Pathosis or Additional Maxillary Neurovascular Channel? A Case Report

A. Johanna Leven, BDS, MFDS RCSEd, and Banoo Sood, BDS, MSc, FDS RCSEd, FDS (Rest Dent) RCSEd

Abstract

This case report highlights an incidental finding of an anatomic variation of a neurovascular channel in close proximity to the maxillary right permanent lateral incisor (tooth #7). A 32-year-old patient presented with discomfort and a history of trauma in childhood to the right maxillary central incisor (tooth #8). A periapical radiograph of tooth #8 revealed an incidental finding of a radiolucent area in the apical one third of the right maxillary lateral incisor (tooth #7) root with the appearance of inflammatory apical root resorption. A cone-beam computed tomographic scan taken to assess the suspected area of resorption revealed this to be a neurovascular channel within the bone passing distal to the apex of tooth #7, which has been superimposed over the root of tooth #7 on the periapical radiograph. This case report highlights that additional bone channels are a common finding in the maxillary alveolus. These channels can in fact be the canalis sinuosus (or branches of it), a bone channel that is a frequent anatomic variant arising from the infraorbital canal. The canalis sinuosus has been reported rarely in the literature, but it should be considered to be a potentially common finding in the maxillary incisal region. Clinicians are made aware of the presence of additional neurovascular bone channels such as the canalis sinuosus when interpreting radiographs for assessing periapical status of teeth and for surgical planning in the anterior maxilla. *(J Endod 2018;■:1–4)*

Key Words

Additional neurovascular channel, canalis sinuosus, cone-beam computed tomography, incidental finding

Significance

Additional neurovascular channels are common in the maxillary incisor region but have not been reported frequently in the literature. Clinicians should be aware of the presence of these additional channels when interpreting radiographs and planning surgical procedures in the anterior maxilla.

The infraorbital nerve is a terminal branch of the maxillary nerve; it typically exits the maxilla through the infraorbital foramen and branches into the soft tissues to form the labial, nasal, and palpebral branches, which provide sensory innervation to the upper lip, nose, lower eyelid, and conjunctiva. Before exiting the infraorbital foramen, branches of the infraorbital nerve form the middle superior dental nerve and the anterior superior dental nerve, which together with the posterior superior dental nerve form the superior dental plexus innervating the maxillary teeth (1). The anterior superior alveolar nerve branches away from the infraorbital canal halfway along the canal and runs below the infraorbital foramen. It travels in a medial direction toward the nose before splitting to supply the canine and incisors (2). Additional bone channels or branches of the infraorbital canal can often be present, but there are few reports of this in the literature. These bone channels can be mistaken for pathosis or, in this case, root resorption.

Root resorption is an inflammatory process described as a gradual loss of dentin and cementum as a result of osteoclastic activity (3). This can occur when the protective precementum or predentin layers of the root are damaged and the mineralized dentin or cementum layers, which are more susceptible to resorption, are exposed (3). When damage occurs, cytokines of the tumor necrosis factor group are triggered, which, in turn, signal monocytes and macrophages to fuse and form osteoclasts (4–6). The presence of bacteria is also a factor that can initiate and perpetuate osteoclastic activity (4). There are numerous classifications of root resorption based on the site (eg, apical or cervical), surface (eg, internal or external), etiology (eg, infection or pressure), type (eg, inflammatory or replacement), or a combination of these (3, 4, 7–12). Resorption can be initiated by a multitude of stimulants such as pulpal disease, trauma, orthodontic treatment, pressure from impacted teeth, and periodontal disease. With regard to trauma, intrusion and avulsion injuries are particularly high risk for teeth later developing resorption (13).

In the case presented here, an area of radiolucency was indicative of external inflammatory resorption in the apical third of the root (4). This is typically found when there has been damage to the root surface and the periodontal ligament, often as a result of the trauma, and the pulp has become necrotic or infected. It can be a rapidly progressive condition if endodontic treatment is not performed (4). However, external inflammatory root resorption is often asymptomatic and is an incidental radiographic finding unless there is an acute inflammatory response, in which case the tooth may

From the Liverpool University Dental Hospital, Liverpool, United Kingdom.

Address requests for reprints to Ms A. Johanna Leven, Liverpool University Dental Hospital, Restorative Dentistry Department, Liverpool, Merseyside L3 5PS, UK. E-mail address: alexandra.leven@rlbuht.nhs.uk

0099-2399/$ - see front matter

https://doi.org/10.1016/j.joen.2018.02.025

be tender to percussion (14). Radiographically, it often appears as an irregular concavity of the root and a corresponding radiolucency in the bone (8). If associated with an endodontic cause, the resorptive defect will be more apical, but if associated with trauma, it may be anywhere on the root surface. Immature and young teeth have been found to be more susceptible (13). The American Association of Endodontists and the American Academy of Oral and Maxillofacial Radiology joint position statement on the use of cone-beam computed tomographic (CBCT) imaging in endodontics clearly states CBCT scanning is the imaging modality of choice to accurately diagnose and assess root resorption (15–17).

The purpose of this case report was to highlight the presence of an anatomic variation that could have been mistaken for disease. The use of CBCT imaging helped to prevent misdiagnosis and avoid unnecessary treatment.

Case Report

A 32-year-old woman was referred from general practice to the dental hospital complaining of intermittent low-grade pain on biting from the right maxillary central incisor (tooth #8) region. She had suffered trauma as a child, and, subsequently, tooth #8 was crowned. Seven months before referral, tooth #8 became symptomatic, and endodontic treatment was undertaken. The patient's dentition was otherwise unrestored.

Clinically, tooth #8 tested mildly tender to percussion; the crown margins were defective, and it was the main tooth involved in protrusive guidance with the right mandibular lateral incisor (tooth #26). The periapical radiograph obtained revealed a well-condensed root filling and absence of periapical disease. An incidental finding of a radiolucency in the apical third of the right maxillary lateral incisor (tooth #7) root was suggestive of inflammatory apical root resorption (Fig. 1). Clinically, there were no signs or symptoms associated with tooth #7 (ie, no soft tissue swelling, discoloration, increased mobility, or tenderness to percussion). Given the history of trauma, the suspected area of root resorption on tooth #7, the symptoms reported, and the American Association of Endodontists/American Academy of Oral and Maxillofacial Radiology guidelines, a CBCT scan was requested to better assess the area (15).

Figure 1. A periapical radiograph of tooth #8 and #7. The *arrow* indicates the radiolucent area.

The CBCT report revealed that there was a neural or vascular channel within the bone, approximately 1.5 mm in diameter, passing from the distopalatal aspect of tooth #7 root to the anterior aspect of the maxilla within the bone (Figs. 2–4). This channel was superimposed over the apical third of the root of tooth #7, creating the appearance of a radiolucency on the periapical radiograph. The CBCT scan confirmed the absence of root resorption. A similar neurovascular channel was also noted on the CBCT scan running palatal to the maxillary left lateral incisor (tooth #10) (Fig. 4).

A replacement crown for tooth #8 with shared protrusive guidance with the other anterior teeth was prescribed to address the diagnosis of inadequate coronal seal and occlusal trauma followed by a maxillary soft occlusal splint if needed.

Discussion

Torres et al (18) commented that the greater access to CBCT imaging has provided, among other benefits, information about important anatomic structures. Additional channels or canals have been described in the literature as neurovascular anatomic variations with names including the lateral incisive canal and branches of the canalis sinuosus (19–22).

The literature refers to the canalis sinuosus as a bone channel that is a lateral branch of the infraorbital canal and contains the anterior superior alveolar nerve and vessels supplying the maxillary anterior teeth and soft tissues (18). The canalis sinuosus branches from the infraorbital canal, runs below the floor of the orbit and medially downward between the anterior wall of the maxillary sinus and the lateral wall of the nasal fossa, and opens in front of the nasopalatine canal but lateral to the nasal septum (18, 23, 24). In our patient, this appears to be seen in the sagittal CBCT image adjacent to tooth #8 (Fig. 5). A Brazilian study found the canalis sinuosus to be present on CBCT imaging in 87.5% in a sample of 100 patients. The authors of the study concluded that the canalis sinuosus should be considered a common anatomic finding and not a variant (24).

In a retrospective study performed in Switzerland that assessed the presence of additional bone channels using CBCT scanning, 55.5% of the sample of 176 participants presented with 1 or more of these channels in the anterior maxilla (22). The study revealed additional canals in the canine and lateral incisor region originated from the canalis sinuosus, whereas additional channels in the central incisor region more commonly arose from the piriform aperture (22). However, only 27.8% of the patients had additional maxillary channels of $\geq$1 mm (22). Another study found 32.9% of the 65 patient sample group had additional bone channels present in the maxillary canine region but included smaller channels of 0.5 mm. The mean diameter of the bone channels found was 1.23 mm (25). It is likely that additional channels are often present but with diameters $\leq$0.5 mm are not often visible on plain radiographs; however, the larger channels that may pose as periapical disease are less common and may indeed be additional branches or variants of the canalis sinuosus (18, 20).

The authors accept that sensibility testing would have been a useful adjunct to diagnosis and is something that should be routinely performed on teeth with a history of trauma or suspected pathosis.