DECOMPRESSION OF THE TRIGEMINAL ROOT

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In a preliminary communication12 decompression of the trigeminal root was described as a treatment in trigeminal neuralgia. The paper reported the results in 10 cases with a very short follow-up. Since then this method has been used almost regularly in cases of trigeminal neuralgia in Copenhagen, and it has been introduced too in a number of clinics in other countries.

Up to the present the procedure has brought both some satisfaction and some disappointment. The disappointment has been that in some of the patients, as was apprehended in the first communication, the pain has recurred and a re-operation has been necessary. The satisfaction has been that the risk of this operation seems to be rather small in a larger series and that the procedure seems to be useful also in other hands.1,3,5–11,13

However, in some of the clinics where this surgical procedure has been tried, there has been doubt about certain technical details of the operation, and the technique has been modified.1,5,6,9–11,13

It is therefore felt justifiable to describe here the details of the technique used and to report on further experiences with the operation, with a warning against too much enthusiasm, as follow-up has shown that recurrence of the pain has occurred in at least some of the patients. It will be necessary to follow the patients for a long period before the actual percentage of recurrences can be established. It is felt that it still is too early to advocate this surgical procedure as one that should be used as a standardized operation at present.

THE MATERIAL

Up to July 1, 1953 a total of 76 patients have been treated in Copenhagen by decompression of the trigeminal root (Table 1).

The patients may be divided in three groups: (1) those with lightning-like shooting pain called typical trigeminal neuralgia, (2) those with the same kind of pain but who have besides this a more constant burning pain called atypical trigeminal neuralgia, and (3) those showing no tic pain but a more constant burning pain in some part of the face, called atypical facial pain.

The difference, if any, in etiology and pathogenesis between the diseases of the first two groups is small. Both groups suffer from what is usually called trigeminal neuralgia, and the results of the decompressive treatment indicate that the diseases in these two groups are related. On the other hand,

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there are other differences in these two groups. In the second group, for instance, the percentage of men, the percentage of left-sided pain, and the percentage of what has been called “pre-operative spontaneous hypesthesia” seem to be higher than in the first group. The third, rather heterogeneous group seems to differ from the first two groups in regard to etiology, as indicated by the results of the treatment.

All patients except one were suffering from pain at the time of admission to the neurosurgical department. More than half of the patients had been treated previously with alcohol, exeresis, or electrocoagulation of the peripheral branches of the trigeminal nerve. Consequently some of the patients presented slight hypesthesia following this treatment, but other patients had “pre-operative spontaneous hypesthesia,” i.e. slight hypesthesia in some part or another of the face, which was not caused by previous treatment. Two patients had been treated previously by partial trigeminotomy.

The patients in the first two groups were selected in no special way for operation. Practically all patients suffering from trigeminal neuralgia admitted to the neurosurgical departments in Copenhagen within the last 2½ years.

<table>
<thead>
<tr>
<th>Material</th>
<th>Typical Trigeminal Neuralgia</th>
<th>Atypical Trigeminal Neuralgia</th>
<th>Atypical Facial Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients (76)</td>
<td>43</td>
<td>27</td>
<td>6</td>
</tr>
<tr>
<td>Men (32)</td>
<td>15</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>Women (44)</td>
<td>28</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Average age</td>
<td>60 yrs. (29–79 yrs.)</td>
<td>56 yrs. (34–73 yrs.)</td>
<td>42 yrs. (39–63 yrs.)</td>
</tr>
<tr>
<td>Average duration of symptoms</td>
<td>7 yrs. (2 mos.–23 yrs.)</td>
<td>7 yrs. (1 mo.–25 yrs.)</td>
<td>11 yrs. (1–30 yrs.)</td>
</tr>
<tr>
<td>Right side</td>
<td>29</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Left side</td>
<td>11</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Both sides</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>1st branch</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2nd branch</td>
<td>5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>3rd branch</td>
<td>9</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1st + 2nd branches</td>
<td>9</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1st + 3rd branches</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2nd + 3rd branches</td>
<td>15</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>1st + 2nd + 3rd branches</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Previous peripheral treatment</td>
<td>28</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Previous trigeminotomy</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Pre-operative “spontaneous”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hypesthesia</td>
<td>7</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>hemihypesthesia</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
have been treated by decompression. The diagnosis in some cases may be
difficult, and perhaps it has been wrong in some few cases in this series.

TECHNIQUE

The patients in this series have been treated in three different ways:
(1) by temporal-intradural approach, (2) by temporal-extradural approach,
and (3) by cerebellar-intradural approach. Most of the patients have been
operated on by the author, some of them by other surgeons.

*The temporal-intradural approach* has been the standard method. Local anesthesia
is used, usually with some Pentothal. The patients are placed on the back in a hori-
zontal position with the head turned to the side. No hypotensive drugs are used and
no lumbar puncture is performed.

The operation is performed through a vertical incision in the temporal region
reaching the zygomatic arch and a small triangular craniectomy, about 1½"×1⅔", just
above the base of the skull, the temporal vessels being ligated and the soft tis-
sues drawn apart with a self-retaining retractor. For a time the foramen spinosum
was plugged extradurally, but now the author feels that the bleeding is about the
same during the opening of the cavum Meckelii without this procedure, and in the
last some 40 cases the foramen has not been plugged.

The dura mater is opened by a T-shaped incision and the wings of the cut dura
mater are fixed to the muscle with a couple of stay sutures. The surface of the brain
is covered by pieces of cotton and the temporal lobe is elevated from the base of
the skull with a ribbon retractor. At the same time the head is lowered. Generally the
veins running from the temporal lobe to the dura mater can be avoided, but in 20
cases in this series it has been necessary to cut one or more of the veins, which in no
instance caused any postoperative complications.

The dura mater in the middle fossa is palpated with a forceps. Posteriorly the
tentorium feels soft, and just in front of this the superior petrosal sinus is seen at the
edge of the petrous part of the temporal bone. In some cases the superior petrosal
sinus is very small and difficult to observe. The cavum Meckelii usually can be very
easily located as the most lateral part of the middle fossa where the dura mater is
not tightly bound to the base of the skull but soft and yielding to the palpating
instrument—just in front of the superior petrosal sinus.

With a sharp knife and scissors the dural roof of the cavum is opened widely.
Care must be taken not to injure the root-fibres and not to incise the cavernous
sinus, which is directly medial to the cavum. If this happens, the lesion of the sinus
may be plugged with gel-foam. The incision over the cavum is continued posteriorly
above the trigeminal root through the superior petrosal sinus, which is divided be-
tween clips. For this purpose special scissors and clips-forceps are used, called Olive-
crona's tentorium scissors and clips-forceps.* The bleeding from the sinus in some
cases may be difficult to control, but diathermy should not be used. The diatherm
is practically never used by the author at the base of the skull during this operation,
as he feels it is important not to do so. There have been two cases of facial palsy
following the use of diathermy in this region.

In most cases the tentorium then has been divided to its free edge, but attention
must here be drawn to the trochlear nerve, which lies close upon the free edge of the
tentorium and disappears into it just behind the superior petrosal sinus. Therefore,

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* Made in Sweden by Stille.
the incision through the tentorium just behind the sinus should be made in a direction that is posterior and a little lateral for some centimetres and then turned medially to the edge. Even a very slight pull upon the nerve may cause a trochlear palsy.

At a re-operation upon one of the patients, who had recurrence after a decompression of the trigeminal root, it was found that the posterior angle of the tentorial incision, which in this case had not been continued to the free edge of the tentorium, had retracted in a forward direction since the first operation, and now was pressing upon the trigeminal root. The incision then was enlarged to the free edge, and the patient was free from pain. Therefore, as far as the author can see, an important advantage of the intradural approach is that one can cut the tentorium and in this way perhaps diminish the risk of recurrence. By the extradural approach it is difficult to cut back farther than the sinus. The author also feels that visualization is better by the intradural method, and that bleeding is less and more easily controlled. However, he has only seen the extradural approach used by others and has never tried it himself.

The temporal-extradural approach in many clinics has been the method of choice, but in this series it was used in only one patient. As in the Frazier operation, the dura mater was stripped from the base of the skull to the middle meningeal artery, which was cut. The dura mater covering the trigeminal ganglion and the root was incised to the superior petrosal sinus, which was divided between clips. The dura mater between the root and the brain was incised just in front of the sinus in order to place the clips at the sinus.

The cerebellar-intradural approach. In some patients with trigeminal neuralgia in this series, suspected to have tumors in the cerebellopontine angle, a cerebellar approach was performed, but no tumor was found. The approach was the same as Dandy used for trigeminotomy. An attempt then was made to cut the superior petrosal sinus and to perform a decompression of the trigeminal root by this approach, but it appeared to be very difficult and dangerous and did not succeed. A hook then was put into the porus trigemini—i.e. the opening where the root leaves the cavum Meckeli—and an attempt was made to enlarge the porus a little in different directions in order to free the root from possible adhesions. Although no real decompression was performed in the 5 patients treated in this way, they were all free from pain after the operation, and the sensibility was normal.

Re-operations have been performed in 5 patients with recurrence of pain. At the first two re-operations the root was cut. The third case was the one mentioned above, in which the posterior angle of an incomplete tentorial incision was seen to press upon the trigeminal root. Consequently a better decompression was made. At the last two re-operations no explanation of the recurrence of pain was found. The root was covered by a thin new-formed membrane and surrounded by liquor from the neighbouring cistern. A new decompression was made with special care of the lateral part of the root in the porus trigemini. Postoperatively the patients became free from pain.

RESULTS

Typical and Atypical Trigeminal Neuralgia. In one patient (Table 2) the operation had no or very little effect. On recovery from anesthesia 7 patients for few days had some pain similar to the pre-operative pain. This happened
Results

<table>
<thead>
<tr>
<th></th>
<th>Typical Trigeminal Neuralgia</th>
<th>Atypical Trigeminal Neuralgia</th>
<th>Atypical Facial Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>43</td>
<td>27</td>
<td>6</td>
</tr>
<tr>
<td>Type of operation:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporal-intradural</td>
<td>42</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>Temporal-extradural</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cerebellar</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow-up after operation</td>
<td>3–27 mos.</td>
<td>1–21 mos.</td>
<td>11–20 mos.</td>
</tr>
<tr>
<td>Average follow-up</td>
<td>13 mos.</td>
<td>9 mos.</td>
<td>14 mos.</td>
</tr>
<tr>
<td>No effect</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Recurrences</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Few minor attacks</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Some uncharacteristic pain</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>No pain</td>
<td>33</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Re-operation with trigeminotomy</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Re-operation with decompression</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

especially in the early cases of the series, in which the operations occasionally were troublesome and some contusion of the root may have occurred.

The remainder of the patients with trigeminal neuralgia were free from pain on recovery from anesthesia. Nine of the 17 patients with “pre-operative spontaneous hypesthesia” had normal sensation in the previously hypesthetic area after the operation, which may indicate that the “spontaneous hypesthesia” and perhaps the neuralgia had been caused by a slight compression of the trigeminal root.

At follow-up, which still is short, 4 patients have presented real recurrences of tic pain, usually with the same localization as pre-operatively, so that a re-operation was needed. The recurrences in these 4 cases arose 9 months, 9 months, 5 months, and 2 weeks after the first operation. Three patients have had a partial recurrence of pain 18 months, 2 months, and 2 days after the operation, but in 2 of these cases pain soon disappeared again. Some patients have had a few minor attacks of tic pain, but no further treatment has been necessary. Some other patients have presented uncharacteristic pain and sensations in the face, but only one needed treatment (vitamin B12).

Atypical Facial Pain. The decompression of the trigeminal root was developed as a treatment for trigeminal neuralgia. For another group of patients, those with atypical facial pain, no satisfactory treatment is available. It therefore was felt reasonable to try decompression of the trigeminal root in some of these patients. The results, however, were disappointing in nearly all cases. In some of them the operation, just as many other kinds of treat-
ment in these patients, brought about a temporary release, after which the pain recurred. Only one patient with atypical facial pain in this series—and recently one more—were relieved of pain. Both were young women who presented what is usually termed supra- and/or infra-orbital neuralgia, i.e., a constant burning pain localized on one or both sides to the areas of the supra- and infra-orbital nerves with local tenderness of the nerves. The first of these patients, who was operated upon 1 year ago, had pain on both sides, and both sides were decompressed, since previously alcohol injections in the nerves had had good effect for some time. These are the only 2 patients with supra- and infra-orbital neuralgia who were treated by decompression. Another patient in this group had probably a zoster neuralgia. He was the only elderly person in this group.

**COMPLICATIONS**

Usually the patients stand the operation well. In most cases they are sitting up in bed the day after operation, and on the third day they are out of bed.

In 2 patients auricular fibrillation developed postoperatively; it was controlled by digitalis. These were the only severe postoperative complications pertaining to the general condition of the patients.

The most common complication has been severe headache for some time. Another common complication has been palsy of the troclear nerve, which occurred in 15 patients. In by far the greatest number of these the palsy disappeared after a couple of months; in some cases it persisted for more than half a year before receding, and in a couple of cases it has remained stationary.

The patient operated upon by the extradural approach presented a postoperative trigeminal anesthesia which disappeared within some time. Four more patients have shown some hypesthesia after the operation.

In 2 cases in which diathermy had been used at the base of the skull there was a transitory palsy of the facial nerve.

In 1 patient a transitory aphasia developed. He had been operated upon several years earlier with partial trigeminotomy by an extradural temporal approach. He then had recurrence of his tic pain and a decompression by the intradural approach was performed. The temporal lobe was markedly adherent to the dura mater at the base of the skull, and some contusion of the lobe was unavoidable. This case shows that even an extradural approach may cause subdural adhesions from contusion of the temporal lobe. It is therefore doubted by the author that the extradural approach is more safe than the intradural, as has been suggested by others. Finally one patient had slight paraphasia for some days; no veins passing from the temporal lobe to the base of the skull had been cut in this case.

**SUMMARY**

Further experiences with decompression of the trigeminal root are presented together with some remarks on the surgical technique.
DECOMPRESSION OF THE TRIGEMINAL ROOT

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