Review Article

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Trigeminal neuralgia: The Evolving Age

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ABSTRACT

Background: The head and neck region is a common site for neuralgias. Because facial neuralgias produce pain that often mimics pain of dental origin, the dental profession is frequently called on to rule out odontogenic or inflammatory causes. Trigeminal neuralgia [TN] causes sudden, usually unilateral, severe brief lancinating type of recurrent pain in the region of distribution of one or more branches of the trigeminal nerve. Patients with TN are usually treated medically. Surgical approaches are performed when medication cannot control pain or patients cannot tolerate the adverse effects of the medication. The failure of medical treatment led to the development of various surgical techniques that include peripheral injections of various agents having neurolytic properties, peripheral neurectomy, cryotherapy, microvascular decompression and radiofrequency thermocoagulation.

Keywords: Trigeminal neuralgia, Peripheral neurectomy.

INTRODUCTION

History

Early in 1677, John Locke first described trigeminal neuralgia in the Countess of Northumberland. In 1756 the French physician Nicolaus Andre gave the term *tic douloureux* for the condition. The English physician John Fothergill in 1773 also outlined the major clinical features of TN [1]. Trigeminal neuralgia is described as a painful unilateral affliction of the face, characterized by brief electric shock like (lancinating) pain limited to the distribution of one or more divisions of the trigeminal nerve.

Pathophysiology

The pain in trigeminal neuralgia is characterstically abrupt in onset and termination may remit for varying periods, in particular areas. These areas from which the pain is activated have been described as a trigger zones. Characteristically trigger zones occur around the supraorbital, infra orbital foramina, the inner canthus of the eye, lateral to the ala, and over the mental foramen. Trigger zones are common intraorally. The second and third divisions of the trigeminal nerve are most commonly affected. Less than 5% of cases involve the first division. Common precipitating factors are washing one's face, talking, eating, cold winds, emotional stress, brushing the hair. Pain within the mouth can be precipitated by tongue movement, brushing one's teeth or the placing of food within one's mouth· [2]. The mechanism of trigeminal neuralgia could be as follows. A tactile stimulus to the face sends an impulse through the trigeminal nerve to the brainstem, which in turn sends out a valley of impulses for each one received. When this valley of impulses reaches the artificial synapse on its way created by pressure on the trigeminal root, new impulses are sent to the brainstem, and a chain reaction resulting in severe pain has started; it

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stops when the neurons in the brain stem are exhausted [3].

Sweet diagnostic criteria for TN [1]

1. The pain is paroxysmal
2. The pain may be provoked by light touch to the face (trigger zones).
3. The pain is confined to the trigeminal distribution.
4. The pain is unilateral.
5. The clinical sensory examination is normal.

DISCUSSION

The pain is, in general unilateral, though bilaterally has occurred in approximately 5 % of cases. The right side is affected approximately twice as often as the left, and females are affected approximately two times as frequently as males. The incidence is at the peak in the sixth and seventh decades of life [4]. MRI is the most sensitive technique for detecting intracranial lesions. Selective indication of MRI for TN include young patients, those who have failed to respond to medical therapy, and those with atypical history or clinical signs such as involvement of more than one division of the trigeminal nerve, bilateral involvement, or the presence of other cranial nerve abnormalities [5]. Magnetic resonance imaging, with the enhanced ability for multiplanar assessment, better soft tissue contrast, and more detailed anatomic details, provides a unique tool for the evaluation of the skull base. This may make MRI useful in identifying the different types of pathoses, especially in the preganglionic segment of the trigeminal nerve and thus helpful to clinicians in selecting appropriate treatment for patients with trigeminal neuralgia [6]. MRI offers an easy and non-invasive method for pre-operative evaluation of patients with trigeminal neuralgia by providing excellent visualization of the intracranial course of the trigeminal nerve and cerebellopontine angle, without the use of ionizing radiation [7].

The various treatment methods include thermocoagulation of the trigeminal ganglion with percutaneous radiofrequency waves, percutaneous glycerol gangliolysis, percutaneous balloon microcompression of the trigeminal ganglion, gamma knife radiosurgery, cyber knife radiosurgery, cryotherapy, peripheral alcohol block, repetitive transcranial magnetic stimulation over motor cortex and peripheral neurectomy [8].

In 1925 Walter Dandy published a report of a new operation for the treatment of tic douloureux, by introducing the sectioning of the sensory root of the trigeminal nerve at the pons via suboccipital craniotomy. The concept of microvascular decompression of the trigeminal root at its root entry zone was then developed by Gardner and Miklos, based on the original observations of Dandy. Jannetta used microvascular decompression for tic douloureux [9]. He stated that trigeminal neuralgia and hemifacial spasm are due to pulsatile compression by arteries at the root entry or exit zone (REZ) of the appropriate cranial nerve. This zone was defined as “a juncional area between central and peripheral myelin”, which measures from 0.5 to 1 cm in length for the fifth, seventh, and ninth cranial nerves [10]. Microvascular decompression [MVD] of the trigeminal root is done after suboccipital craniotomy. MVD certainly acts on pain modulation by peripheral pathological impulses and even if it could not be considered as the “definitive etiological cure” it certainly is one of the most rational therapeutic options for the treatment of trigeminal neuralgia [11]. Although permanent pain relief can be achieved in about 70% to 80% of cases, potential risks have to be considered, such as hearing loss, permanent facial anesthesia, brain stem infarction, cerebellar injury, ataxia, and death [12]. This form of treatment is now used as an alternative for percutaneous trigeminal rhizolysis for an otherwise healthy individual in whom medical therapy is no longer sufficiently effective. Because it is a major operative procedure, it is not recommended very frequently for frail elderly patients [13].

Injection of glycerol at the peripheral nerves produces instantaneous pain relief because of the high viscosity and poor miscibility of glycerol in water. But its exact mechanism of action is unknown. Minal Hakanson was the first to demonstrate that trigeminal neuralgia could be relieved by the retrogasserian instillation of pure glycerol [14]. Retrogasserian glycerol injections increase the average latencies and reduce the average amplitudes of trigeminal brainstem evoked potentials. Anhydrous glycerol probably insulates the so called pathological site on the axons, it has a

high dielectric constant (45.5 at 25 degrees) making it a poor conductor. This would prevent impulse reflection and presynaptic inhibition [15].

It can be postulated that glycerol, because of its highly hypertonic and hygroscopic nature, causes partial dehydration of the surrounding axons, of which the content is about 90% water. As a result, the activity of the nerve fibers decreases and paroxysmal discharge that constitutes the attacks of trigeminal neuralgia is partially hindered [16]. Peripheral alcohol injection is a quick and easy technique, which acts by causing neurolysis of the nerves but the complications present in the form of avascular necrosis, impairment of eye muscles movements, herpes zoster opthalmicus with trochlear nerve involvement, sudden loss of vision and trismus if mandibular muscles are involved [17]. Two distinct techniques were described by Stookey and Ransohoff. One involves the transcutaneous injection of the nerve at the skull base and the other involving injection at a site more distally as the nerve passes recognizable landmarks of the facial skeleton (supraorbital notch, infraorbital foramen, inferior dental foramen, or mental foramen). It allows the patients to experience the anesthetic effect of the treatment, which is transient in the case of alcohol injections, but permanent with rhizotomy [18].

Peripheral neurectomy is indicated for aged or severely debilitated patients, where MVD or percutaneous ablative procedures are contraindicated or ineffective. During neurectomies, not only the sensory receptors of the peripheral nerves are removed, but the trauma that is produced also causes temporary degenerative changes in the ganglionic cells. Local anesthetic injection should be used to test the effectiveness of peripheral neurectomy. It is to be carried out under local or general anesthesia.

Freemont and Millac reported that on an average, while a single neurectomy yielded 26.5 pain-free months, serial neurectomies gave 59 pain-free months. Mason stated that infraorbital neurectomy was more likely to be successful than inferior alveolar neurectomy. However Quinn and Weil found that there was a mean pain free period of 37.5 months after mental neurectomy, 38 months after inferior alveolar alveolar neurectomy, and 38.5 months after infra orbital neurectomy. Failures of inferior alveolar neurectomies were largely caused by the onset of symptoms in another branch or division of the trigeminal nerve. Loss of facial sensation in appropriate division is inevitable [8].

CONCLUSION

Surgical approaches are performed when medication cannot control pain, patients cannot tolerate the adverse effects of the medication or in medically compromised patients with polypharmacy for other conditions. Peripheral neurectomy is performed in patients not suitable for or not willing to have other procedures. The patients can tolerate the paresthesia or anesthesia rather than pain. The technique also has a low morbidity and free from long term medical treatment. However no strict rules are set and each patient should be evaluated individually.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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