Meningitis After Percutaneous Radiofrequency Trigeminal Ganglion Lesion. Case Report and Review of Literature

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ABSTRACT

Case Report. A 79-year-old man with severe trigeminal neuralgia presented to the pain clinic, and was offered a radiofrequency trigeminal ganglion lesion. He had only partial response to the first procedure, so a second was undertaken. The following day he presented with signs of meningitis and the diagnosis was confirmed on lumbar puncture. He was treated with appropriate antibiotics, and recovered well.

Literature Review. The current literature on reports of meningitis after percutaneous trigeminal ganglion lesioning reveals an overall mean incidence of meningitis of 0.15% (confidence interval 0.10–0.21). The Scottish Intercollegiate Guidelines Network guide the decision on the routine use of antimicrobial prophylaxis, and although the risk of infection can be estimated from the literature and the severity of infection is high, the effectiveness and consequences of prophylaxis cannot be established.

Conclusion. If breach of the oral mucosa has occurred, then antibiotic prophylaxis should be administered.

Key Words. Trigeminal; Neuralgia; Meningitis; Antibiotic Prophylaxis

Introduction

Trigeminal neuralgia is a sudden, severe, brief, stabbing, recurrent pain in the distribution of one or more branches of the trigeminal nerve [1]. The incidence is 2.7:100,000 men, and 5.0:100,000 women, most commonly over the age of 50 years, although it may occur in younger patients secondary to multiple sclerosis, tumors, or vascular abnormalities. The most frequently affected branch is the mandibular division, and the pain may be spontaneous or triggered by otherwise innocuous stimuli in the area [2].

Management consists of medical treatment, percutaneous procedures using radiofrequency, glycerol, or balloon compression, focal gamma radiation, or open microvascular decompression [2].

Percutaneous techniques are undertaken when pharmacotherapy is ineffective or not tolerated, and can be performed with minimal anesthesia, thus making it suitable for most patients, who are typically elderly. In our experience, it is appropriate for a suitably trained pain physician to perform percutaneous pain-relieving techniques in a district general hospital setting as opposed to surgical techniques such as microvascular decompression that require posterior fossa surgery with associated risks, and requiring referral to a neurosurgical center.

Whichever percutaneous technique is used, the procedure requires the passage of a needle through the skin of the cheek, through the facial muscles and into the foramen ovale, risking inadvertent puncture of the oral mucosa. The procedure therefore risks introducing either skin or intraoral commensal bacteria into the cranium. Bacterial meningitis and abscess formation are recognized complications of the percutaneous procedures, although rare [3]. As a result of the
case of bacterial meningitis reported below, we
have searched the literature for the incidence of
infection, the causative organisms, and discussed
the indications for use of prophylactic antibiotics.

Case Report

A 79-year-old man presented with a 2-year history
of right-sided trigeminal neuralgia in the maxillary
branch distribution. He had not responded to
pharmacological treatment with carbamazepine,
phenytoin, or gabapentin. Infraorbital nerve
cryoablation performed by maxillofacial surgeons
failed to produce pain relief. He therefore under-
went radiofrequency thermocoagulation of the
right trigeminal ganglion as a day stay patient.

The patient was placed supine on the operating
table with the head in an extended position. Seda-
tion was given, using fentanyl and midazolam, and
the skin was infiltrated with 1% lidocaine. Under
strict aseptic conditions in a surgical environment,
the radiofrequency needle was guided into the
foramen ovale with a submental view on fluoros-
copy. Once the needle entered the foramen ovale
a lateral view was obtained and the correct posi-
tion of the needle verified. After aspiration, stim-
ulation confirmed paraesthesia in the maxillary
branch of the trigeminal nerve. No intraoral check
was performed. The lesion was then performed at
60°C for 90 seconds having first instilled a small
amount of local anesthetic.

There was a partial response to this procedure,
and radiofrequency thermocoagulation was re-
peated 1 month later. After an uneventful repeat
procedure the patient was discharged home. The
day following the repeat procedure the patient
presented to our Accident and Emergency depart-
ment complaining of severe headache, fever, and
rigors, and on examination had a temperature of
39°C, decreasing level of consciousness, and a stiff
neck. Lumbar puncture showed cloudy cerebrospi-
nal fluid with a white count of 3,200/mm³, 85% polymorphs. Pneumococci were identified on cul-
ture. The patient was treated with a 10-day course
of benzylpenicillin, and 3 days of cefotaxime, and
following a full recovery was discharged home on
day 15. The patient’s trigeminal neuralgia had im-
proved, and remains so some 3 years later.

Discussion

Radiofrequency thermocoagulation of the Gasse-
rian ganglion is a well-recognized technique to
treat trigeminal neuralgia, and was first described
by Sweet and Wepsic in 1974 [4]. Possible sources
of microbial contamination are equipment con-
tamination, lack of asepsis of the operator, inade-
quate preparation of the skin, and accidental
penetration of the needle into the oral cavity.
Meningitis has been reported as a complication of
this procedure. It can result in serious morbidity
or even mortality. In this case the causative organ-
ism was *Streptococcus pneumoniae*, which may have
been due to contamination from the oral cavity.

A literature search for causative organisms (see
Table 1) shows that they include *Streptococcus
mutans*, *Streptococcus salivarius*, *Streptococcus
gangis*, *Gemella hemolysins*, and one case of a subdural
empyema caused by *Staphylococcus aureus*. These
indicate that the most likely cause is contamina-
tion from oral commensal bacteria. Care should
be taken to avoid breach of oral mucosa, and plac-
ing a finger in the mouth before the needle is
removed from the formaen ovale should identify
any such breach. Using a skin entry point suffi-
ciently lateral to the mouth should also help avoid
the oral cavity. If antibiotic prophylaxis were to be
recommended, then the organisms to target would
be oral streptococci and related Gram-positive
cocci. Benzylpenicillin would be a possible choice.
However, the increasing emergence of penicillin
resistance in pneumococci and the superior cere-
brospinal fluid penetration of cefotaxime might
make it a better choice [9].

<table>
<thead>
<tr>
<th>Author</th>
<th>Journal</th>
<th>Organism Reported</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>2. No organism, purulent CSF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. <em>Streptococcus sanguis</em></td>
</tr>
<tr>
<td>Gocer et al. [8]</td>
<td>Acta Neurochir 1997</td>
<td>Subdural empyema due to <em>Staphylococcus aureus</em></td>
</tr>
</tbody>
</table>

Table 1 Organisms reported to cause meningitis after percutaneous radiofrequency thermocoagulation of the Gasserian ganglion
In order to determine whether antibiotic prophylaxis is warranted to prevent the complication of meningitis, we have looked at the reported incidence of meningitis (see Table 2). The largest case series is that of Sweet [10], and in 14,000 cases there were seven cases of meningitis and two cases of temporal lobe abscess. This gives an incidence of infection of 0.06%. A review of published literature by Lord and Bogduk [17] reported a range of incidences of 0.003–0.2%.

In our institution, over the last 14 years since 1990 when data started to be collected, 221 percutaneous trigeminal lesions have been performed, and the above patient is the only case of meningitis that has occurred. This gives an incidence of infection of 0.45%. Taking all the published data available reveals a total number of patients of 19,135, total number of studies 7, a total number of cases of meningitis of 28, giving a mean incidence of meningitis of 0.15% (95% confidence interval 0.10–0.21).

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The process for deciding whether or not the use of antibiotic prophylaxis is appropriate has been outlined by the Scottish Intercollegiate Guidelines Network (SIGN) [18]. They state that “the final decision regarding the benefits and risks of prophylaxis for an individual patient will depend on:

1. the patient’s risk of surgical site infection
2. the potential severity of the consequences of surgical site infection
3. the effectiveness of prophylaxis in that operation
4. the consequences of prophylaxis for that patient (e.g., increased risk of colitis).”

For percutaneous trigeminal procedures the patient’s risk of infection is low, but in the case of meningitis, the potential severity is such that prophylaxis should be considered. Points 3 and 4 cannot be answered definitively, as there is a lack of published evidence regarding both the effectiveness and consequences of prophylaxis, and the numbers required to draw statistically significant conclusions would be impossible to attain from a single institution.

On balance we would suggest that a routine check should be made of the oral cavity during every needle placement. If penetration of the oral cavity occurs, the needle should be withdrawn and a fresh needle used, avoiding the introduction of oral commensals into the middle cranial fossa. If oral cavity entry has occurred, there would be a reasonable call for antibiotic prophylaxis in view of the potential severity of this relatively rare complication.

References
4 Sweet WH, Wepsic JG. Controlled thermocoagulation of trigeminal ganglion and rootlets for differ-

### Table 2

<table>
<thead>
<tr>
<th>Author</th>
<th>Journal</th>
<th>Description of Report</th>
<th>Reported Incidence of Bacterial Meningitis</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet [10]</td>
<td>N Engl J Med 1986</td>
<td>Review citing 33 reports, 14,000 cases</td>
<td>7 cases of meningitis</td>
<td>0.05</td>
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<tr>
<td></td>
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<td>2 cases of temporal lobe abscess</td>
<td>0.014</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>9 cases of aseptic meningitis</td>
<td>0.064</td>
</tr>
<tr>
<td>Kanapolat et al. [11]</td>
<td>Neurosurgery 2001</td>
<td>Case series 2,138 procedures</td>
<td>1 aseptic meningitis</td>
<td>0.046</td>
</tr>
<tr>
<td>Nugent [12]</td>
<td>Neurosurg Clin N Am 1997</td>
<td>Case series 1,456 procedures</td>
<td>1 culture negative meningitis</td>
<td>0.068</td>
</tr>
<tr>
<td>Jho and Lunsford [13]</td>
<td>Neurosurg Clin N Am 1997</td>
<td>Case series 800 procedures</td>
<td>Aseptic meningitis 0.6%</td>
<td>0.6</td>
</tr>
<tr>
<td>Matthews and Scrivani [14]</td>
<td>Mt Sinai J Med 2000</td>
<td>Case series 258 patients</td>
<td>2 aseptic meningitis</td>
<td>0.775</td>
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<tr>
<td>Yoon et al. [15]</td>
<td>Anaesthesia 1999</td>
<td>Case series 108 procedures</td>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Taha et al. [16]</td>
<td>J Neurosurg 1985</td>
<td>Case series 154 procedures</td>
<td>None</td>
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