Paresthesia during orthodontic treatment: Case report and review.

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Paresthesia of the lower lip is uncommon during orthodontic treatment. In the present case, paresthesia occurred during orthodontic leveling of an extruded mandibular left second molar. It was decided to remove this tooth from the appliance and allow it to relapse. A reanatomization was then performed by grinding. The causes and treatment options of this rare disorder are reviewed and discussed. The main cause of paresthesia during orthodontic treatment may be associated with contact between the dental roots and inferior alveolar nerve, which may be well observed on tomography scans. Treatment usually involves tooth movement in the opposite direction of the cause of the disorder.
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Key words: orthodontic appliances, paresthesia

Paresthesia can be defined as an abnormal sensation of tingling, burning, or itching in the absence of stimuli,[1] normally caused by neural injury.[2] In dentistry, paresthesia can be caused by local or systemic factors. Local factors include trauma resulting in fractures, compressive cystic and cancerous lesions, impaction of teeth, localized infection and surgical trauma, and compression cause by inflammation,[3–10] while systemic factors include demyelinating diseases, viral infections, metabolic disorders, hypovitaminosis, Paget disease, syphilis, transitory ischemic attack, cerebral strokes, neural neoplasia, metastatic malignancies, and some systemic drug reactions.[3–10] Normally, paresthesia can be diagnosed by clinical examination and anamnesis, with the patient reporting numbness or abnormal sensation localized in a particular area of the body.

Even though paresthesia is a common finding in oral-craniofacial surgery[11–16] and endodontics,[6,17–19] it rarely occurs during orthodontic treatment. This fact is clearly supported by the reduced number of reports of paresthesia associated with orthodontic treatment. In the nine reports available in the literature,[20–28] the causes, diagnostic tools, and treatment options to solve this condition are very different.

This variable management is probably related to the lack of knowledge, considering the rare occurrence of this disorder. A review of the published reports may aid in the early identification of patients that may develop paresthesia associated with orthodontic treatment as well as suggesting approaches to be adopted it if it occurs.

This paper reports a case of paresthesia of the lower lip during orthodontic alignment and leveling, comparing the cause, diagnosis, and treatment options with information in the literature. The tomographic diagnosis and treatment to solve the condition are suggested and discussed.

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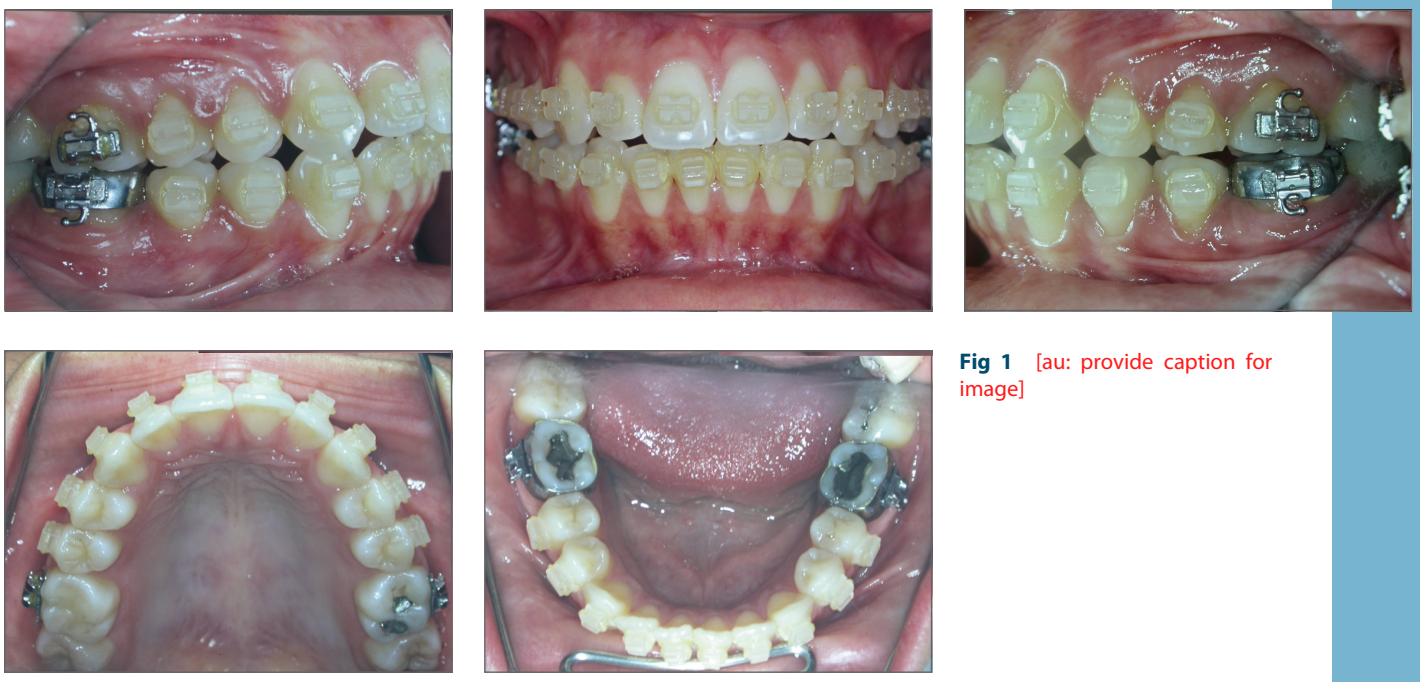

Fig 1 [au: provide caption for image]

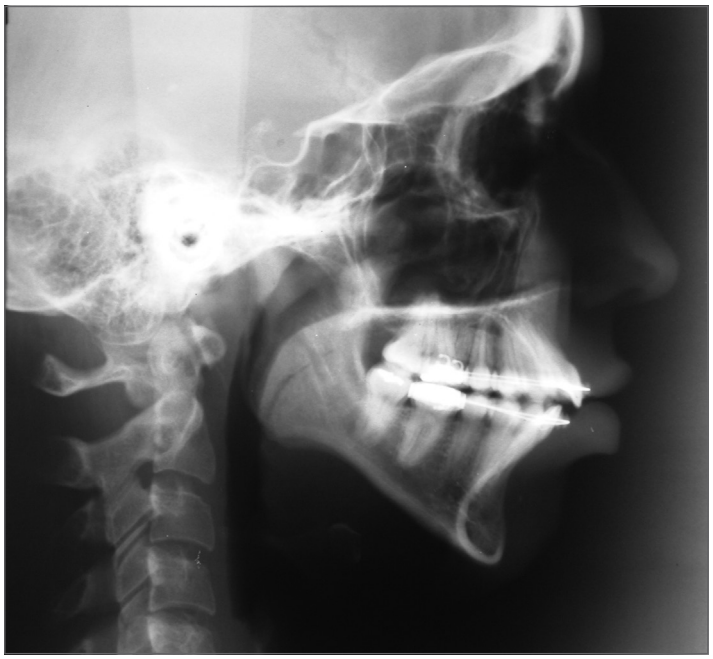

Fig 2 *(left)* [au: provide caption for image]

Fig 3 *(above)* [au: provide caption for image]

CASE REPORT

A 24-year-old white woman presented in search of treatment after two previous unsuccessful orthodontic treatments, with the latter still in progress (and had been for 2 years). The patient had no underlying medical conditions and was not under any kind of medication. The patient's history did not reveal any significant dental pathology.

She had a Class II, division 1 malocclusion, excessive buccal tipping of the mandibular incisors, and a deep curve of Spee. She also reported pain and discomfort while chewing. According to the patient, the mandibular second molars had not

Table 1 Pre- and posttreatment cephalometric measurements

Measurement	Standard measurement	Pretreatment	Posttreatment
Maxillary components			
SNA	82	75	73
A	1	–	–
Mandibular components			
SNB	80	70	67
P	–	–	–
Maxillomandibular components			
ANB	2	5	6
Growth pattern			
SN.Ocl	14	21	22
SN.GoMe	32	43	45
Maxillary dental components			
Mx1.NA	22	38	23
Mx1-NA (mm)	4	7	3
Mx1.PP	112.1	118	101
Mx1.SN		113	96
Mandibular dental components			
Md1.NB	25	36	30
Md1	4	10	13
I MPA	95.3	104	97
Soft			
Nasolabial angle	110	103	110
Upper lip to S Line (mm)	0	5	2
Lower lip to S Line (mm)	0	8	3

[au: add zeroes to all whole numbers or round values with decimal points—all values need to be rounded to the same decimal place]

been included in the appliance in either of her previous treatments, even though they were extruded, preventing anterior guidance during protrusion. Initial photographs and lateral cephalogram are displayed in Figs 1 and 2.

The treatment plan for the maxillary arch comprised extraction of both maxillary first premolars and retraction of the maxillary canines and incisors with the aid of mini-implants. For the mandibular arch, interproximal enamel reduction was to be performed to both retract the incisors and adjust the tooth discrepancy due to the excessive proclination of the mandibular incisors (Table 1).

Ceramic brackets (Inspire, Ormco) with 0.018-inch slots were used for treatment, and all molars were banded. After 2 weeks of treatment, with the leveling initiated with 0.016 × 0.016-inch nickel-titanium (Ni-Ti) archwire, the patient returned with the complaint of loss of sensitivity on the left side of the lower lip. She reported the feeling was like constant anesthesia to the lip. This loss of sensitivity reported by the patient was spontaneous and continuous, and it was not aggravated or alleviated by any factors. Since the panoramic radiograph revealed a close relationship between the roots (which appear to be fused) of the mandibular left second molar and the mandibular canal (Fig 3), a computed tomography (CT) [au: edit ok?] scan was requested to provide better evaluation of the region.

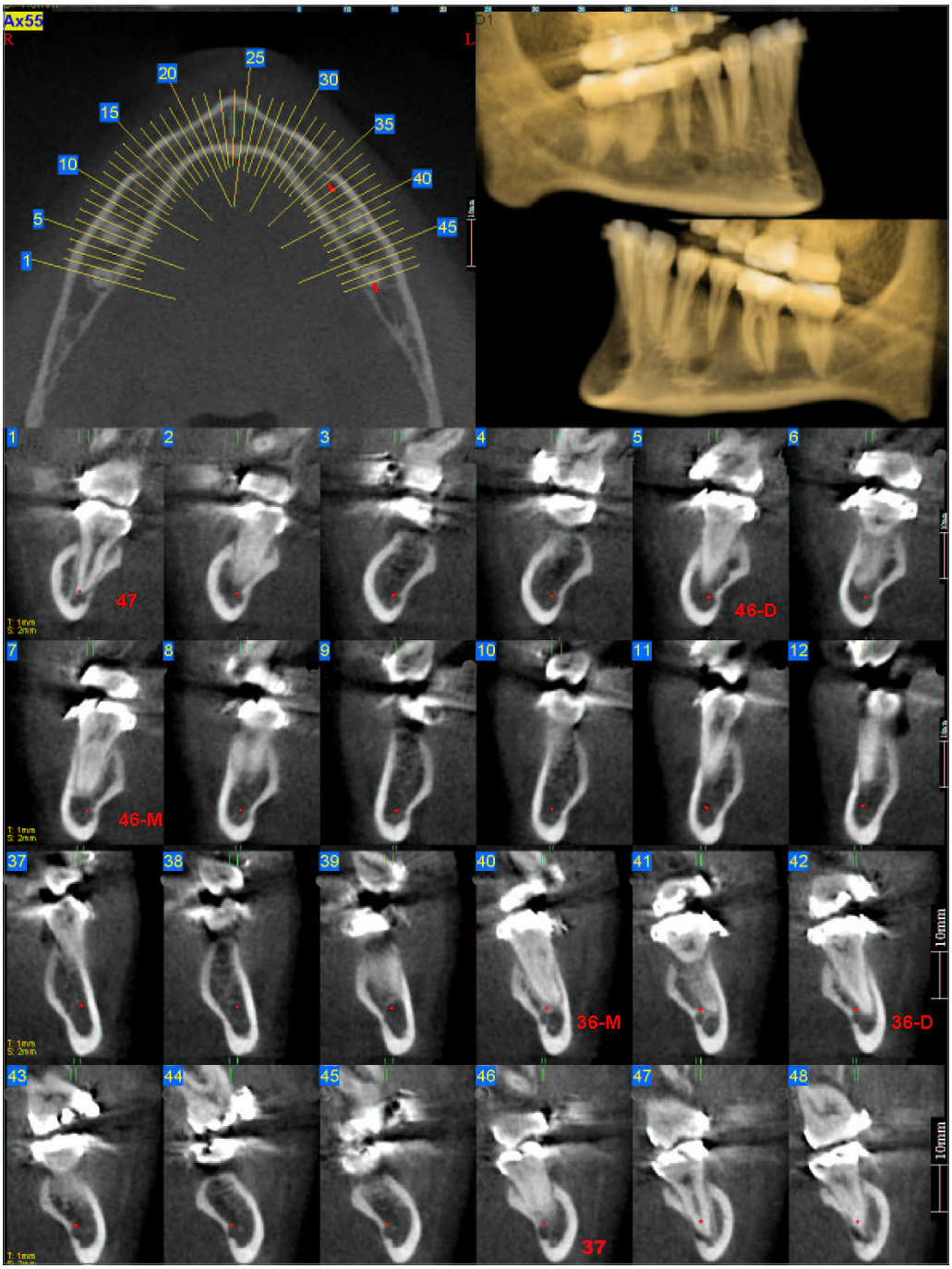

Fig 4 [au: provide caption for images]

The CT scan evidenced the close contact between the inferior alveolar nerve and the root of the mandibular left second molar (Fig 4). It was assumed that paresthesia was caused by the contact of this tooth root and the inferior alveolar nerve. The band on the mandibular left second molar was removed, and the tooth was detached from the orthodontic appliance. Within 4 weeks, the paresthesia reverted, corroborating the

Fig 5 [au: provide caption for image5]

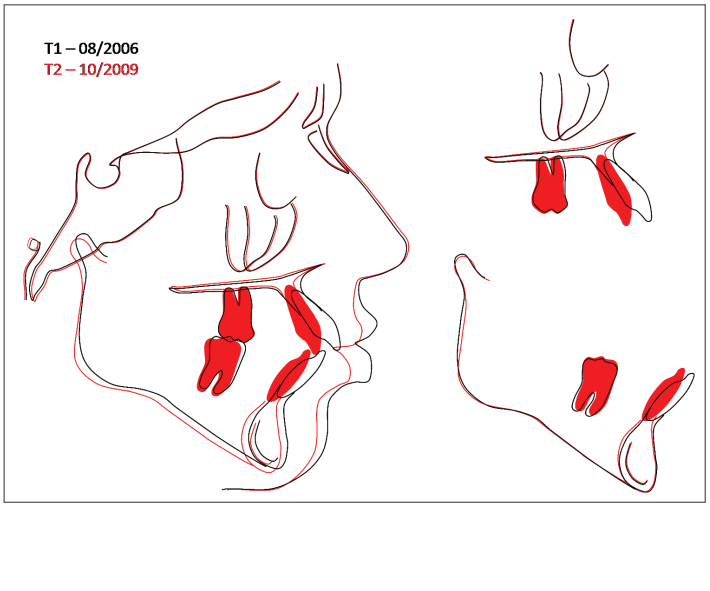

Fig 6 Total *(left)* and partial *(right)* superimpositions.

suggested diagnosis. The second molar was reanatomized with the use of high-speed burs to allow the patient to occlude normally, allowing incisor guidance during protrusion and no contacts during canine guidance on the balancing side. The final pictures are shown in Fig 5; the final cephalogram superimposition is in Fig 6 (also see Table 1).

DISCUSSION

The diagnosis of the patient was made solely based on the patient's report. A more precise diagnosis would have involved a quantitative sensory testing, a noninvasive method that can be used as a tool in the assessment of sensory nerve damage.[29–33] These methods are based on traditional

Table 2 Literature review on paresthesia associated with orthodontics

Author	Sex	Malloclusion	Local affected	Diagnostic means	Cause	Treatment
Stirrups[15]	Female	—	Numbness of the right side of lower lip	Intraoral and occlusal radiography	Leveling and alignment of a mandibular right second premolar	Force interruption followed by tooth extrusion
Tang et al[16]	Female	Class II, division 1	Lip exhibited a tingling sensation while the chin area was described as being of dull or reduced sensibility	Panoramic radiography	Leveling and alignment of a mandibular right second molar	Tooth extrusion
Krogstad and Omland[14]	Male	Class III	Lower left lip	Panoramic, intraoral, and occlusal and CT radiography	Leveling and alignment of a mandibular left second molar	Bracket removal
Erickson et al[12]	Female	Class II	All of the lower lip anterior to the second molar to the midline with the exception of the vermilion.	CT scan	Correction of a crossbite of mandibular right second molar	Buccal root torque and extrusion of the tooth
Patel et al[18]	Male	Class II, division 1	Paresthesia over the right side of the patient's forehead with variable paresthesia over the cheek, lip, and chin	Magnetic resonance imaging	Cavernous hemangioma	Surgical removal
Willy et al[17]	Male	Class II, division 2	Diffuse dull ache in the left side of the mandible, left side of the lower lip as well as chin	Panoramic radiography	Leveling and alignment of the mandibular lower second premolar	—
Baxmann[11]	Female	Class II, division 2	Right side of the chin and the lower lip	Panoramic radiography and scan or a cross-sectional image	Leveling and alignment of the mandibular right second premolar	Force interruption followed by tooth extrusion
Farronato et al[13]	Male	Class I	Area of innervation of the mandibular right nerve	CT and panoramic radiograph	Distalization of the mandibular right second molar	Anti-inflammatory drug, vitamin B, and bracket removal
Noordhoek and Strauss[19]	Female	—	Teeth, gingiva, and the lower lip on the right side	CT scan	Distalization of a third molar	Removal of forces and anti-inflammatory drug
Present study	Female	Class II division 1	Lower lip	CT scan	Leveling and alignment of the mandibular right second molar	Bracket removal and occlusal adjustment

[au: numbers DO NOT match reference list. Please adjust to make sure these names and numbers are accurate!]

neurologic examination of sensory function, psychophysic procedures, and an array of stimulus modalities that assess the functional capacity of primary afferent fibers.[34]

Contact between the root of mandibular teeth and the inferior alveolar nerve can cause paresthesia during tooth movement. In the present case, paresthesia was caused by contact between this nerve and the root of the mandibular left second molar. Two conditions have been associated with the occurrence of paresthesia during orthodontic treatment: the presence of a cavernous haemangioma[27] and the contact of dental roots with the inferior alveolar nerve (Table 2).[20–26,28] In the first case, the paresthesia disappeared after removal of the tumor,[27] and in the second case, related to

this report, the symptomatology was solved after the contact between the roots and the inferior alveolar nerve was removed.[20–26,28] This suggests a cause-and-effect relationship between a contact of dental roots with the inferior alveolar nerve and paresthesia. This is the only nerve that may be affected on the face, since from an anatomic standpoint, no other nerve is that close to the dental roots. Long roots of premolars and second molars favor this close relationship.

The CT scan is the safer option to confirm the diagnosis of paresthesia caused by contact with dental roots compared to other imaging examinations. In the present case, the definitive diagnosis could be reached only by analysis of the CT scan. Conventional radiographs may suggest proximity or contact of the roots with the mandibular canal, yet the accuracy of diagnosis is impaired by the superimposition of images of anatomical structures. The CT scans do not have this limitation and are therefore more elucidative than conventional radiographic images,[14,35–38] because they clearly demonstrate the contact of roots with the inferior alveolar nerve.[20–23] The literature also suggests the utilization of magnetic resonance imaging,[26,27] yet this examination is impaired by the presence of fixed appliances, because metal interferes with image formation, especially if the metallic structure is close to the area to be observed.[26,27,39] Therefore, so far, CT scans are the best option to evaluate the proximity of roots to the mandibular canal.[21]

Movement of the dental root away from the inferior alveolar nerve solves the paresthesia caused by orthodontic movement. The few reports available in the literature describe different approaches to solve the paresthesia caused by orthodontic movement (Table 2). In most cases,[20,21,24,25] the solution is associated with an extrusive orthodontic movement to increase the distance between the tooth apex and the inferior alveolar nerve. Even though remodeling of the mandibular canal during intrusion of molars has been demonstrated in animals,[40] it is not possible to know if there was paresthesia during tooth movement or even if it was solved after remodeling. Thus, paresthesia should be solved by tooth movement opposite of the direction that caused the disorder or by allowing the tooth to relapse. In the case presented, it was decided to interrupt the tooth movement and remove the mandibular left second molar from the archwire, allowing the tooth to relapse, since it was extruded initially. Reanatomization of the molar was necessary and accomplished by grinding, since the tooth was extruded and leveling was not an option. No reports in the literature (Table 2) mention the occlusal adjustment of initially malpositioned teeth as an option to adapt the orthodontic treatment.

CONCLUSION

The following conclusions can be drawn:

- Paresthesia by tooth movement has been rarely reported and is usually associated with close contact between the roots of second premolars or second molars in the inferior alveolar nerve.
- The diagnosis should be confirmed by CT scan when the radiographic image suggests close proximity between the tooth apex and the mandibular canal, or even for prevention at treatment onset in suspected cases.
- Treatment may involve tooth movement opposite to the direction that caused paresthesia, exclusion of the tooth from the orthodontic appliance, and occlusal adjustment when required.

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