THE CERVICOGENIC HEADACHE: A PAIN IN THE NECK

Chronic headaches occur in about 5% of the population. One of the biggest barriers to effective treatment is that the cause of headaches is simply unknown in most cases. In the past 15 years, however, a small number of medical scientists began to suspect that damaged neck structures could cause headaches.

By Peter Rothbart, MD, FRCPC, DABPM

Chronic headaches (occurring more than 15 days a month for over six months) are not uncommon; they occur in about 5% of the population. A simple explanation of cervicogenic headache is that this headache ensues from the cervical spinal structures, such as cervical ligaments, cervical zygapophyseal joints, cervical discs and/or anulus fibrosus, and cervical muscles. The official definition of a cervicogenic headache originates from the North American Cervicogenic Headache Society and is proposed for the third edition of the International Association for Study of Pain, Taxonomy of Chronic Pain. It is defined as "referred pain perceived in any region of the head caused by a primary nociceptive source in the musculoskeletal tissues innervated by cervical nerves."

One of the biggest barriers to effective treatment of headaches in general is that the cause of headaches is simply unknown in most cases. A small percentage of cases are clearly caused by tumors or intracranial vascular damage, but the cause of the commonly diagnosed headaches such as migraines or tension-type headaches has never been ascertained.

In the past 15 years, however, a small number of medical scientists began to suspect that damaged neck structures could cause headaches. This body of knowledge has now grown, thanks largely to the work of Bogduk and Sjaastad.

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CERVICOGENIC HEADACHES

**TABLE 1**

**CLINICAL FEATURES**

<table>
<thead>
<tr>
<th>Pain</th>
<th>Typically dull or aching</th>
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</thead>
<tbody>
<tr>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>Occipital</td>
<td></td>
</tr>
<tr>
<td>Parietal</td>
<td></td>
</tr>
<tr>
<td>Temporal</td>
<td></td>
</tr>
<tr>
<td>Frontal or orbital regions of the head</td>
<td></td>
</tr>
<tr>
<td>Any combination of these regions, unilaterally or bilaterally</td>
<td></td>
</tr>
<tr>
<td>Indicators</td>
<td></td>
</tr>
<tr>
<td>Neck pain</td>
<td></td>
</tr>
<tr>
<td>Focal tenderness</td>
<td></td>
</tr>
<tr>
<td>Impaired cervical motion</td>
<td></td>
</tr>
<tr>
<td>Aggravation of the headache by neck movements</td>
<td></td>
</tr>
<tr>
<td>History of neck trauma</td>
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Blume, and more recently Gawel and Rothbart, have described their clinical experiences. Apkarian has gone on to demonstrate the anatomical connection that permits neck pain to be perceived as headache.  

**INCIDENCE: HOW OFTEN IS THE NECK INVOLVED?**
The incidence of cervicogenic headaches is unknown. This is because, until recently, the medical profession has not been aware of this entity. Physicians are not taught to consider or explore neck structures when investigating headaches. This results in a rarely diagnosed but common condition.

Approximately 800 new headache patients per year are examined at our clinic. An estimated 80% of these patients are diagnosed with cervicogenic headache (Table 1). Of these patients, almost none are referred with this diagnosis (Table 2). They are usually referred with diagnoses such as tension-type headache and migraine headache and sometimes without a correct identification of the problem.

**NECK STRUCTURE: A LOT OF NERVES**
The muscles supporting the vertebrae and attaching to the base of the skull, ligaments (anterior and posterolongitudinal ligaments together with alar ligaments), zygapophyseal joints and anulus fibrosus, are all highly innervated. The anulus fibrosus, which is the portion surrounding the soft central disc materi-
Figure 2. This diagram shows how the C1 to C3 low cervical nerves meet the trigeminal spinal nucleus. Reproduced with permission from The Pain Monitor, Spring 1992, Volume 3, Number 4.

Facial pain and head pain. One of the trigeminal nuclei, specifically the spinal trigeminal nucleus, extends caudally through the brainstem and becomes contiguous with the dorsal columns down to about the C3 level.

As the upper three cervical nerves enter the dorsal columns, their fibers synapse with the descending fibers of the spinal trigeminal nucleus. The intermingled impulses then travel to the cortex as described above. The cortex is unable to discern from which geographic area the impulses come, so impulses from the C1 to C3 neck structures are indistinguishable from trigeminal impulses. In other words, there is the classic neurologic condition of "referred pain" (Figure 1, 2).

Recently, it has been shown that painful impulses from even the lower cervical structures can also be perceived as headaches. This is probably because impulses from these structures travel cephalad to the level of C2-C3 before entering the spinal cord.

WHAT ARE THE SYMPTOMS?
There is a strict classification by symptomatology for the various types of headaches. This classification was prepared by the International Headache

Table 2
DIAGNOSTIC CRITERIA

Identification by clinical examination or by imaging of a cervical source or cause of pain known on the basis of valid, antecedent studies to be reliably associated with the genesis of head pain; or

Complete relief of head pain following controlled, local anesthetic blocks of one or more cervical nerves or structures innervated by cervical nerves.

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Society (IHS) in 1988 and is the usual guide by which "headacheologists" diagnose and compare headaches.

One of the interesting and confusing phenomena about the cervicogenic headache is that its symptoms can present as migraine headaches, tension-type headaches or even cluster headaches. This upsets the IHS classification.

Although migraine headaches are thought to arise from the brain and possibly from the brainstem's structures, many migraine headaches arise from trauma to the neck; if surgical means can be employed to stop impulses from the damaged neck structures, the migraines are relieved. The same phenomenon exists with headaches presenting the tension-type features or even cluster headache features.

Clearly then, it is important to differentiate which migraine, tension or cluster headaches arise from some intracranial cause and which arise from damaged neck structures. The approach to treatment will be very different for intracranial headaches versus cervicogenic headaches.

**STEPS TO DIAGNOSIS**

Proper diagnosis should be carried out using the standard routine of history, physical examination, and investigations.

**History.** The patient's age of onset of headaches should be ascertained and also the frequency and duration of the headaches. The relationship of the onset with any neck trauma is also very important and should raise the index of suspicion of cervicogenic headache if there is a close relationship. The character of the headache (such as throbbing, dull, constant or intermittent, etc.) should also be ascertained.

**Physical examination** always begins with a neurologic examination and especially examination of the cranial nerves to rule out space-occupying lesions or cranial nerve lesions.

When examining the neck, the degree of active flexion, extension, rotation and lateral bending should all be tested.

In cervicogenic headache, the neck is often thrust forward because this is the most comfortable position for the patient. Decrease in flexion raises suspicions of damaged cervical disc or anulus fibrosus. A decrease in extension should raise suspicions of facet joint disease.

Palpation should include the area of the greater occipital nerve. These nerves are tender in cervicogenic headaches. The paracervical and scalene muscles are usually swollen and tender in cervicogenic headaches. Palpation of facet joints can be easily learned with proper instruction. These are often tender, and very often an especially tender area is a source of the level at which the facet joint pathology resides.

**Other investigations.**

**Brain.** If a computerized axial tomography (CAT) scan of the brain has not already been done, this should be carried out to exclude space-occupying lesions.

**Neck.** Regarding x-rays, CAT myelograms and magnetic resonance imaging (MRI) of the neck, pathology can exist and not appear on the tests, which may be problematic. Alternatively, pathology may manifest itself but may be unrelated to the pathology that is causing the pain. It is well known that x-rays of many people may show degenerative spinal
CERVICOGENIC HEADACHES

SOMATIC BLOCKADE OF HEAD AND NECK

Figure 3. Greater and lesser occipital nerve block. Note the greater and lesser occipital nerve branches crossing the superior nuchal line approximately halfway between the greater occipital protuberance and the mastoid process. Superficial infiltration along this line will produce anaesthesia of the posterior scalp. The greater occipital nerve can be located by identifying the pulsations of the posterior occipital artery, which crosses the nuchal line in company with the nerve.

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changes but that patients may be asymptomatic. Thus, these tests are not always reliable for identifying the source of pain.

DIAGNOSTIC BLOCKS IDENTIFY THE SOURCE
Diagnostic blocks are the gold standard in pain conditions for ascertaining the source of pain. If a structure is damaged or irritat-
ed and is sending pain signals (nociceptive pain), then blockade with a local anesthetic will stop that pain for the duration of its action. This is the basis of diagnostic nerve blocks. The diagnostic nerve blocks currently utilized are as follows:

**Occipital nerve blocks.** The greater occipital nerve is the main sensory nerve supplying the C2 nerve. Thus the greater occipital nerve blocks impulses along the C2 nerve. The point of entry to the dorsal horn at the C2 level is a very important relay area for carrying pain impulses. If the occipital block relieves a patient's headache, this is suggestive of cervicogenic headache.

**Facet joint diagnostic blocks.** Facet damage has been shown by Bogduk to be the most common cause of chronic neckaches. Chronic headaches are also triggered by facet damage. The test is carried out under fluoroscopic control. About half a cc (2% lidacain or 1/2 cc .5% markeine) of local anesthetic is injected to the nerve supplying the facet joint in question. If relief of the headache is achieved for the duration of action of the local anesthetic, the test is positive. This indicates that the facet joint is the source of the headache. It should be noted that because of false-positive and false-negative results, further testing is required in certain cases.

**Provocative and relieving discography.** As noted above, MRIs do not help in ascertaining whether certain discs are the source of headache and/or neckache, especially if there is damage of the anulus fibrosus. The only accurate technique is to inject dye into the suspected disc and see if this provokes pain. With the needle still in place, local anesthetic should then be injected to determine if there is immediate relief of the pain. This technique was used in the past and fell into disrepute, largely because it is a very painful procedure and it often was not carried out with careful enough technique. Today, however, it is rapidly becoming recognized again as the technique "par excellence" for correlating disc and anulus fibrosus damage with pain.

**WHAT TREATMENT IS AVAILABLE?**

Unfortunately, where there has been severe chronic damage to various structures such as discs, facet joints, ligaments and muscles, these structures will not heal. Thus, the most logical way of relieving the pain is by stopping nociception (pain impulses) from the damaged structures. This can often be achieved by repeated nerve blocks. When these no longer work, surgery needs to be contemplated. The following surgical procedures can be used but it should be noted that at present we do not have good multicentered, controlled-outcome studies; until these have been done, we rely on the anecdotal reports of highly experienced surgeons with a large series of patients:

**Surgery for facet joint damage.** Facet joint rhizolysis has been widely used in Canada, the United States, Australia and Europe. The results depend to a large extent on the experience of the surgeons. Most experienced surgeons report about 60% success rate with duration up to two years (at this point the surgery.) may need to be repeated. Some patients obtain permanent relief.

**Cervical discotomy and fusion at one or more levels.**

Many surgeons report good results with this technique where discography was
used to ascertain the number of levels requiring surgery.

**Occipital neurotomy procedure.** This procedure was pioneered by Blume. If a diagnostic occipital block relieves the headache for two weeks, then this usually indicates that this procedure will be successful in providing good long-term relief. In 600 patients over 15 years, Blume reports about an 80% success rate for this procedure.

**C2 ganglionectomy.** In certain selected cases this is the usual operation. The Lozano and Rothbart cases have shown that this is a good procedure for lancinating post traumatic headaches, but not for migraine or tension-type headaches.

**CONCLUSION**

This new knowledge about headaches may be the most important and exciting knowledge about headache etiology in this century. It allows us to define structural damage and attempt to treat it. Unfortunately, we are not yet at the stage of having good outcome studies for the surgical procedures; this awaits further investigation. Nevertheless, there is a rich body of anecdotal experience that can give us a good start toward properly controlled outcome studies.

**REFERENCES**


**SUGGESTED READING**

The Role of Occipital Nerve Blockade on Refractory Post Traumatic and Non-Post Traumatic Headaches

M.J. Gawel¹, P.J. Rothbart²

¹Sunnybrook Health Science Centre, University of Toronto, and ²Whiplash and Pain Clinic, Toronto

Introduction
We have previously reviewed the role of occipital nerve blockade in patients with headache, both post traumatic and non-post traumatic. We present here a prospective assessment of the effect of repeated blockade of the greater occipital nerves with local anaesthetic and methylprednisolone acetate in patients with post traumatic and non-post traumatic headaches.

Materials and Methods
Ninety-seven sequential patients who attended the clinic and who agreed to the study were administered a questionnaire which described the symptoms which accompanied the headache. Table 1.

Table 1 - Patient Demographics

<table>
<thead>
<tr>
<th>Headache Type</th>
<th>n</th>
<th>age</th>
<th>sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post traumatic</td>
<td>58</td>
<td>39±12</td>
<td>37±21 m</td>
</tr>
<tr>
<td>Non-post traumatic</td>
<td>39</td>
<td>40±16</td>
<td>30±19 m</td>
</tr>
</tbody>
</table>

The headache type was classified into two types: a) those arising solely after head and/or neck trauma and b) those not post traumatic. Patients with more than 20 headaches a month were categorized as having chronic daily headache, either post traumatic or non-post traumatic although most of these patients had symptoms which put them into the migraine category. All of the patients studied had undergone the full range of both symptomatic and prophylactic medications and were deemed to be non-responders to these approaches.

Method of performing occipital nerve blockade
The procedure was performed by placing a 22 gauge, 1.5 inch needle into the area of the greater occipital nerve. The latter was located by palpating the notch found at the nuchal line between the attachment of the medial border of the sternocleidomastoid and the lateral border of the paracervical (trapezius) muscle. The needle was directed medially until it hit the nuchal line. It was then withdrawn approximately 0.25 inches and aspirated to ensure that a blood vessel had not been entered.

Results
In terms of reduction of severity of headaches, reduction of frequency of headaches and duration of headaches, there was no difference between the two groups of patients. Most of the patients experienced pain relief immediately after the nerve block, but this relief generally lasted no more than five days. (Table 2).

Table 2 - Immediate Effect of Occipital Nerve Blockade

<table>
<thead>
<tr>
<th>Headache Type</th>
<th>% No effect</th>
<th>% &lt;24 hr</th>
<th>% 1-2 days</th>
<th>% 3-5 days</th>
<th>% 5-10 days</th>
<th>% 10-14 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Post</td>
<td>5</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Traumatic</td>
<td>20</td>
<td>5</td>
<td>9</td>
<td>17</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

In order to assess the overall benefit of the procedure, we asked the patients whether the headaches were better on a global rating at 4 weeks and 4 months after the series of blocks had been completed. Patients with chronic daily headache and migraine, whether post traumatic or non-post traumatic, responded with a good improvement on the global scale at 4 weeks and 4 months. (Table 3 and 4.)

Table 3 - Pain Relief in Chronic Headache

<table>
<thead>
<tr>
<th>Headache Type</th>
<th>Better at 4 weeks</th>
<th>Better at 4 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post traumatic</td>
<td>72% (13/18)</td>
<td>60% (15/25)</td>
</tr>
<tr>
<td>Non post traumatic</td>
<td>70% (16/23)</td>
<td>63% (12/19)</td>
</tr>
</tbody>
</table>

Discussion
Patients with a wide variety of headache syndromes refractory to medical treatment improved after a series of occipital nerve blocks following a standard protocol. In this study we classified patients into post traumatic and non-post traumatic groups. There were, however, within these groups, patients who suffered from headaches fulfilling the criteria of migraine, cluster tension type and chronic daily headaches. It was impossible to identify any symptom of post traumatic migraine which distinguished it from idiopathic migraine using the questionnaire, apart from there being significantly less nausea in the post traumatic group (p < 0.002). Both groups did well at 4 months following the series of blocks, however the post traumatic group did significantly better.

References

Poster prepared by Sunnybrook Studios, the media service of Sunnybrook Health Science Centre, University of Toronto