Treatment of Essential Neuralgia of the 9th Nerve  
by Selective Tractotomy

Zdeněk Kunc, M.D.
Neurosurgical Clinic, Charles University, Prague, Czechoslovakia

Essential neuralgia of the 9th nerve is much less frequent than that of the 5th nerve. The associated suffering, however, is much greater than that with trigeminal neuralgia; eating and even the swallowing of liquids produces new neuralgic attacks.

There are few reports of large groups of cases. Parsons operated upon 15 patients during a period of 25 years, and Olivecrona operated upon only 2 patients in 13 years.

The most generally used method of treatment is intracranial section of the glosso-pharyngeal nerve. It is little known that spinal tractotomy offers perfect relief from 9th nerve pain. This procedure was inspired by the findings of Brodal in 1947. In 4 cases, in which Torkildsen had performed tractotomy for trigeminal neuralgia, he also found analgesia in the area served by the 7th, 9th and 10th nerves. These findings were confirmed and utilized for relief of pain in appropriate cases of malignant tumors. Sweet made a similar observation in 1942 and 1943; in 1944 and 1945 he performed trigeminal tractomies in cases with 9th nerve neuralgia caused by tumor. Tractotomy was not recommended for essential neuralgia where intracranial section of the nerve was still considered a much safer and simpler method.

In 1954 when we performed our first spinal trigeminal tractotomy for essential glosso-pharyngeal neuralgia we could find no comparable report. In 1961, Bues published an account of 7 operated cases.

The success, possibly by chance, of our first case stimulated our interest in the problem of the exact relation of the 9th nerve pathways to those of the spinal trigeminal tract.

In 1897, Ramón y Cajal was the first to find in the cat fetus and in newly born mice that a small bundle of afferent fibers of the 9th and 10th nerves enters the spinal trigeminal tract and forms approximately one sixth or one seventh of its dorsomedial part. Other anatomists have made similar mammalian observations that include the 7th as well as the 9th and 10th nerves. These findings were not generally known. Freeman in 1927 was the first to observe that some bundles of 9th and 10th nerves enter the spinal trigeminal tract in the human fetal brain. Clinical observations had already demonstrated that trigeminal tractotomy affects the pain pathways of these nerves, but the precise location of their fibers was not known. In the published anatomies of the human central nervous system either they are not mentioned, or the spinal trigeminal tract is considered to be a common somesthetic bundle of all head nerves. Electrophysiological methods could not solve this problem because of the rich synaptic connections between all these nerves. Operative observation placed the pain fibers of the 7th, 9th and 10th nerves in different parts of the spinal trigeminal tract. It appeared that these pathways were part of the trigeminal tract and that, to interrupt them, the whole tract would have to be cut.

Our experience conflicted with this assumption. We, therefore, tried to solve the problem in three ways: by stimulation during trigeminal tractotomy, by careful charting of sensation after tractotomy, especially after partial tractotomy, and finally by animal experiments. We came to the conclusion that in man the pain fibers of the 7th, 9th...
Selective Tractotomy for 9th Nerve Neuralgia

FIG. 1. Diagram of the location of the pain and temperature fibers of the 7th, 9th and 10th nerves in the medulla oblongata in accordance with our operative and postoperative observations.

and 10th nerves form a distinct bundle, running between the Burdach bundle and the trigeminal tract (Fig. 1). We suggest calling it the "Tractus spinalis nervi facialis, glossopharyngici et vagi communis."

The precise course of this bundle has been established by simple light mechanical stimulation with a thin needle especially constructed for this purpose and guided by the use of binocular lenses. The patient feels slight pain and localizes it in the auditory passage, the pharynx or the tonsil. Stimulation of the lateral portion of this small tract evokes pain in the area served by the 3rd division of the 5th nerve. Stimulation of the medial portion causes pain over the area innervated by the 2nd cervical spinal root. The fibers of the 9th and 10th nerves are located either directly on the surface of the medulla oblongata, or slightly deeper, where they may overlap the fibers of the 3rd trigeminal division. The fine traces of stimulation pricks, clearly visible under the binocular lens, indicate the extent of the tractotomy needed. Its painlessness and precision can be ensured by infiltration of the tract with 0.05–0.1 ml. of 1 per cent procaine. This method of anesthesia, since it is performed at the level of the medulla oblongata, is without danger.

Our study made selective tractotomy practical. It can be successful if one inserts a narrow scalpel at the margin of the Burdach bundle and spinal trigeminal tract to a depth of 2 mm. at the most, and about 12 mm. above the 2nd cervical root level. This procedure cannot produce undesirable neurological damage. The spinocerebellar, spinothalamic and pyramidal pathways are far from the incision in the tract. There is usually no effect on the Burdach bundle; occasion-
ally there is disturbed sensory perception around the earlobe. If the section penetrates the trigeminal tract, the resulting analgesia involves the 3rd division only.

Within a period of 10 years we have used spinal tractotomy in 15 patients suffering from essential neuralgia of the 9th nerve, 7 patients with combined neuralgia of the 3rd trigeminal division and the 9th nerve, and 9 patients with tumors in areas innervated by the 9th and 10th nerves.

**Case Histories**

*Six patients who had successful selective tractotomies for essential 9th nerve neuralgia.*

**Case 1.** This 57-year-old man had suffered for 3 years from severe pains in the left tonsil, spreading into the neck. Eating always caused severe attacks and regularly evoked tachycardia with a pulse rate as high as 200/min.

**Examination.** There were no abnormalities in the throat. Neurological findings were normal. The heart was slightly enlarged. Roentgenological examination showed a massive left ventricle, and elongated aorta. An electrocardiogram revealed signs of diffuse hypoxia of the myocardium.

**Operation.** On January 24, 1958, laminectomy of C1 was performed under local anesthesia. The zone of pain pathways for the 9th nerve was found to be so broad that it also covered a large part of the fibers of the 3rd trigeminal division. Tractotomy was performed at the boundary of the Burdach bundle and spinal trigeminal tract, about midway between the obex and the 2nd cervical root.

**Postoperative Course.** After the operation the patient could again speak and swallow without pain. There was complete left-sided analgesia of the dorsal third of the tongue, the tonsil and the pharynx; the trigeminal region and the auditory passage had normal sensation. The patient had no secondary neurological changes. There was no longer any evidence of paroxysmal tachycardia.

**Case 2.** This 66-year-old woman had suffered for 4 years from severe paroxysms of pain on the left side of the throat, spreading to the root of the tongue and into the ear. The occurrence of the pain, especially at night, was constantly increasing.

**Examination.** The findings in the throat and tonsil were normal. There was areflexia in all extremities with disturbed deep sensory perception in the legs.

**Operation.** On October 26, 1961, laminectomy of C1 under local anesthesia was performed. By stimulation at a level 15 mm. above the C2 root, the 3rd division of the 9th nerve and, medially to it, the fibers of the 9th and 10th nerves were located. Tractotomy was performed in such a way that it only slightly affected the Burdach bundle and the 3rd trigeminal division. The result was checked during the procedure; the patient was given cold water, which she could drink without pain.

**Postoperative Course.** After operation there was a narrow strip of left-sided analgesia in the region innervated by the 3rd trigeminal division, analgesia in a small area of the left earlobe and behind and below it on the neck, and analgesia in the sensory region of the 9th nerve on the left side (Fig. 9).

Analgesia in region of the 3rd trigeminal division disappeared later. It remained only in the throat, the tonsil and around the earlobe. The patient was completely without complaint.

**Case 3.** This 81-year-old woman had suffered from paroxysms in the root of the tongue and on the tonsil on the left side, commencing in May, 1962. A resection of the styloid process did not relieve the patient of pain.

**Examination.** There were no pathological changes in the throat or the tonsil. A neurological examination gave normal findings. There were no abnormalities in the somatic state except for the manifestations of old age.

**Operation.** On November 23, 1963, a left side hemilaminectomy of C1 and a small craniotomy of the margin of the foramen magnum were performed under local anesthesia. Stimulation in the dorumedial part of the tract evoked pains in the ear, throat, and behind the earlobe. Collaboration with the patient was very difficult owing to her age. A small tractotomy on the boundary of Burdach’s bundle and the trigeminal tract was performed.

**Postoperative Course.** Immediately after operation there was great relief from pain. Two years later she reported that she was completely without painful attacks. At the site of former pains she perceived pressure but could swallow and speak without pain. Examination revealed hypalgesia on the left side of the pharynx and tonsil, vague hypalgesia of the 3rd trigeminal region, and normal sensation in the auditory passage. Owing to her age it was necessary to evaluate all data with reservations.

**Case 4.** This 57-year-old man had suffered for some years from paroxysmal attacks of pain, which spread from the root of the tongue to the left ear. They were so severe that he could not drink, eat or speak, and even thought of suicide. In addition to this he had a grave disturbance of hearing.
Selective Tractotomy for 9th Nerve Neuralgia

Case 2. Selective tractotomy of the fibers of the 9th nerve. Analgesia in the distribution of the 9th nerve, part of the 2nd cervical nerve (ear) and a narrow strip innervated by the 3rd division of the trigeminal nerve (which later disappeared).

Examination. There were no abnormalities at the site of pain nor in the neurological findings. Roentgenograms of the skull and cervical spine disclosed no pathological changes. The patient was almost totally deaf. Compensated cardiosclerosis was found, with stenocardial complaints. Laboratory examinations revealed no abnormalities. The blood pressure was 170/100. There was sclerosis of the retinal vessels of the 1st and 2nd degree.

Operation. On November 11, 1963, a laminectomy of C1 was performed under local anesthesia. There was arteriosclerosis of the spinal cord vessels. Stimulation in the medial part of the trigeminal tract at a level 10 mm. above the first filament of C2 evoked pain in the ear, in the region served by the third trigeminal division, but not in the throat. Owing to his deafness, it was not possible to speak with the patient and therefore it was necessary to write questions in order to obtain information about the effects of stimulation. A very small tractotomy on the boundary of the Burdach bundle and trigeminal tract was performed. We anticipated that the fibers of the 3rd division had been partially cut.

Postoperative Course. Immediately after operation analgesia was found in the left side of the throat, on the tonsil, in the external auditory passage and to a small extent in the distribution of the third trigeminal division. At follow up in October, 1964, the patient was completely relieved of pain. At the site of former pains he had a sensation of cold.

Case 5. This 57-year-old man had suffered attacks of typical glossopharyngeal neuralgia for 10 years, more frequent during the last 3 years. Pains were severe, spread from the right tonsil to the ear, and were provoked by speaking and swallowing. Their frequency increased so that they occurred many times every day. All therapy had been unsuccessful.

Examination. The right tonsil was normal, but sensation was a little decreased. The somatic and neurological examinations revealed no abnormality.

Operation. On June 12, 1964, laminectomy of C1 and partial craniotomy of the margin of the foramen magnum were performed under local anesthesia. Stimulation of the medial part of the
trigeminal tract on the right side, 4 mm. below the obex, evoked pain in the distribution of the third trigeminal division and in the ear. A small tractotomy was performed close to the Burdach bundle. The patient reported that he felt pain on the tonsil during the sectioning.

Postoperative Course. After operation there was analgesia in the region of the right 9th nerve, but perception of pain in the auditory passage and in the whole trigeminal innervation region was preserved. The patient could eat and drink. The severe attacks of pain disappeared, but a slightly painful sensation on the tonsil remained and gradually increased. The patient evaluated this pain as one quarter of that in the preoperative state. Because of his request to be completely relieved of pains, a second operation was performed 12 days after the first one, and the tractotomy was deepened. Two months later he was permanently relieved of pains. The tonsil felt as if it were swollen. There was analgesia in the region of the 9th nerve and normal sensation on the face and in the ear.

Case 6. This 66-year-old man had had neuralgic attacks in February, 1961, lasting for 4 weeks. The pain was in the left tonsil and was provoked by swallowing. The pains disappeared but returned again in 1962 for a period of 10 weeks. In March 1964 the pains recurred and spread to the ear and the temporomandibular joint. In addition, pains appeared in the neck. Movements of the head, especially bending to the left side and backwards, provoked the neuralgia. At the peak of some painful attacks the patient lost consciousness and suffered grand mal seizures. He was then having about 30 attacks a day. Conservative treatment was without effect. In order to be able to swallow he had to bend his head forward. Finally it was possible to provoke the neuralgia by even a slight touch behind the earlobe.

Examination. The patient was exhausted, and had lost much weight. There were no abnormal findings in the tonsil or pharynx. The arch of the palate on the left side was slightly lower and, when putting out his tongue, the uvula and tongue deviated slightly to the right side. The cervical spine was rigid. There was chronic glaucoma and asthmoid bronchitis. Roentgenograms of the cervical spine showed a kyphosis and narrowing of the intervertebral disc C5/C6. The blood pressure was 135/80. Laboratory findings were normal.

Operation. On September 15, 1964, a hemilaminectomy at C1 on the left side was performed under local anesthesia. At a level 4 mm. above the C2 root on the margin of the Burdach bundle and trigeminal tract stimulation provoked pain in the ear, throat, face and shoulder. This region was anesthetised with 0.01 ml. of 1 per cent procaine and then cut.

Postoperative Course. The patient was permanently without pains. He could swallow and speak. He had analgesia in the distribution of the 9th nerve and normal sensation in the face and auditory passage.

Results

All 6 patients operated for essential glossopharyngeal neuralgia by selective tractotomy were cured of neuralgia. Tractotomy was repeated in one of them within 12 days since the analgesia was not complete. One patient has been followed for 6 years, 2 for 3 years, 1 for 1 year, and 2 for a few months.

Four of the patients have analgesia only in the area of the 9th nerve and one in the external auditory passage as well. One patient had in addition a narrow strip of analgesia in the distribution of the 2nd cervical nerve around the earlobe and in the distribution of the 3rd trigeminal division, which later disappeared.

Tractotomies were performed at different levels below the obex, the lowest being 4 mm. above the C2 root. The analgesia obtained in Case 6 suggests that the pain pathways of the 7th, 9th, and 10th nerves descend to the lowest parts of the spinal trigeminal nucleus.

The disappearance of paroxysmal tachycardia in Case 1 can also be explained by tractotomy. This was apparently related to the neuralgic paroxysm which stimulated the carotid sinus or the vegetative cervical ganglia via the fibers of the glossopharyngeal nerve.

In Case 6 there was a trigger zone in the area innervated by the second cervical spinal root behind the earlobe. Neuralgic attack was provoked by touching this region or by bending the head. This fact suggests connections between the glossopharyngeal pathway and the posterior columns of the spinal cord. Stimulation of the carotid sinus by neuralgic attacks could explain the unconsciousness and grand mal seizures during some attacks.

Since submitting this paper for publication we have succeeded with selective tractotomy in a 7th patient with essential glossopharyng-
geal neuralgia. After operation he had analgesia in the throat, on the tonsil and in the auditory passage and a very slight hypalgesia in the trigeminal area.

The question arises as to why analgesia was achieved mostly in the 9th nerve and not in the 10th and 7th nerves as well. This could possibly be explained by the topography of the fibers. Doubtless they are stratified on the circumference of the oblongata in the same way as Hyndman and Epps have described for the spinothalamic tract. If they are situated from dorsal to ventral in the sequence 10th, 9th, 7th and 5th, then the pathway of the 10th nerve is beneath the edge of the lateral nucleus of the Burdach bundle and can escape section, particularly if the scalpel is not inclined to the midline.

Discussion

Selective tractotomy of the pain fibers of the 7th, 9th and 10th nerves has many advantages when compared with section of these nerves intracranially.

In the first place, as a spinal procedure it is much safer and less demanding than an operation in the posterior fossa. This is of great importance, as the majority of patients with neuralgia caused by tumors and also with essential neuralgia, are not the best operative risks. The best proof of the lack of severity of selective tractotomy is the fact that we carried out this procedure regardless of the age of the patients. Three patients were operated upon at 57, 2 at 66 and 1 at 81 years of age and none of these had any operative or postoperative complications.

Selective tractotomy is more definitive and at the same time more physiological than the section of the nerve. Tractotomy can eliminate pain in the distribution of all these nerves without disturbing their other functions. Section of the 9th nerve itself may result in loss of taste of bitter flavors, a sense of dryness in the mouth, paralysis of the soft palate and disturbed swallowing and anesthesia in the throat. After the interruption of the glossopharyngeal nerve, a resistant, almost untreatable anesthesia dolorosa may occur. After spinal tractotomy this complication has never been reported.

The 10th nerve often participates in glossopharyngeal neuralgia. Dandy always recommended in neuralgia of the 9th nerve that the 10th nerve be partially cut also. His requirement is perfectly fulfilled by tractotomy, without endangering the fibers of the nervus recurrens.

Tractotomy is very suitable in cases where the pain involves distribution of the 3rd trigeminal division as well as that of the glossopharyngeal.

It is hardly necessary to discuss the relative value of tractotomy in bilateral neuralgia of the 9th nerve because bilateral nerve section would result in grave functional disturbance.

Selective tractotomy of the 7th, 9th and 10th nerves is suitable in cases of neuralgia in the auditory canal. Sometimes it is difficult to decide which of these nerves is primarily involved. These neuralgias have been treated by section of nervus intermedius or by direct section of the chorda tympani, or at other times by cutting the 9th nerve or its branch, nervus Jacobsoni, and again even by section of all 3 nerves in the posterior fossa.

Anatomically different sources for the neuralgia may have the same symptomatology. Selective tractotomy simplifies the problem, as the fibers of all nerves are interrupted.

Summary

1. The pain fibers of the 7th, 9th, and 10th nerves run in the medulla oblongata as a well defined fascicule between the Burdach bundle and the spinal trigeminal tract, as low as the most caudal portion of the nucleus of that tract (subnucleus caudalis).

2. Selective tractotomy has been used on 15 patients with essential 9th nerve neuralgia, and on 7 patients with combined neuralgias involving the 3rd division of the 5th nerve as well as the 9th.

3. The last 6 cases with essential 9th nerve neuralgia have been relieved of pain by selective tractotomy. There have been no neurological sequelae other than the anticipated
analgesia. The case histories are reviewed and the operative technique described.

4. Selective tractotomy of the 7th, 9th, and 10th nerves is a more definite and physiological procedure than the section of nerves in the posterior fossa.

5. Even very old and debilitated patients may be subjected to this procedure safely. There have been no operative or postoperative complications.

The author gratefully acknowledges the drawings by Mr. V. Mašková and photograph by Mr. L. Slavík.

References


