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Neurosensory testing of orofacial pain in the dental clinic

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CLINICAL PROBLEM

During an examination of a new patient, the dentist noticed that a patient turned her head away when her right cheek was touched. Touching an area of the lower lip elicited “tingling sensations,” which the patient said felt like “small insects crawling on the skin.” On inspection, the dentist did not find any visible pathology (the patient’s skin looked normal), but the dentist could provoke the sensation readily by touching a well-defined area on the lower lip. What could be the reasons for this exaggerated response to a seemingly nonpainful stimulus?

First, the dentist might have considered that the patient was “faking” or “exaggerating” the unpleasant sensation. But on second thought, the dentist asked her if she had experienced any traumatic events in this region. The patient said that her mandibular right third molar had been extracted surgically seven months previous, and the pain started immediately afterward. She also stated that the local anesthesia from the procedure never wore off completely, and for some time after the extraction was performed she could not feel things touching her lip, which was a problem when she was eating.

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This type of observation and the patient's history should have led the dentist to consider that this problem might be a case of traumatic nerve injury followed by neuropathic pain. Third-molar extractions can be associated with damage to the mandibular nerve branches, including the lingual and buccal nerves and the inferior alveolar nerve.¹ In addition, there still are questions as to whether some local anesthetics may increase the risk of experiencing a neurotoxic reaction.

In this type of situation, the dentist initially should obtain more information about the surgical procedure, as well as learn more about the characteristics of the symptoms—for example, whether symptoms are painful always or only sometimes, how intense the pain is, what makes the pain better or worse. The important features in diagnosing neuropathic pain are the changes in responsiveness to different types of somatosensory stimuli, as well as the presence of positive neurological signs (for example, spontaneous pain, hyperalgesia) and negative neurological signs (for example, hypoesthesia).² The diagnostic technique used to reveal such aberrations in normal somatosensory function is called “psychophysics” or “neurosensory testing.”^{3,4} In general, there are two main methods for evaluating somatosensory function: a quick and easy chair-side technique and an elaborate and comprehensive quantitative sensory test (QST) performed in a specialized university setting or pain clinic.^{4–6} In this article, we describe the chairside method.

NEUROSENSORY TESTING

QST is a psychophysical procedure in which the examiner applies test stimuli at defined intensities to a patient, who then reports his or her perceptions of the intensity and quality of the stimulus. Simple versions of QSTs have been used for centuries to learn more about the sensory systems, including how people perceive different smells and tastes, as well as auditory and somatosensory stimuli.⁴ We present semiquantitative chairside techniques that can be used to examine a patient's sensory complaints. These techniques are similar to performing muscle palpation, percussion and vitality tests of teeth, and they involve the use of a cotton swab, a toothpick or a dental explorer, and cooled and heated metal spatulas.

Cotton swab test

Use the cotton swab to test for sensitivity to low-intensity, nonpainful mechanical stimulation. Using the cotton swab, stroke the skin gently above the eyebrow (the area of the supraorbital nerve [V1]) and compare the response from the nonpainful side with that from the painful side. Make three to four strokes 1 to 2 centimeters in length on both sides. Ask the patient if she feels the same sensation on both sides (normosensitivity), less sensation on one side than the other (hypoesthesia) or more sensation on one side than the other (hyperesthesia). If the patient's answer indicates hyperesthesia, ask her if it is painful (allodynia, a painful response to a nonpainful stimulus). Next, using a cotton swab, stroke the skin below the eye (the area of the infraorbital nerve [V2]) on the left and right sides and ask the patient the same questions as for the area above the eyebrow. Finally, repeat the test in the area of the lower lip and cheek (the area of the mandibular nerve [V3]). The patient may report that even gentle strokes on the right side elicit a strange, annoying sensation, which is unpleasant and “more intense” than on the left side. In the patient's record, add a

note—for example, “Hyperesthesia/allodynia in the right-side V3 to light moving tactile stimuli.”

Pinprick test

Repeat the test, but use the toothpick or dental explorer to test for sensitivity to high-intensity, painful mechanical stimulation. The patient may report that in the V3 area he or she feels pain on the right side that is stronger and lasts longer than the stimulation did. Add a note in the patient’s record—for example, “Mechanical hyperalgesia.”

Spatula test

Cool a metal spatula in a refrigerator until it is 5°C or heat it in a water bath until it is 40°C and apply the spatula to the six test areas for two to three seconds to test for sensitivity to cold and hot stimuli. You may find that the patient reports experiencing an increased sensation of cold only on the right-side V3 area, and you can note “Hypersensitivity to cold stimuli” in the patient’s record.

Intraoral tests

Finally, test for sensory changes inside the oral cavity by performing all three tests on the attached gingiva in the V2 area and the V3 area. (Figure).

Interpreting the results

The results of these simple tests can be sufficient to help dentists make a tentative diagnosis of traumatic neuropathic orofacial pain. According to the proposed diagnostic criteria for neuropathic orofacial pain, the degree of certainty can be graded from “unlikely” to “possible,” “probable” or “definite” (Box^{2,3,7}). On the basis of the patient’s history and chairside testing results, in a case such as the one we describe, the dentist would rate the certainty of the patient’s having neuropathic orofacial pain as probable.

BOX	
Proposed diagnostic criteria for neuropathic orofacial pain.*	
POSSIBLE	
1	If the patient has pain that has a distinct neuroanatomically plausible distribution, check the trigeminal nerve branch distribution
2	If the patient has a history that indicates a relevant lesion or disease that can affect the peripheral or central somatosensory system, check for trauma including oral surgeries
PROBABLE	
Criteria 1 + 2 +	
3	If the distinct neuroanatomically plausible distribution is confirmed by results of at least one test, [†] check neurosensory function
DEFINITE	
Criteria 1 + 2 + 3 +	
4	If a relevant lesion or disease is confirmed by results of at least one test, consider referring the patient for neurophysiologic consultation [‡] or imaging

* Sources: Treede and colleagues² and Cruccu and colleagues.³

† Clinical somatosensory examination may be supplemented by laboratory and objective tests to uncover subclinical abnormalities. If in doubt, refer the patient to an orofacial pain expert.

‡ Source: Thygesen and colleagues.⁷

FURTHER CONSIDERATIONS

The basic underlying mechanisms of neuropathic pain are not understood completely, but they involve a host of changes in the damaged peripheral nerve fibers (for example, upregulation of receptors), central nervous system amplifications or both. The neurobiology is complex and involves phosphorylation of nociceptors, as well as increased trafficking of intracellular signaling systems and structural changes in neurons.⁸ The medical management of pain and sensory disturbances related to traumatic nerve injuries involves primarily topical or systemic medications such as low-dose antidepressants (for example, tricyclic or norepinephrine-selective reuptake inhibitors) or anticonvulsive agents such as pregabalin or gabapentin.⁹ Patient education and counseling, as well as more cognitive-behavioral treatment approaches, also should be considered.

CONCLUSIONS

Traumatic nerve injuries are associated with distinct changes in somatosensory function. Clinicians need to know that such aberrant sensations are normal when treating patients who have neuropathic pain. Simple neurosensory testing can reveal the extent of such somatosensory changes, and the results of more sophisticated QST methods might be a way to study the mechanisms of orofacial pain.

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Figure.

Clinical photographs of a patient undergoing various tests. **A.** The intraoral cotton swab test.

B. The intraoral pinprick test. **C.** The intraoral spatula test.