Radiofrequency trigeminal rhizolysis for the treatment of trigeminal neuralgia secondary to brainstem infarction

Report of two cases

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Although percutaneous radiofrequency trigeminal rhizolysis (RFL) has been used to treat idiopathic trigeminal neuralgia thought secondary to multiple sclerosis, the use of RFL for trigeminal neuralgia caused by brainstem infarction has not been advocated. The authors report two patients with trigeminal neuralgia following pontine infarction in whom aggressive medical management failed, but who were successfully treated with RFL. Pain relief has persisted for the 3- and 6-year duration of follow-up examinations. Descending trigeminal reticular fibers may be affected by brainstem infarction and result in trigeminal neuralgia; thus, treatment by rhizotomy may be effective in decreasing the peripheral afferent input into the spinal trigeminal nucleus thus decreasing the pain. These two cases demonstrate the utility of RFL in the relief of ischemia-induced trigeminal neuralgia and lead the authors to suggest that its use be broadened to include this indication.

Key Words * trigeminal neuralgia * brainstem infarction * radiofrequency lesion * chronic pain

Pontine infarction is an uncommon but recognized cause of trigeminal neuralgia.[5,6] Although percutaneous radiofrequency trigeminal rhizolysis (RFL) has been shown to be effective in the treatment of idiopathic trigeminal neuralgia thought secondary to microvascular decompression,[2] and multiple sclerosis,[3] the use of this technique to treat pain secondary to cerebral infarction has not been reported. We describe the successful treatment, using RFL, of two patients with medically intractable trigeminal neuralgia due to pontine infarctions. The clinical histories and radiological data obtained in these two patients are presented.

NEUROIMAGING AND SURGICAL PROTOCOLS

Magnetic resonance (MR) T₁-weighted images (SE 616 msec/TR 20 msec) were obtained in both patients in the sagittal and axial planes. Following intravenous administration of gadolinium contrast material, T₁-weighted images were also obtained in the axial and coronal planes. Proton density (SE 2300 msec/TR 20 msec) and T₂-weighted images (SE 2300 msec/TR 80 msec) were then obtained in the axial plane.
At the time of surgery the patients were placed supine and the ipsilateral face was prepared. After the patient had been injected with local anesthesia, a hollow 19-gauge needle, insulated except for the tip, was advanced into the foramen ovale. The needle was advanced until the tip was superimposed over the clivus on lateral fluorograms, the stylet was removed, and cerebrospinal fluid flow was confirmed. The stylet of the needle was then replaced with a radiofrequency stimulating and lesioning electrode, which had temperature monitoring capabilities. Stimulation at 50 Hz (1 msec pulse width, 100-500 mV amplitude) was used to identify the involved trigeminal division(s) by mapping stimulation-induced paresthesias. Motor stimulation at 2 Hz (1 msec pulse width, 100-500 mV amplitude) was performed to avoid motor trigeminal rootlets. Using the radiofrequency generator, serial lesions were made for 60 seconds at 60 to 80°C; the procedure was completed when a consistent mild sensory deficit was noted by the patient in the involved region(s).

CASE REPORTS

Case 1

This 50-year-old woman presented with right-sided mandibular pain extending into her mouth, gums, and the lateral border of her tongue. The pain was described as "shocklike" sensations, which were triggered by talking, chewing, or contact with the buccal mucosa. The pain initially resolved with carbamazepine therapy. Seven months later, her symptoms recurred and increased both in severity and frequency; she had at least 20 episodes of pain lasting 2 to 10 seconds each day and her ability to swallow and speak became significantly limited. Therapeutic trials of escalating doses of carbamazepine, dilantin, baclofen, and amitriptyline all failed to provide relief. Topical lidocaine provided only temporary and incomplete relief.

Fig. 1. Magnetic resonance image of the brain obtained in a 50-year-old woman with right-sided, third division trigeminal neuralgia. Note the signal abnormality at the junction of the pons and the right middle cerebellar peduncle posteriorly, which is consistent with a right pontine infarction. There were no other lesions within the brain.

Examination. On clinical examination, sensation to light touch and pinprick was normal in the entire trigeminal distribution bilaterally. The patient had no facial weakness or asymmetry. Corneal reflexes were intact. Magnetic resonance imaging demonstrated a region of signal abnormality at the junction of pons and the right middle cerebellar peduncle with no contrast enhancement (Fig. 1) consistent with infarction. There were no other intracranial lesions. The course of the fifth cranial nerve and its divisions were normal.

Operation and Postoperative Course. A right percutaneous trigeminal rhizotomy was performed. Postoperatively, second and third trigeminal sensation was minimally decreased and the patient experienced complete pain relief. Seven months
later, she developed mild recurrent pain on the right side of her tongue while eating. This resolved after administration of a short course of carbamazepine therapy. The patient remains pain free at 6 years of follow up.

**Case 2**

This 76-year-old right-handed man with a history of hypertension, atherosclerotic cardiac disease, schizophrenia, and colon cancer presented with left-sided pain greater in the second than third division of the trigeminal nerve. The pain had persisted for 6 years but had increased in both frequency and severity over the previous few months. Each day, he suffered three to seven uncomfortable paroxysms of sharp, lancinating pain in his upper lip and on the left side of his tongue. The pain was triggered by talking, drinking, eating, and touching. Dose escalation trials of carbamazepine, dilantin, baclofen, and amitriptyline failed to control his pain. Chronic meperidine administration had little impact on the pain.

**Examination.** On clinical examination, the patient had normal sensation to pinprick and light touch in all three fifth cranial nerve distributions. There was no masseter muscle weakness and the jaw jerk reflex was intact, but the patient had mild left-sided facial weakness. Magnetic resonance imaging demonstrated multiple areas of increased signal intensity on the T2-weighted images in the basal ganglia, in the white matter of both hemispheres, and the left brachium pontis. The abnormalities did not demonstrate enhancement and were most consistent with multiple bilateral lacunar infarcts (Fig. 2).

**Operation and Postoperative Course.** Left second and third division percutaneous trigeminal rhizolysis was performed. Postoperative sensory testing failed to reveal a deficit, although pain relief was complete. The patient continues to experience complete pain relief without medications for over 3 years of follow up.

**DISCUSSION**

Approximately 5000 to 10,000 new cases of trigeminal neuralgia occur annually in the United States,[2] with an incidence of 4.3 per 100,000 population.[4] Proposed causes of trigeminal neuralgia include trauma, dental pathology and
suppuration, clinical and subclinical viral infections, demyelinating processes,[1] neoplasms, vascular compressive lesions, and intrinsic brainstem pathway dysfunction.[2] Microvascular compression at the trigeminal root entry zone is believed to be the cause of trigeminal neuralgia in the majority of patients.[3] As MR imaging has been more sensitive, pontine infarction has been increasingly recognized as an uncommon but potential cause of trigeminal neuralgia.[5,6] The routine use of MR sequences specifically tailored to detect ischemic lesions may, in fact, reveal that pontine infarction is a much more common cause of typical trigeminal neuralgia than has been previously recognized.

Although most patients receive adequate pain relief from medical therapy, some patients require surgical intervention. Microvascular decompression and percutaneous trigeminal rhizotomy are the most frequently used surgical procedures for the treatment of intractable trigeminal neuralgia. Although RFL has not been used traditionally for the trigeminal neuralgia associated with multiple sclerosis, one recent study (SC Pannullo, et al., unpublished data) reported an increase of 2 to 6% in the number of patients with multiple sclerosis undergoing RFL. This increased use of RFL has been associated with excellent results.

Radiofrequency trigeminal rhizolysis similarly appears to be effective in the treatment of trigeminal neuralgia secondary to pontine infarction. The two patients reported here had radiologically confirmed pontine infarctions and classic symptoms of trigeminal neuralgia. Very aggressive trials of medical therapy failed in both of these patients. Radiofrequency trigeminal rhizolysis was performed without complication and has provided relief lasting for the full 3 and 6 years of follow up. It is possible that both the plaques of multiple sclerosis and pontine infarction affect the descending trigeminal reticular fibers, altering signal processing in the spinal trigeminal nucleus and thus decreasing pain threshold. Radiofrequency trigeminal rhizolysis may then be effective by decreasing the peripheral afferent input into the spinal trigeminal nucleus. Regardless of its mechanism of action, RFL appears to be effective in treating trigeminal neuralgia resulting from pontine infarction. Radiofrequency trigeminal rhizolysis should be considered for the treatment of this uncommon but significant clinical problem.

References


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