Percutaneous retrogasserian glycerol rhizotomy for treatment of trigeminal neuralgia

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The treatment of trigeminal neuralgia by percutaneous retrogasserian glycerol rhizotomy was assessed in a series of 58 patients with a follow-up period ranging from 2 to 40 months postoperatively. All patients were considered medical failures prior to the procedure. Idiopathic trigeminal neuralgia was the diagnosis in 54 patients, and four patients had trigeminal neuralgia associated with multiple sclerosis. Forty-two patients (72%) reported complete relief from the procedure and are taking no medications. Four patients (7%) are much improved and require only minimal drug therapy. Twelve patients (21%) were considered treatment failures. The recurrence rate after initial relief of symptoms was 11%. Ten patients (17%) noticed a mild decrease in facial sensation following the procedure, and one additional patient had a profound sensory loss including loss of corneal reflex. The authors conclude that, while percutaneous retrogasserian glycerol rhizotomy may be useful in the treatment of trigeminal neuralgia, more clinical series and documentation of recurrence rate and complications are needed before any firm conclusions can be reached as to the efficacy of this therapy.

KEY WORDS • glycerol • rhizotomy • trigeminal neuralgia
Glycerol rhizotomy for trigeminal neuralgia

Wave stimulation (50/sec) helped to localize the electrode tip at the desired division of the trigeminal nerve. If we encountered cerebrospinal fluid, the patient was placed in a sitting position and 0.3 ml of pure glycerol was injected. The last 18 patients underwent metrizamide cisternography through the same route using a No. 20 spinal needle as originally described by Håkanson. Once the cistern was entered, the patient was placed in a sitting position with the head flexed. Metrizamide (0.3 cc of 300-mg iodine/ml dye) was then injected into the cistern and a lateral skull x-ray film was obtained. This was performed to ensure that the needle was in the cistern and to give an estimate of the size of the cistern. The patient was then placed supine again in order to allow the metrizamide to run out of the cistern. The patient was then sat up once again and 0.2 to 0.4 cc of 100% glycerol was injected into the trigeminal cistern; the actual amount depended on whether the cistern was judged to be large or small and whether the first division of the trigeminal nerve was involved. The needle was then immediately withdrawn, and the patient was instructed to remain sitting for 1 to 2 hours with the head slightly flexed.

Treatment Results

The results are shown in Fig. 1. Forty-two patients (72%) reported complete relief of pain and are taking no medications. This group includes five patients who had a repeat glycerol injection, either for a technical failure on the first attempt (two patients) or for recurrent pain (three patients). The pain recurred in less than 3 months in all three patients. Four patients (7%) are much improved, but still have occasional pain and are receiving carbamazepine. Twelve patients (21%) were considered treatment failures. Ten patients had no relief from this procedure, and subsequently underwent either a radiofrequency rhizotomy (eight patients) or a vascular decompression (two patients) for relief of their pain; three of these patients had trigeminal neuralgia associated with multiple sclerosis. Two additional patients had complete pain relief for 11 and 26 months, respectively, before recurrence. They underwent a repeat glycerol injection without relief of pain and had a subsequent radiofrequency rhizotomy to relieve their trigeminal neuralgia.

The follow-up period ranged from 2 to 40 months postoperatively with an average of 18 months (Fig. 2). Forty-two patients have been followed for longer than 1 year postoperatively.

Complications

The complications from the procedure are listed in Table 2. These include herpetic eruptions, mild hypalgesia, permanent analgesia, aseptic meningitis, and Bell’s palsy. All patients were examined within 2 months postoperatively. The mild hypalgesia has re-

![Fig. 1. Overall results in 58 patients treated with percutaneous retrogasserian glycerol rhizotomy for trigeminal neuralgia.](image1)

![Fig. 2. Duration of the follow-up period in 58 patients with percutaneous retrogasserian glycerol rhizotomy for trigeminal neuralgia.](image2)

**TABLE 1**

<table>
<thead>
<tr>
<th>Trigeminal Nerve Distribution</th>
<th>No. of Cases</th>
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<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
</tr>
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<td>3</td>
<td>13</td>
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<td>2</td>
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<tr>
<td>1, 2, 3</td>
<td>4</td>
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</tbody>
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**TABLE 2**

<table>
<thead>
<tr>
<th>Complications</th>
<th>No. of Cases</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>herpetic eruptions</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>mild hypalgesia</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>permanent analgesia</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>aseptic meningitis</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Bell’s palsy</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

*PRGR = percutaneous retrogasserian glycerol rhizotomy.
solved in most patients, and at no time was this bothersome for the patient. The 10 patients with hypalgesia experienced this in both the second and third divisions of the trigeminal nerve in a patchy distribution regardless of which distribution was symptomatic; none of these 10 patients had diminished corneal sensation. The one distressing complication has been a permanent analgesia, including loss of the corneal reflex, in one patient. At 5 months postoperatively, this patient still has had no recovery of sensation.

Bell's palsy is a rather curious complication. This occurred in a 44-year-old woman 3 weeks after the glycerol injection. Her trigeminal nerve function was totally normal. We suspect the Bell's palsy is due to herpes zoster that we may have activated with our procedure, although this patient did not have an accompanying herpetic eruption in her ear canal. We do not think the facial paralysis is due to a toxic effect of the glycerol per se, as it did not appear until 3 weeks following her procedure.

**Discussion**

The initial excitement over the use of glycerol in the treatment of trigeminal neuralgia was caused by the high success rate in relieving pain while sparing trigeminal nerve function, as well as the relative ease of the procedure. In his initial report, Håkanson cited a 60% success rate in relieving pain while sparing trigeminal analgesia in all nine patients. This procedure was repeated in one patient. At 5 months postoperatively, this patient still has had no recovery of sensation.

Another 23% of their 112 patients. Håkanson reported a 65% incidence of zones of analgesia lasting for up to 6 months after this procedure. We had a 17% incidence of mild hypalgesia and one patient with a permanent analgesia, including the loss of corneal reflex, following glycerol rhizotomy. This last complication was possibly due to an intraganglionic rather than a retrogasserian glycerol injection.

In our series, 72% of the patients have complete relief of their pain, and another 7% are well controlled with the administration of carbamazepine. This success rate is comparable to that of Lunsford and Bennett who had excellent results in 67% and good results in another 23% of their 112 patients. Håkanson reported that 65 (86%) of 75 patients were pain-free postoperatively, and five were relieved after a second injection. He later reported on 100 patients, of whom 77% were completely pain-free and 19% were doing well on medication.

Percutaneous retrogasserian glycerol rhizotomy in trigeminal neuralgia associated with multiple sclerosis failed to relieve pain in three of four patients in our series. Lunsford and Bennett reported only one poor outcome in 12 patients with associated multiple sclerosis. We do not have an explanation for the discrepancy between the two groups, and our population of four patients is too small to draw any conclusions.

Obviously, long-term follow-up results and more clinical series must be analyzed before any conclusions can be made as to the efficacy of PRGR in the treatment of trigeminal neuralgia. Lunsford and Bennett reported a 17% recurrence rate in patients followed from 4 to 28 months, and Håkanson initially reported an 18% recurrence rate in a similar follow-up period. He subsequently reported 100 patients followed for 1 to 6 years with a 31% recurrence rate. In the present series, 27 patients have been monitored for over 2 years postoperatively. There have been five recurrences (11%) in patients who initially had complete relief from their first glycerol injection.

The success rate for PRGR is somewhat lower than that reported for radiofrequency rhizotomy. Sweet was successful in relieving paroxysms of pain in all 570 patients who had dense hypalgesia in the affected trigeminal zone. Menzel, et al., described a 96.7% success rate on 315 cases. Late recurrences occur with this procedure, ranging from 15% in a 13-month average follow-up period to 28% in a 4½ to 9-year follow-up period.

Although only a few series have been published describing the use of PRGR for the treatment of trigeminal neuralgia, several conclusions can be reached. The first is that trigeminal nerve function is not spared, and a significant number of patients have a subjective loss of sensation in at least one division of the nerve. Also, the procedure carries a risk of total anesthesia in the face, and it is important that the patient know this before undergoing the procedure. Although the mechanism of action of glycerol is not fully understood, it has been shown to be a neurolytic agent causing both demyelination in large and small fibers and axolysis.

The profound sensory loss occasioned may be due to injection of the glycerol directly into the gasserian ganglion. The second conclusion is that on a short-term basis (up to 3 years) the recurrence rate reported in several studies is quite significant (between 10% and 20%), and in at least one report it was as high as 31% in 6 years.

A series of 58 patients with trigeminal neuralgia treated by the percutaneous injection of glycerol into the trigeminal cistern is reported. Our results, complications, and follow-up results are similar to those reported by others. We believe that this treatment for trigeminal neuralgia may prove to be a useful one, but a larger clinical experience and longer follow-up periods are needed before conclusions can be reached.

**References**

2. Håkanson S: Transovale trigeminal cisternography. A method for radiological examination of the trigeminal...
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