Alterations in Tooth Structure and Associated Systemic Conditions

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KEYWORDS

• Dental • Anomalies • Tooth abnormalities • Systemic • Syndromes

KEY POINTS

- Tooth development is a complex process that involves precise and time-dependent orchestration of multiple genetic, molecular, and cell interactions.
- The cause of most dental anomalies is multifactorial, including genetic and environmental contributors.
- Some dental abnormalities are commonly seen with specific systemic diseases and syndromes.
- Dental abnormalities can be broadly categorized as anomalies affecting the tooth number, size, shape, structure, eruption pattern, and position in the dental arch.

INTRODUCTION

The development of a normal dentition occurs from the dental lamina, which originates from a string of epithelial cells in the oral ectoderm during the early months of embryonic development. A variety of factors can affect the normal development of tissues and may lead to variation in the normal compliment of teeth and development of alterations and defects in the shape and size of teeth. These dental anomalies can be congenital, developmental, or acquired. This article discusses some of these tooth alterations with associated systemic and genetic conditions.

TOOTH NUMBER ANOMALIES

Hyperdontia

Definition: the presence of extra or supernumerary teeth in the dental arches beyond the normal 32 teeth of the permanent dentition and 20 teeth of the primary dentition.

Cause: genetic predisposition as well as environmental factors may increase the activity of the dental lamina leading to formation of the extra tooth/teeth.[1,2]

Clinical presentation: clinical intraoral and radiographic examinations are key in accurate diagnosis. Supernumerary teeth may occur in variable numbers, size, and locations, and tend to have variable morphology. They can be found in the primary and permanent dentitions. Supernumerary teeth may develop in any region of the dental arches; however, the most common sites tend to be the anterior maxilla, maxillary molar, and mandibular premolar regions. The term mesiodens is used when a supernumerary tooth is located close to the maxillary midline, between the central incisors.

Radiographic appearance: often, extra teeth remain embedded in bone because they do not have enough space to erupt. If not seen clinically, the presence of more than the normal number of

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Radiol Clin N Am ■ (2017) ■–■
http://dx.doi.org/10.1016/j.rcl.2017.08.009

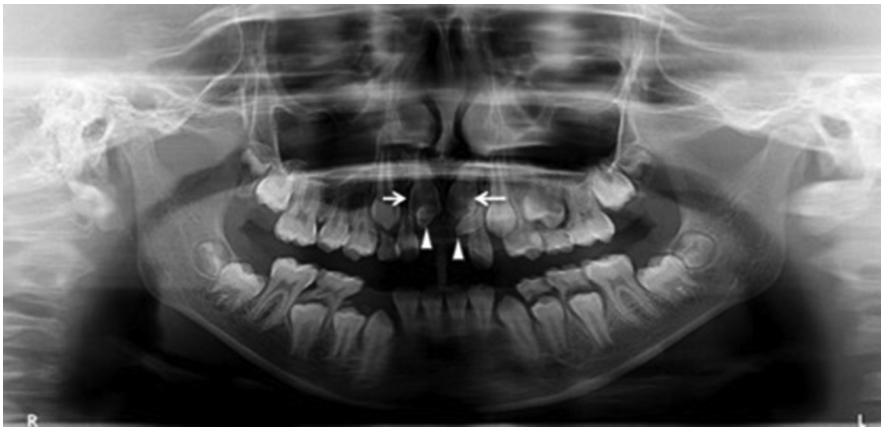

Fig. 1. Supernumerary teeth. Panoramic image shows 2 mesiodens (*arrowheads*) blocking the eruption of the permanent maxillary central incisors (*white arrows*). (*Courtesy of* Frederico Sampaio Neves, DDS, Brazil.)

teeth can be detected radiographically. The tooth may be inverted in position and located facial to, lingual to, or between the adjacent teeth (**Figs. 1–3**).

Clinical relevance: the effect of the supernumerary teeth on the surrounding teeth and bone may differ according to their relation to the adjacent teeth. Supernumerary teeth may cause impaction of adjacent teeth, varying degrees of root resorption, and thinning of the surrounding bone.

Associated conditions: supernumerary teeth can be an incidental finding or they may be associated with systemic or genetic disorders[3] (**Box 1**).

Hypodontia

Definition: the term hypodontia or oligodontia is used when the patient has less than the normal complement of teeth in the arches. This condition can be congenital or acquired. The term anodontia or agenesis is used for congenital absence of all teeth (failure of teeth to develop), which is a rare occurrence.

Cause: to date, the mutation spectra of nonsyndromic forms of familial and sporadic tooth agenesis in humans have revealed defects in various genes that encode transcription factors, Msh homeobox 1 gene (MSX1) and Paired box gene 9 (PAX9), or genes that code for a protein involved in canonical Wnt signaling (Axis inhibition protein 2 [AXIN2]), and a transmembrane receptor of fibroblast growth factor receptor 1 (FGFR1).[4]

Possible causes of acquired hypodontia include destruction of tooth buds and follicles caused by trauma or primary teeth infection affecting the developing permanent dentition, or extraction of teeth.

Clinical presentation: hypodontia can be partial or complete. The most commonly missing teeth are the third molars, followed by maxillary lateral incisors and mandibular second premolars. Hypodontia can be seen in primary and permanent dentition.

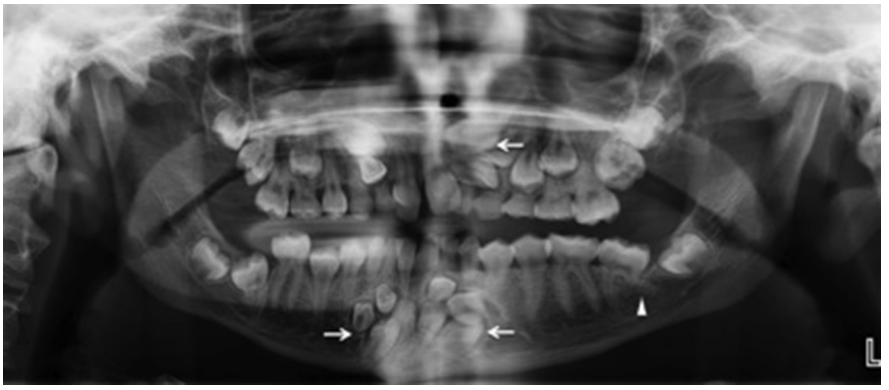

Fig. 2. Cleidocranial dysplasia. Panoramic image shows several supernumerary teeth in maxilla and mandible (*white arrows*). Arrowhead is showing root dilaceration. (*Courtesy of* Kevin Smith, DDS, Oklahoma City, OK.)