

Neurosurgery Views

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Trigeminal Neuralgia

“With the advent of the operating microscope, the differentiation between idiopathic and symptomatic Trigeminal Neuralgia can now be consigned to the annals of medical history.”

P.J. Jannetta

By P. Jeffrey Lewis, MD, FACS

Physicians were taught for years that the majority of cases of Trigeminal Neuralgia (Tic Douloureux) were idiopathic and were treated by trigeminal nerve destructive procedures after failure of medical therapy. A very small percentage of cases of Trigeminal Neuralgia were caused by tumors, aneurysms, and AVM's and were considered symptomatic cases of Trigeminal Neuralgia.

The use of the operating microscope for neurological procedures has elucidated the pathology in these “idiopathic” cases and shown them to be the result of vascular cross compression (96% of pts) of the trigeminal nerve at the brain stem nerve root entry zone. The offending vessel is usually a tortuous loop of the superior cerebellar artery although other vessels can be involved.

Direct Microvascular Decompression of the trigeminal nerve achieves long term complete pain relief in the majority of patients and avoids destruction of the trigeminal nerve, thereby avoiding the complications of facial numbness, dysesthesia, corneal anesthesia, and ulceration as well as the dreaded anesthesia dolorosa (extreme constant burning pain after neural destructive procedures).

Trigeminal Neuralgia: A Condition Of Cranial Nerve Vascular Compression

The excruciating facial pain of Trigeminal Neuralgia (Tic Douloureux) has been described to me by Dr. Bryce Weir, a professor from my residency in Edmonton, Canada. Dr. Weir portrays it as pain so severe its like having one's teeth pulled without anesthetic. Dr. Weir taught me the opera-



tion to cure this horrible pain. I learned from his patients the extraordinary success that can be achieved. My own patients over the past 22 years in practice as a neurosurgeon have taught me about the debilitation that this condition has brought to their lives and the dramatic, rapid reversal that can be so reliably achieved (90-95% of cases¹) with the Microvascular Decompression procedure (MVD). It is one of the most gratifying operations on the brain that I have ever performed.

The Dreaded Pain

I often treat patients with Trigeminal Neuralgia using the Microvascular Decompression procedure. These cases illustrate the clinical aspects of this condition including the frustration in achieving a correct diagnosis and finally coming to definitive treatment.

Some patients describe having many years of extreme one sided facial pain. Patients experiencing pain involving the lower part of the face (cheek and jaw regions) described anatomically as the V2 and V3 dermatomes of the trigeminal

CLASSICAL PRESENTATION OF TRIGEMINAL NEURALGIA

- Sequential repetitious stabs of sharp, electrical shock like pain
- One side of the lower face
- Lasts a few seconds to under one minute
- Often can be brought on by touch, a gust of wind, or facial movement such as chewing
- Frequency of episodes increases over time
- Pain often mistaken as originating in the teeth

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Unfortunately, many patients with Trigeminal Neuralgia undergo unsuccessful dental procedures (tooth extractions, root canals) in the early stages of the disease.

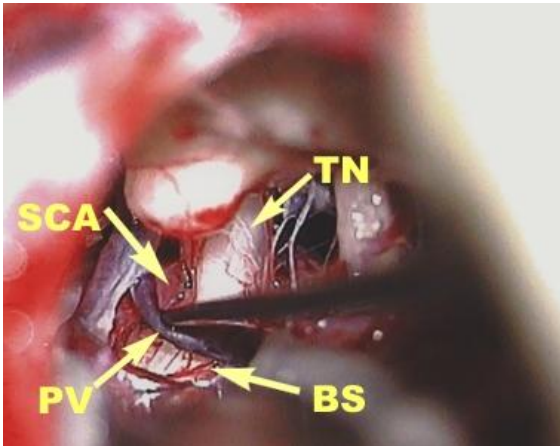


Figure 1: Surgical view through the operative microscope. A branch of the petrosal vein (PV) is preserved and reflected down by a dissector. This exposes the loop of the superior cerebellar artery (SCA) that is pressing against the trigeminal nerve (TN) where it meets the brain stem (BS).

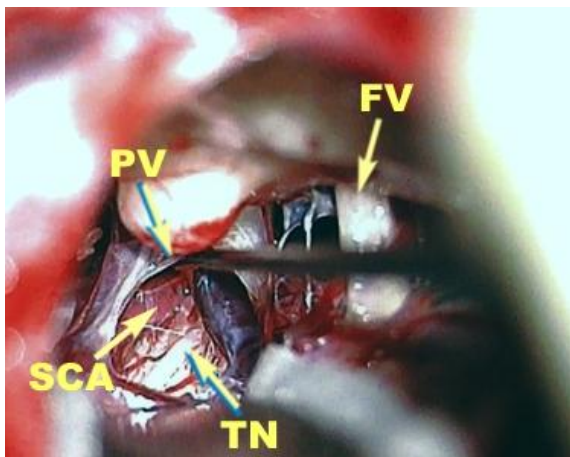


Figure 2: Additional view showing preservation of the petrosal vein (PV) which is lifted up revealing the loop of the superior cerebellar artery (SCA) that is pressing against the trigeminal nerve (TN). The facial (VII) and vestibulocochlear (VIII) nerves (FV) are exposed but never touched.

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nerve. The pain is unilateral and involves the lower face in the majority of patients. The right side is also more commonly involved than the left side of the face.

Many patients describe the symptoms as mild sensations like a crawling on one side of their face and this may be intermittent at first. But over time the pain gets worse and more debilitating.

The pain of Trigeminal Neuralgia is distinctive when it manifests itself in full; in fact it is the history of the pain and only the history that can make the diagnosis. There is no diagnostic study, not even an MRI scan, that can make the diagnosis. It is the only condition that we treat as neurosurgeons where the diagnosis is made by history alone. Even the physical examination is most often normal with no evidence of sensory loss or motor weakness of the face, although touching “trigger points” on the face during the physical exam may reproduce the pain. The pain of Trigeminal Neuralgia is a chronic pain, in that patients often suffer for years but it’s quality when it comes is very acute in nature. Often it is described as “electric, shock-like, and lancinating”, or, as many patients describe it, “the worst pain I have ever experienced, worse than childbirth”. The mild onset, early intermittent and relapsing nature of the pain makes the early diagnosis deceiving. Dentists are most often the first health care workers sought for treatment, as was the case for both of the patients described here.

Unfortunately, many patients with Trigeminal Neuralgia undergo unsuccessful dental procedures (tooth extractions, root canals) in the early stages of the disease.

Many of the patients I have treated have undergone dental extractions only to realize almost immediately after a tooth extraction that “it didn’t work, the pain was still

there.” Some have gone on to have several more tooth extractions thinking the wrong tooth was treated. The complete failure of dental procedures to relieve the facial pain is actually a very positive characteristic of the patient’s history in making the correct diagnosis of Trigeminal Neuralgia. I’m not saying that a patient should have a tooth extraction done before making the diagnosis of Trigeminal Neuralgia, but it happens so frequently that it actually helps make the correct diagnosis. Better education of the dentists regarding this condition may help. However, at the early stage in the disease when they are seeing the patient the diagnosis is not very obvious. We as neurosurgeons see the patient at a much later stage in their disease, at a stage when the pain is unrelenting and the entire clinical history in retrospect makes the diagnosis unquestionable.

Many patients are often misdiagnosed with TMJ (temporal-mandibular joint dysfunction) early on and fitted with mouth guards to no avail. Patients often undergo CT and MRI scans which are negative. These tests are an important step in ruling out space occupying lesions since this is the case in about 3-4% of patients with Trigeminal Neuralgia. Multiple sclerosis is a rare cause of trigeminal neuralgia especially in young patients. But the old adage that trigeminal neuralgia in a young patient is caused by multiple sclerosis is usually not true.

The Effect Of Medication

The medication of choice for Trigeminal Neuralgia is Tegretol, an anti-epileptic drug. In fact, an initial good response to Tegretol is another confirmatory characteristic of the correct diagnosis of Trigeminal Neuralgia. This fact can be very helpful in distinguishing Trigeminal Neuralgia from other conditions such as atypical facial pain. Unfortunately, the positive re-

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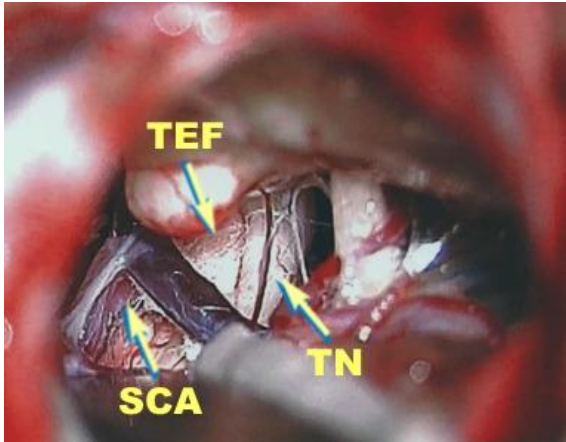


Figure 3: Teflon (TEF) is placed as a cushion between the loop of the superior cerebellar artery (SCA) and the trigeminal nerve (TN).

Although medications are extremely helpful in controlling pain for patients, unfortunately, they do not cure pain and at higher doses, side effects are very common and often debilitating.



Figure 4: Neurosurgeon P. Jeffrey Lewis working through the operative microscope.

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sponse of pain control that Tegretol has is just that - control, and not a cure. Tegretol does not cure the pain; it helps patients live better with the pain. Patients will get short term relief only to relapse requiring increased dosages.

Pain is the most common symptom I treat as a neurosurgeon. You know when you've cured pain and when you've only reduced it. Although medications are extremely helpful in controlling pain for patients, they unfortunately do not cure pain and at higher doses, side effects are very common and often debilitating. The most gratifying neurosurgical procedures performed for pain are those that completely eliminate the pain. In my experience, the Microvascular Decompression procedure for Trigeminal Neuralgia is one of the most gratifying procedures that I have performed as a neurosurgeon.

Surgery For Trigeminal Neuralgia

When I first saw Dr. Weir perform the Microvascular Decompression for Trigeminal Neuralgia, I marveled at the spectacular brain anatomy. To see the cranial nerves at the brainstem surrounded by a complex array of arteries and veins, bathed in cerebrospinal fluid (CSF) and covered by a membrane of flimsy but obscuring tissue, the arachnoid, was an amazing experience. The surgical anatomy gradually unfolded with magnificence. A short incision had been made behind the ear and a small opening in the skull and the dura mater membrane was created. At first only the cerebellum could be seen. With gradual relaxation and very gentle retraction of the cerebellum, the depths of the brain could be explored. It's actually a deep exposure to the brainstem and with gentle opening of the arachnoid membrane, the cranial nerves from V to VII/VIII can be identified. The trigeminal nerve is a broad, thick, very white nerve. It is quite sturdy and enters the midpons of

the brainstem. This is obviously the nerve of interest for this procedure. Just below or inferior, the facial (VII) and vestibulocochlear (VIII) nerves are seen to be much more delicate, thinner, and a little more gray in color. These nerves must not be touched in order to prevent a complication of facial palsy or hearing loss. A large vein is in the way of the trigeminal nerve and initially obscures its exposure. This vein, the superior petrosal vein, courses upward, across the trigeminal nerve at the brainstem before entering a large venous sinus, the superior petrosal sinus. Careful arachnoid incision around this vein opens the working space and allows excellent visualization under the operating microscope of the pathology of Trigeminal Neuralgia. A tortuous arterial loop of the superior cerebellar artery is seen pressing against the trigeminal nerve in the majority of cases (96%)¹. This artery is then carefully freed from the nerve by incising more arachnoid between the artery and the nerve. The artery can then be mobilized from the nerve and the vascular, pulsatile compression on the nerve relieved. Plegets of Teflon sponge are placed between the artery and the nerve to maintain the decompression.

Technically, it at first appeared to be a very challenging operation given the delicate structures exposed. However, just as I marveled at the anatomical beauty of the brain as seen through this operative procedure, I was equally awed by the great benefit the patients received. Immediate relief of their pain without even any facial numbness. Patients that were completely normal right after surgery. I remember saying to Dr. Weir one day while on morning rounds, after seeing a patient who had the surgery the day before: "that is an excellent operation".

Over the past 22 years in practice as a neurosurgeon I have experienced the same success with this

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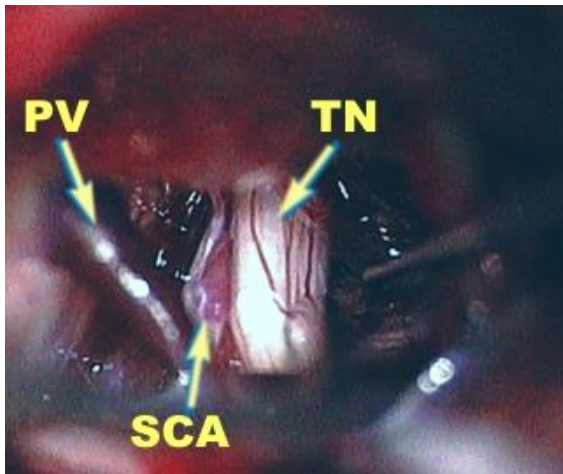


Figure 5: Surgical view through the operative microscope. The petrosal vein (PV) is seen as well as the loop of the superior cerebellar artery (SCA) that is pressing against the trigeminal nerve (TN).

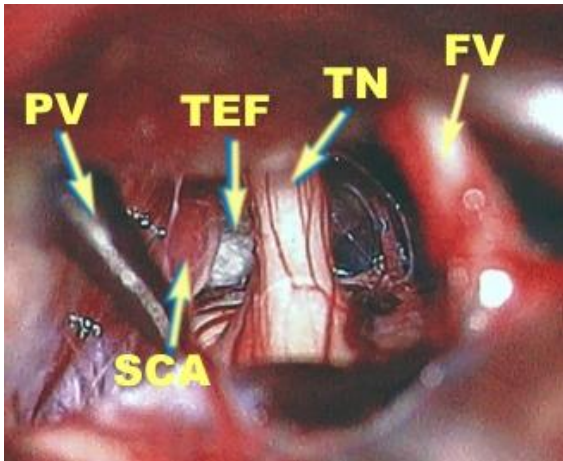


Figure 6: Teflon (TEF) is placed as a cushion between the loop of the superior cerebellar artery (SCA) and the trigeminal nerve (TN). The facial (VII) and vestibulocochlear (VIII) cranial nerves (FV) are exposed but never touched.

References:

1. Jannetta, P.J.: in Neurosurgery, Eds Wilkins, R.H., et al, McGraw Hill pp2357-2363.
2. Sheehan, J: Gamma knife surgery for trigeminal neuralgia: outcomes and prognostic factors. J Neurosurg 102:434-441, 2005.
3. Rabih, G., et al: Stereotactic gamma knife surgery for trigeminal neuralgia: detailed analysis of treatment response. J Neurosurg 102:442-449, 2005.

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operation that I witnessed Dr. Weir having. Pain relief is achieved in about 90-95% of patients. This is similar to the success reported in the world literature¹. Many patients experienced the immediate relief of their chronic facial pain after the 1.5-2 hour operation. Complete relief of pain, cure of the pain and a normal patient neurologically can be achieved reliably in the majority of patients. The hospital stay is 2-4 days. An experienced microneurosurgeon can perform the surgery very safely in every patient with a rare risk of complications. I have learned that the key to safety is obtaining a relaxed cerebellum (intraoperative lumbar spinal drainage aids greatly) which minimizes cerebellar retraction. Sharp microsurgical arachnoid dissection with preservation of the petrosal vein and no manipulation of the facial/vestibular nerve complex results in the safest, most reliable exposure of the trigeminal nerve vascular pathology.

Referral To A Brain Surgeon/Alternative Surgical Procedures

Many patients I treated have achieved complete relief of the facial pain after the microvascular procedure. Unfortunately, like many of these patients, it took years of suffering before they ultimately had this procedure performed. The MVD procedure is the only operation that treats the condition at the root of the problem, at the most frequent etiology of the pain - vascular compression. It thereby offers the best chance for cure without side effects. Many patients often research the procedure on the Internet. They talk to people online who had the operation and feel that if they did well, they could also do well with it. This is one of the most common self-referred conditions that I treat. Educating the public and the other health care workers about this procedure is the most difficult aspect of the condition for me as a treating specialist, far more difficult than the opera-

tion itself. There is an excellent web site hosted by the Trigeminal Neuralgia Association at www.tna-support.org. The site provides a volume of information and references on the topic. The Trigeminal Neuralgia Association was founded by patients with Trigeminal Neuralgia to provide support for other patients suffering from this disease.

The Microvascular Decompression procedure for Trigeminal Neuralgia is the gold standard treatment, to which all other treatments are compared. Early in my teaching, only younger, healthy patients could be considered for this procedure. However, in my experience this old adage does not bear out. Even patients in their 80's can undergo the procedure successfully.

Trigeminal nerve destructive procedures have been the surgical alternative to the MVD procedure. Percutaneous gasserian ganglion rhizotomy by radiofrequency or glycerol nerve destruction are needle procedures through the cheek. A higher failure rate and facial numbness have resulted in these procedures being done less and less. Gamma Knife radiosurgery employs highly focused, high intensity radiation to the nerve at the brainstem. Initially attractive because of its lack of surgical incision, the Gamma Knife procedure for partial destruction of the trigeminal nerve has had limited success with pain relief noted in only 44% of patients². Like the other nerve destructive procedures, the greater the amount of facial numbness produced, the better the success for pain relief³. Also, the dreaded complication of anesthesia dolorosa (extreme constant burning pain) can occur after any nerve destructive procedure including Gamma Knife. Anesthesia dolorosa is almost impossible to treat. In over 22 years of experience with the microvascular procedure, I have never seen a complication of anesthesia dolorosa from MVD alone.

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Buffalo Neurosurgery Group - from left to right: Drs. Pollina, Castiglia, Lewis, Guterman, Moreland, and Egnatchik

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