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Review Article

Headache Management in an Interventional Pain Practice

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More than 20 million people in the United States suffer from severe headaches. Most have been diagnosed as "migraines," which have been assumed to be an intracranial process. Recognition of the extracranial sources of headaches (such as supraorbital neuralgia, infraorbital neuralgia, auriculotemporal neuralgia, facial neuralgia, posterior auricular neuralgia, occipital neuralgia, cervical facet pathology, masseter spasm, sternocleidomastoid muscle spasm, trapezius spasm, and interspinous ligament pathology) has led to an expansion of the treatment options available for practitioners skilled in interventional pain procedures. However, unless the clinical presentation is recognized, treatment cannot be offered. Clinical presentation, diagnostic injections, differential diagnosis, and advanced neurolytic techniques are discussed in this article.

Keywords: Headache, migraine, facial neuralgia, neurolysis

More than 20 million people in the United States suffer from severe headaches, and the annual prevalence has increased nearly 60% since 1980. Nearly 80% of these patients report headache-related disability that may result in missed work. In fact, nearly 50% of headache sufferers are moderately or severely disabled by a headache attack or "migraine" and lose an estimated thirteen workdays and eight leisure days each year (1).

Migraine is a term of much confusion in the lay public's mind. Physicians, especially neurologists, use the term migraine to mean a specific intracranial vascular headache. Patients usually use the term to mean a "sick headache" or a throbbing headache. Pain management doctors treating headache patients are beginning to realize that the symptomatic diagnosis of migraines (unilateral throbbing headache associated with photophobia, phonophobia and emesis) does not distinguish between intracranial and extracranial causes of headaches.

In this article I will discuss some of the most common causes we have found to be associated with "migraines" and intractable headaches.

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SUPRAORBITAL NEURALGIA

Entrapments of the first-division of the trigeminal nerve can cause unilateral or bilateral throbbing headaches, often just before menses or triggered by bright lights that cause squinting. Supraorbital neuralgia can be mistaken for frontal sinusitis. It can be caused by trauma to the face, such as when the head hits the windshield or after a punch to the face. The headache might not present for many years until the scar cicatrix tightens enough around the nerve to finally cause entrapment. There can be auras and unilateral or bilateral throbbing, as well as photophobia, phonophobia, nausea and vomiting; and these headaches can meet all the International Headache Society (IHS) criteria for migraines. Fluid retention, such as before menses or with salt indiscretion (perhaps with red wine, monosodium glutamate, or cheeses) can trigger these "migraines." The supratrochlear nerve is also in this region and can be injured by poor-fitting eyeglasses, presenting as a more midline forehead pain. We have also seen patients with "classic" cluster headaches (men, sudden onset, rhinorrhea, scleral injection, cyclic pattern) who have had instant and complete relief of their headaches with injection of small (0.5 cc volume) of local anesthetic.

Treatment (and diagnosis) involve injection of local anesthetic with steroid, preferably during the headache initially. Small volumes need to be used to avoid increasing the entrapment, and it has been dramatic how the headache resolves "almost before the needle is out," with rapid relief

of the nausea, photophobia, and other associated symptoms.

Cryoneurablation can give long-term relief by freezing the nerve at the supraorbital notch. Plastic surgeons using Botox for forehead wrinkles noted a dramatic decrease in "migraines" in treated patients, suggesting that muscle entrapment of the supraorbital and supratrochlear nerves may be a common pathology. Topical anti-inflammatory agents can also be very useful because of the thinness of the skin in this area.

INFRAORBITAL NEURALGIA

This second division of the trigeminal nerve is also associated with headaches, often misdiagnosed as maxillary sinusitis. Like the supraorbital nerve, it can be injured years before the headaches start and can present as menstrual headaches or classical/common migraines. The diagnosis is again made by injection, preferably during the headache; and cryoneurablation (intraoral or extraoral) can be used.

AURICULOTEMPORAL NERVE

Temple headaches are often due to entrapment of the auriculotemporal nerve, a third-division trigeminal nerve that leaves the foramen ovale and then travels in front of the temporomandibular joint (TMJ) (enervating the joint as it goes by) to pierce the temporalis muscle. This is a common headache site (visualize all the headache patients rubbing or pressing their temples for relief). Patients will awaken with a headache at three or four o'clock in the morning secondary to bruxism during the lightest plane of sleep, ie early in the morning. The headache can be unilateral or bilateral and throbbing in nature because of the proximity of the temporal artery. In fact, tenderness of the "temporal artery" has been used as supporting evidence of the vascular nature of migraines instead of recognizing that the auriculotemporal nerve is possibly the true pathology. Teeth clenching with stress, prolonged talking or chewing and "TMJ" pathology (which may be actually auriculotemporal nerve irritation) can all trigger these headaches.

The relief seen with injection of the nerve during a migraine "attack" can be dramatic and gratifying and patients have gone back to work a half hour after "throwing up my toenails." Bite blocks, sleep aids, and topical anti-inflammatories are usually curative; and cryoneurablation and Botox have been used successfully in recalcitrant cases.

ZYGOMATIC FACIAL NERVE

Although the facial nerve is usually considered a pure motor nerve, there are sensory fibers across all the branches. The most common entrapment site we see is the zygomatic branch as it crosses the zygomatic arch. Edentulous patients will have the coronoid process move cephalad, which catches the nerve in the arch. The pain can mimic the pattern seen by either the auriculotemporal nerve or maxillary nerve. The headache may be worse in the early morning after the dentures have been removed the night before and the body tries to "find" the previous "natural" site of dental occlusion. These usually respond to injection therapy but cryoneurablation may be needed.

POSTERIOR AURICULAR NERVE

Ear pain and parietal headaches can be caused by entrapment of the posterior auricular nerve by the sternocleidomastoid muscle. This can occur during flexion/extension injuries, especially if the head was turned at impact. Blows to the side of the head can also present as posterior auricular entrapment years later. There can be persistent "fullness" in the ear or decreased hearing, as well as tinnitus and vertigo. These symptoms may be difficult to differentiate from sternocleidomastoid pathology (see sternocleidomastoid). Injections need to be of a small volume. Cryoneurablation can be used with caution, noting the very thin skin and the ease with which the probe could slide off the skull into the carotid sheath.

GREATER AND LESSER OCCIPITAL NERVE

The occipital nerve is made up of the dorsal rami of C2 and C3 (see cervical facets) (2). Classic occipital neuralgia causes pain in the back of the head. However, because the ganglion interconnects with the trigeminal ganglion in the brain stem (3), occipital neuralgia will refer to any of the branches of the trigeminal nerves, especially the retroorbital area. These nerves pierce the nuchal fascia at the base of the skull and are therefore prone to trauma from flexion/extension injuries, as well as entrapment by spasm of the trapezius muscle. There is a frequent association with throbbing (because of the proximity of the occipital artery), as well as nausea and vomiting. If the head was turned at impact, there would be a unilateral pain, which would then meet IHS criteria for migraines. There is usually also temporary relief with "triptans," presumably because the occipital artery is constricted by the medicine, temporarily reducing the entrapment of the occipital nerve. However, as soon as the medicine wears off (usually about six to

eight hours), the headache comes right back. A prospective study of patients presenting to the emergency department (4) with unilateral occipital headaches found that 42% of the patients complained of nausea, 50% of dizziness, and 33% of tinnitus, with visual disturbances in 67%.

Standard anesthesia texts recommend injecting large volumes (10 cc) at the nuchal ridge in a "fan" fashion. However, this large a volume of fluid will cause an entrapment, and the nerve pathology is more caudad so that the medicine does not reach the area of injury. The injection technique I recommend identifies the injection site (in this case describing the right side) by placing the thumb of the right hand at the foramen magnum (which identifies midline and avoids cisternal injections); the index finger is placed at the conjoined tendon attachment, and the second finger identifies the injection site at the base of the skull. Small volumes (less than 2 cc) of local and steroid are thereby injected underneath the tendon where the nerve pierces the tendon. Cryoneurablation is performed at the same site.

Recent reports suggest that stimulation of the occipital nerve using a spinal cord stimulator lead placed subcutaneously can provide relief of intractable occipital headaches (5).

CERVICAL FACET PATHOLOGY

Although cervical facet pathology can obviously cause neck pain, the upper cervical facets are enhanced by the dorsal rami that make up the occipital nerves (6). Therefore, C2 and C3 facet pathology will refer to the occipital nerve. In a similar way, pathology of the cervical discs can cause cervicogenic headaches. This is a common cause of headaches in the elderly because of the predominance of cervical arthritis. However, flexion/extension injuries will also cause cervical facet pathology, unilateral if the head was turned on impact (7). Cervical facet blocks can diagnose, as well as treat these headaches. Cryoneurablation and radiofrequency lesions of the cervical facets can be very useful for longer-term relief. Cervical intradiscal electrothermal coagulation may offer relief if the technique is expanded to the cervical region.

MASSETER MUSCLE

Chronic stress leading to teeth clenching, bruxism, dental malocclusion, and TMJ pathology can all cause spasm of the masseter muscle, which will refer pain to the temples and jaw, and over the eye (8). Local anesthetic injections are diagnostic and therapeutic. Neuromuscular therapy can be useful and Botox can be used with care.

STERNOCLEIDOMASTOID MUSCLE

This muscle will refer pain to the ear, temple and face, especially over the eye (8). Patients often complain of fullness in the ear with decreased hearing, leading to unnecessary ear, nose and throat evaluations. There can also be tinnitus and vertigo, mimicking vestibulitis. Since flexion/extension injuries will traumatize the sternocleidomastoid, what have been considered coup-contrecoup brain injuries are now being recognized as myofascial pain. Posterior auricular neuralgia can be caused by sternocleidomastoid entrapment or can mimic the condition. The sternocleidomastoid muscle can also mimic supraorbital neuralgia, auriculotemporal neuralgia, or masseter spasm. Injections of local anesthetic are diagnostic and therapeutic, and Botox may be useful.

TRAPEZIUS MUSCLE

Tension headaches is a term that seems to trivialize the intractable occipital and retro-orbital headaches that are caused by trapezius spasm (8). The pain can be caused by stress, chronic postural problems (for instance with prolonged neck flexion for reading), or flexion/extension injuries. The muscle can entrap the occipital nerve or refer in a similar pattern. These headaches often start as a dull ache in the neck but can refer sharp, stabbing pain to the retro-orbital region. Trigger-point injections are diagnostic and therapeutic and Botox has been quite useful.

INTERSPINOUS LIGAMENT

In 1954, Feinstein and colleagues (9) followed-up on work done by Kellgren (10) in 1939, which showed that irritation of the cervical ligaments can refer pain to the head and face as well as the extremities. These cervical ligaments are traumatized in flexion/extension injuries but this also can occur with chronic low-grade trauma. The subsequent ligament laxity no longer allows support of the 30-lb head and the cervical muscles will go into spasm to hold the head up. This ligament pathology results in a straightening of the cervical lordosis. Thus, the common X-ray diagnosis of "loss of cervical lordosis secondary to spasm" is actually the reverse-contraction of a muscle above and below the lordosis must cause more lordosis if the muscles are the pathology.

Prolotherapy (or reconstructive therapy or stimulated ligament repair) can very effectively restore the ligament, thereby "taking up the slack," which then removes the mechanical pathology causing the trapezius spasm and occipital neuralgia. Radiofrequency lesioning of the fibro-osseous junction at the spinal process has also proved to be useful.

In conclusion, many of the assumptions we have made regarding headaches and migraines are changing. This has important implications for the patient since extracranial headaches do not respond to standard intracranial treatment. Instead, diagnosis is made by palpation followed by injection of local anesthetic. Treatment is directed at reversing the underlying pathology, so that entrapments are treated with injectable anti-inflammatories, muscle spasms treated with muscle relaxants or possibly Botox, and ligament pathology treated with stimulated ligament repair. Cryoneurablation, radiofrequency lesioning, disc annuloplasty, and subcutaneous nerve stimulation are all now being used with good success for chronic intractable headaches. The interventional pain physician is in a unique position to radically improve patients' lives. The axiom, "you can't treat what you can't diagnoses," has never been more true than in the treatment of headaches and migraines.

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