatic group, which it is proposed to discuss separately, there is little on which to comment in these figures. They have, of course, no universal significance, as they depend on the referring doctors. They merely give an impression of the kind of psychological problem dealt with in one particular setting.

The Patients According to Diagnostic Groups

Psychoneurosis	47(10)	170(21)
Hysteria	5(2)	
Obsessional-compulsive state	118(9)	
Anxiety state		
Depression (mania, 4)		92(12)
Dull and backward		11(1)
Mentally deficient		8
Epilepsy		10(4)
Addiction (chronic alcoholism, 3; ether, 1; thyroid, 1)		5(1)
Cerebral organic states		42(3)
Toxic—exhaustive states 4	Hypertensive deficit 2	
Cerebral tumour .. 7	Parkinsonism .. 1	
Head injury .. 7	G.P.I. .. 2	
Arteriosclerosis .. 6	Cerebral syphilitic 1	
Senile degeneration 3	Paget's disease .. 1	
Pre-senile states .. 1	Myoclonus .. 2	
Bromide intoxication 1	Unknown lesions 3	
Delirium tremens .. 1		
Paranoia		3
Schizophrenia (including paraphrenia)		13(2)
Psychopathic personality (including sexual deviation)		43(5)
Psychosomatic conditions (other than psychoneurotic)		79(7)
No psychiatric abnormality found		24(1)

Fifty-seven of these patients (the diagnoses are given in parentheses in the above table) were admitted to psychiatric beds in the General Infirmary at Leeds, being dealt with among general medical patients in the ordinary wards, under conditions no different from those applying to any other type of illness. The following are reasons for admission: (1) For physical examination and investigation. (2) For psychiatric observation, or more detailed psychological examination than was possible as an out-patient. (3) For specific treatment, such as E.C.T., abreaction, stabilization of analeptic therapy, and so forth. (4) To give relief from an acutely dangerous or unfavourable environment. (5) To assist in establishing a psychotherapeutic role on the part of the physician. (6) To allow of continuity of treatment when a patient had been investigated in a medical or surgical bed and it was not possible to keep him there as long as would be desirable for his further psychiatric investigation or treatment. (7) For convenience, because attending from a considerable distance and more than one interview was required.

Admission for Physical Investigation

This is usually a straightforward issue when a patient presents with a symptom which may be connected with a disorder of mechanism. There are a number of subjective complaints which are particularly apt to be misunderstood: common examples include tiredness in anaemia; shoulder

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