

ABSTRACT

Sodium hypochlorite irrigation may lead to persistent neuropathic pain

Background - A 29-year-old woman visited a general dental residency clinic with a complaint of severe aching and burning facial pain with occasional sharp stabbing pain and persistent numbness. The symptoms had been present for seven months after sudden onset during endodontic irrigation with sodium hypochlorite. She was evaluated and treated by one of the authors, who was trained in oro-facial pain management.

Case description - The patient reported experiencing debilitating symptoms since the hypochlorite injury. She had been treated with methylprednisolone followed by antiseizure, anti-inflammatory and opioid medications prescribed by a neurologist. Examination and testing revealed static and dynamic mechanical allodynia along with neurological deficits on the left side of the face, implicating both peripheral and central pain mechanisms. The oro-facial pain clinician made a diagnosis of peripheral painful traumatic trigeminal neuropathy involving all three branches of the left trigeminal nerve. The addition of an oral neurosensory stent and modification of medications reduced the patient's pain, resulting in improved function and quality of life.

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Sodium hypochlorite–related injury with chronic pain sequelae

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Sodium hypochlorite irrigation may lead to extravasation injuries and debilitating neuropathic pain. The authors describe the case of a patient who experienced an extravasation injury during an endodontic procedure involving sodium hypochlorite irrigation.

Case report

A 29-year-old woman visited the Advanced Education in General Dentistry residency clinic, Department of Dental Medicine, University of New Mexico, Albuquerque, with a chief complaint of pain and numbness on the left side of her face.

Seven months before visiting the residency clinic, the patient reported experiencing pain in her left maxillary canine (tooth no. 13), apparently associated with dental caries. She described the pain as deep and dull, and it was exacerbated by cold and biting. On one occasion, she experienced two hours of “sharp shooting pain,” prompting her to seek dental care. Dental treatment for the initial pain included endodontic therapy for tooth no. 13.

During irrigation with a solution containing sodium hypochlorite, the patient experienced sudden intense burning pain, which was not alleviated by administration of additional local anesthetic. Continuing pain, rapid facial swelling and bleeding from the open canal prompted the general dentist to refer the patient to her physician for medical care and ultimately to a neurologist.

The neurologist prescribed a two-week regimen of oral steroids and opioid analgesics. The patient reported that her face had continued to be swollen and bruised for about two weeks after the endodontic procedure involving the sodium

KEY WORDS

Trigeminal nerve; root canal; postoperative pain; oro-facial pain; neuralgia; irrigation



hypochlorite irrigation. Because of continuing pain, the neurologist prescribed gabapentin and carbamazepine while continuing the opioid analgesic treatment. The pain and numbness persisted and spread across all three divisions of the trigeminal nerve on the left side.

The pain disrupted the patient's sleep and was exacerbated by eating. After six months, she had lost 30 pounds and was referred to the general dental residency clinic for evaluation by an oro-facial pain clinician (J.M.).

At the initial examination, the patient reported a pain level of 9 on a 10-point visual analog scale (VAS). She described the pain as aching and burning with occasional sharp stabbing pain. She stated that touching her face, eating, being exposed to cold and talking exacerbated the pain. Her medications included acetaminophen (600 milligrams) with codeine (60 mg) three times a day, carbamazepine (200 mg) three times a day, gabapentin (900 mg) three times a day and pain-contingent ibuprofen (400 mg).

A cranial nerve examination revealed that light touch and pinprick sensitivity were diminished by more than 50 percent in the areas of the left ophthalmic nerve (V1) and maxillary nerve

PRACTICAL IMPLICATIONS

Sodium hypochlorite irrigation may lead to injury and persistent neuropathic pain. Diagnosis and management of chronic oro-facial pain require an understanding of pain mechanisms and appropriate

treatment options. A multidisciplinary approach with clear communication among the general dentist, dental specialists, primary care physician and medical specialists often is necessary.

Loss of sensation



Fig. 1. The **A** on the patient's face indicates an area of more than 50 percent loss of sensation and approximates an ophthalmic nerve (V1) and maxillary nerve (V2) distribution. The **B** indicates an area of 20 percent loss of sensation with dysesthesia in the mandibular nerve (V3).

(V2) compared with those on the right side. In addition, light touch and pinprick in the area of the left mandibular nerve (V3) revealed a 20 percent diminished sensitivity with tingling dysesthesia. The distribution of sensory changes followed a dermatomal distribution (Fig. 1).

The clinician recorded a Beck Anxiety Inventory (1) score of 10 (of a possible 63 points, indicating "mild anxiety") and a Beck Depression Inventory (2) score of 7 (also of a possible 63 points, indicating "minimal depression"). These questionnaires are administered to patients for psychometric screening of clinical anxiety and depression.

The patient's greatest pain was centered in the left maxillary labial vestibule near tooth no. 13. Light pressure with a cotton-tipped applicator in this area elicited a painful response compared with that on the contralateral side. Lightly stroking the same area and moving distally toward tooth no. 14 also were painful. These test results indicated static mechanical allodynia and dynamic mechanical allodynia, respectively, and are consistent with peripheral and central neuropathic sensitization. Allodynia is pain due to a stimulus that typically does not provoke pain (3).

Topical 20 percent benzocaine gel applied to the left labial and buccal vestibule reduced the patient's pain from 9 to 7 on the 10-point VAS within five minutes. Shallow infiltration injection of 2 percent lidocaine (20 mg) into the left canine fossa reduced the pain further to a VAS score of 6.

On the basis of the static mechanical allodynia, the clinician proposed a preliminary diagnosis of peripheral painful traumatic trigeminal neuropathy by using the diagnostic criteria of Benoliel and colleagues (4). A spreading field of sensory deficit, dynamic mechanical allodynia, cold hypersensitivity and incomplete response to the anesthetic block met the diagnostic criteria for central sensitization and possible sympathetically mediated pain (5,6).

Improvement in the patient's condition with topical and infiltration anesthetic indicated the possible effectiveness of topical therapy to treat one component of the pain. The oro-facial pain clinician initiated use of a neurosensory stent (NSS) with capsaicin 0.025 percent paste mixed in a 50:50 ratio with

20 percent benzocaine (Orabase B, Colgate Oral Pharmaceuticals, New York City). An NSS is an acrylic appliance fabricated to cover specific areas of the gingiva or mucosa and serves as a reservoir for topical or transmucosal medications (7,8). The clinician instructed the patient to wear the NSS 24 hours per day and reapply the ointment every four hours during waking hours.

Five weeks after her initial visit to the residency clinic and at subsequent follow-up appointments, the patient reported experiencing reduced pain, with a VAS score of 5 or less and an ability to eat without an increase in pain. She also had normative weight recovery. To date, the patient continues to receive care from her primary care physician and neurologist, as well as at the residency clinic. The patient's medical and dental team is considering other systemic medications and interventions.

Discussion

Extravasation injuries caused by sodium hypochlorite are rare and range from mild irritation to severe pain. Most cases resolve in a few days to several weeks (9-11). A diagnosis of peripheral and central painful traumatic trigeminal neuropathy after irrigation with sodium hypochlorite is not unique in the literature (12,13). However, the spreading field of neuropathic pain in our patient—starting in V2 on the left side and moving to V1 and V3—is unique, to our knowledge. This spreading field and the presence of dynamic mechanical allodynia are indicative of central sensitization secondary to peripheral nerve damage (5).

To rule out the presence of sympathetically mediated pain and guide further treatment, the oro-facial pain clinician suggested that a sympathetic nerve block be performed. To date, the patient continues to receive gabapentin and carbamazepine treatment, as prescribed by her physician. In this case, the presence of static and dynamic mechanical allodynia indicated pain contribution from both peripheral and central mechanisms. These findings are significant because they implicate specific nerve involvement and pain pathways, thus suggesting possible treatment modalities. Furthermore, peripheral nerve treat-

ment is indicated even long after the injury because the activity of primary afferents can persist for many years (14). We should note that local treatment is beneficial even in cases in which there is a partial response to local anesthetic testing.

Release of substance P and glutamate accounts for one mechanism in chronic pain (7). This release occurs in the peripheral nervous system and centrally at the synapses of first-order neurons activating N-methyl-D-aspartate receptors on wide-dynamic-range secondary neurons in the trigeminal nucleus. Study findings have shown that topical medications that include capsaicin are effective in reducing or eliminating the peripheral component of pain in some patients with neuropathic pain (15,16). This effect may be the result of substance P depletion from the nociceptors (17).

Although it is within the purview of dentists who have had advanced training in orofacial pain management to treat patients with peripheral painful traumatic trigeminal neuropathy, multidisciplinary treatment often is advantageous or necessary. This is especially true when specialized interventions such as sympathetic ganglion blocks are indicated.

Conclusion

Sodium hypochlorite irrigation may lead to extravasation injury and debilitating neuropathic pain. Chronic neuropathic pain often is difficult to treat; therefore, multimodal and multidisciplinary treatment is encouraged. Prompt identification of pain mechanisms and appropriate treatment are crucial in limiting the sequelae of peripheral and central sensitization after nerve injury.

Abbreviation key: NSS: Neurosensory stent. V1: Ophthalmic nerve. V2: Maxillary nerve. V3: Mandibular nerve. VAS: Visual analog scale.

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