

Diagnosis of Anomalous Teeth with Cone-Beam Computed Tomography

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Tooth anomalies in the permanent dentition are rare and often incidental findings in routine orthodontic care. Occasionally, however, an anomaly may have a considerable impact on orthodontic treatment planning. In such a patient, advanced three-dimensional imaging modalities such as cone-beam computed tomography (CBCT) can provide critical assistance, as the following case demonstrates.

Case Report

An 11-year-old female in the late mixed den-

tition presented to the Department of Orthodontics, University of Pennsylvania School of Dental Medicine, for treatment of upper and lower crowding. A supernumerary tooth was observed in the upper left first premolar region, but none of the two-dimensional radiographs was able to accurately depict the size or anatomy of the tooth (Fig. 1).

Because the patient was considered a borderline extraction case, the initial treatment plan was to remove only the suspected supernumerary tooth and then to proceed with comprehensive fixed appliance therapy. Before proceeding with treatment, we ordered a CBCT scan* that would pro-

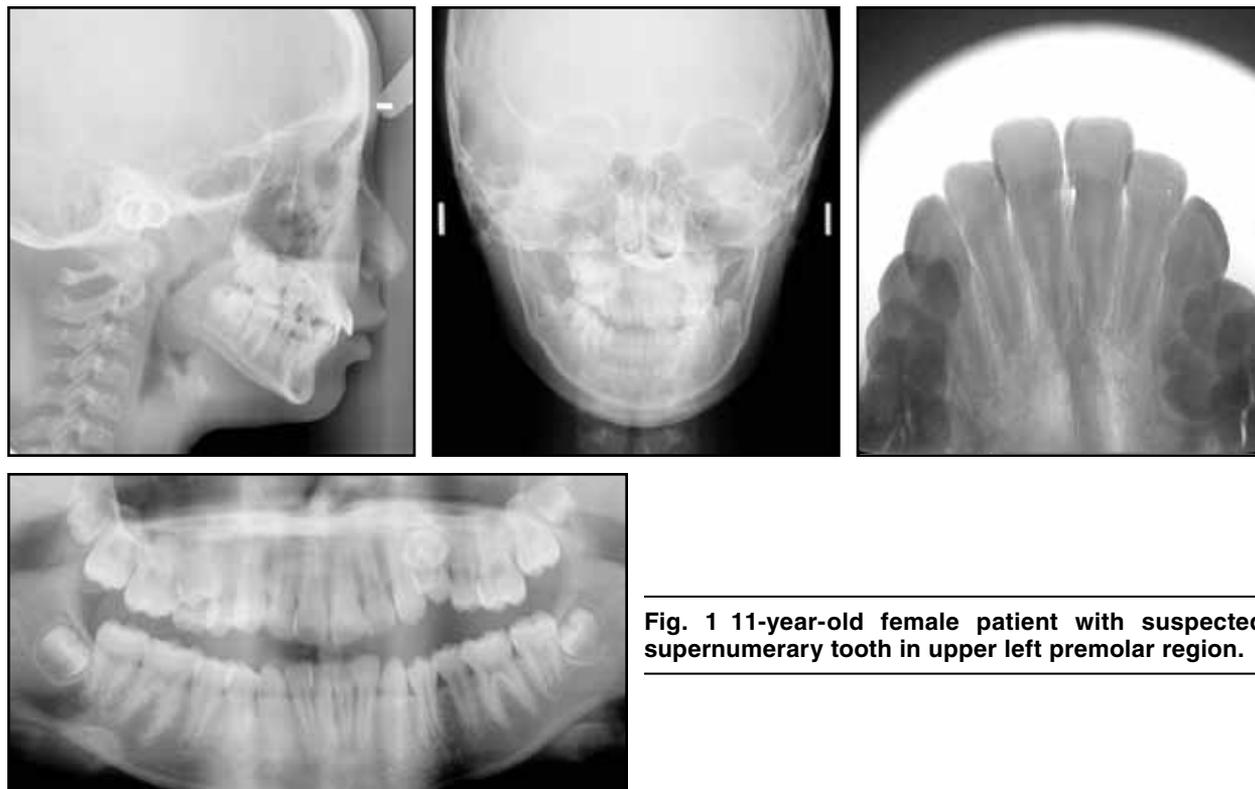


Fig. 1 11-year-old female patient with suspected supernumerary tooth in upper left premolar region.

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vide a more detailed assessment of the shape and position of the tooth, particularly as it related to the first premolar. The scan, taken with a full field of view at a low resolution of .4 voxels, revealed an anomalous tooth with a single root-canal system and two fully formed crowns (Fig. 2). One of the crowns belonged to the first premolar, the other to a supernumerary tooth.

Two options were then considered by the clinical team, patient, and family: elective root-canal treatment of the tooth in question, separation and removal of one tooth crown, periodontal surgery, and placement of an elective crown prior to orthodontic treatment; or extraction of all four first premolars (including the supernumerary) to relieve the dental crowding. Elective treatment of the virgin tooth could have created a periodontal defect and would have required multiple additional dental procedures, with no guarantee of the long-term viability of the involved tooth. There-

fore, the decision was made to extract all four first premolars.

The anomalous tooth was removed with no complications. Extraction revealed an undersize crown fused to the permanent tooth at the level of the cemento-enamel junction (Fig. 3). This anomaly could have been indicative of diphodontic gemination, based on the small size of the second crown and the presence of a single root-canal system.

Discussion

Gemination refers to the cleavage of a single tooth germ; partial cleavage represents true gemination, while complete cleavage is known as twinning. True fusion is when two tooth germs are joined at their enamel and dentin. A dental union known as late fusion can also occur at the dentin or cementum layer. Concrescence is the late fusion of two teeth at the cementum layer, usually after crown development. The union of a supernumerary tooth and a normal tooth is called diphodontic

*iCAT, Imaging Sciences International, Hatfield, PA; www.imagingsciences.com.



Fig. 2 Coronal and axial cone-beam computed tomography slices of left alveolar bone reveal fused crowns with single root-canal system in upper first premolar site.

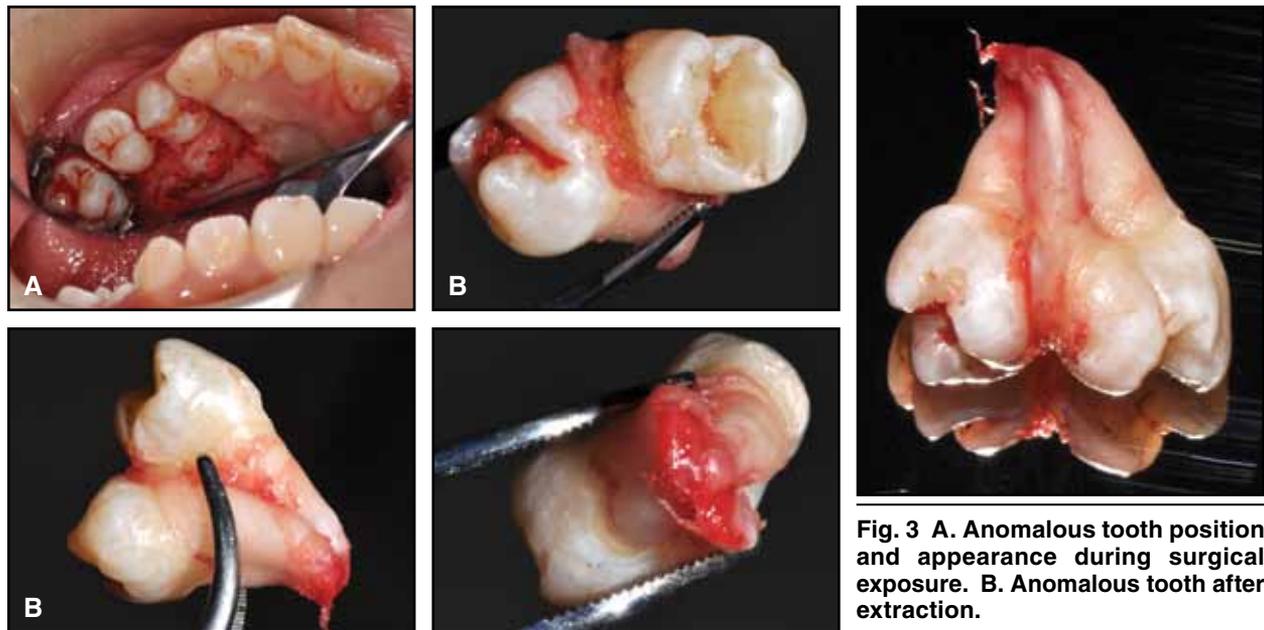


Fig. 3 A. Anomalous tooth position and appearance during surgical exposure. B. Anomalous tooth after extraction.

gemination or odontoma. In this case, the pulp chambers and canals may be joined or separate, depending on the degree of development at the time of union or fusion.¹⁻⁴

Gemination and tooth twinning are caused by developmental irregularities in the ectoderm and mesoderm during morphodifferentiation of tooth germs. Although the etiology of such aberrations remains unknown, many authors suggest a genetic origin.^{1-3,5} The reported prevalence of these anomalies ranges from .5% to 5%, depending on geographic, racial, and genetic factors.^{1,3-12}

The size and number of anomalous teeth and the prognosis for the dentition all play important roles in developing orthodontic diagnoses and treatment plans. In the case presented here, a CBCT scan revealed anatomical details that could not have been visualized with traditional two-dimensional imaging, thus leading to a change in the treatment plan. By understanding the nature of the anomaly, the treating clinicians and family were able to reach a more informed decision to extract all four first premolars. Without the scan, an attempt would have been made to surgically expose the suspected supernumerary tooth, only to be surprised by its fusion to the permanent tooth. Being able to visualize the tooth ahead of time saved us from making a hasty decision in the middle of surgery.

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