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Review

Contemporary surgical management of hypodontia

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Abstract

Hypodontia is the term most commonly applied to the condition in which teeth congenitally fail to develop. Such cases differ from teeth that have been lost early or that have failed to erupt, although their initial presentation may be similar and therefore not recognised. The range of missing teeth and their physical and psychological results is large, and the difference in complexity in the management of a patient with isolated hypodontia compared with one with oligodontia or anodontia together with skeletal and orthognathic discrepancies should not be underestimated. Surgical interventions primarily involve augmentation of bone before placement of an implant, but may include techniques such as distraction osteogenesis and orthognathic surgery. These patients are best managed by a multidisciplinary team, and in this review our aim has been to describe the role of oral and maxillofacial surgeons within it.

Keywords: Hypodontia; Oligodontia; Anodontia; Surgery; Management; Maxillofacial

Introduction

Definition

Hypodontia is the developmental/congenital absence of one or more teeth, and can be classified according to the number of teeth that are missing.[1] Oligodontia denotes the absence of six or more teeth, while anodontia is the total absence of teeth.[2] There is a higher incidence in the permanent dentition (it ranges from 3.5%–6.5%) than in the primary dentition (0.1–1%).[3] Congenital absence of a deciduous tooth does not necessarily lead to absence of its permanent successor and vice versa. Although third molars are the most common teeth that are congenitally missing they are not counted as true hypodontia, so the most common teeth that are congenitally missing are mandibular second premolars followed by maxillary lateral incisors.

As well as anomalies of number, teeth may be of abnormal shape, size, or colour.[4] Anomalies of position, path, and timing of eruption and exfoliation are also possible. Brook's unifying theory of the sizes of teeth suggests that hypodontia and microdontia form one extreme on a scale, with megadontia and supernumerary teeth at the other end.[3] Clinically the term hypodontia can cause confusion, because not all absent teeth are congenitally absent. Other clinical causes of missing teeth include previous extraction, aggressive periodontal disease, infraocclusion, and failure of eruption (Table 1).[5]

Causes of congenitally absent teeth

The most accepted aetiological theories suggest a polygenic mode of inheritance, with epistatic genes and environmental factors exerting some influence on the phenotypic expression of the genes involved (Table 1). This is thought to disturb the tooth germ during the initial stages of formation – that is, the

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Table 1
Aetiology of congenitally absent teeth, those teeth with delayed or failed eruption, and teeth that were lost early.

Causes of delayed or complete failure of tooth to erupt:
Apert syndrome
Cleidocranial dysostosis
Down syndrome
Ectodermal dysplasia
Hypothyroidism
Causes of congenital absence of teeth:
Genetic
Environmental:
Trauma, infection, radiotherapy, chemotherapeutic agents, use of thalidomide during pregnancy
Causes of early loss of teeth:
Extractions for caries
Aggressive, early-onset periodontal disease
Diabetes

initiation and proliferation.[6] The exact genetic mechanism, however, is currently not known, although hypodontia is seen more commonly in nevoid basal cell carcinoma syndrome, and may reflect mutations in the PTCH-1 gene.[7] Local factors that result in acquired hypodontia include early irradiation of tooth germs, hormonal and metabolic influences, trauma, osteomyelitis, and unintended removal of a tooth germ during the extraction of a primary tooth.[8]

Effect of absent teeth on dentofacial development

Alveolar growth is dependent on the presence of tooth follicles, and so their congenital absence will affect dentofacial growth.[9] This is in turn compounded by the number and sites of absent teeth. Retained primary molars without permanent successors sometimes undergo progressive infraocclusion, without predictable exfoliation. This may result in complete submersion of the tooth below the level of the gingiva as the surrounding alveolus continues to grow. Although clinical signs (such as a bulge adjacent to an edentulous ridge or tilting of adjacent teeth) may suggest the presence of an infraoccluded tooth, imaging is necessary to confirm the diagnosis. In most patients there is a tendency to reduced angles of the maxillary mandibular planes associated with reduced lower facial height and protrusion of the lip, which becomes more pronounced as the severity of the hypodontia increases.[10]

Clinical assessment

Clinical assessment should attempt to find out the aetiology of the teeth missing from the arch. Those patients with congenitally absent teeth should be seen at a dedicated multidisciplinary clinic with representatives of oral and maxillofacial surgeons, orthodontists, restorative dentists, and paediatric dentists.[11] Assessment should consist of taking a medical and a social history, examination, and imaging. Clinical photographs, articulated casts, and three-dimensional simulation software can be useful in diagnosis and planning treatment.[12] Genetic testing should be offered, and referral for counselling made available if required.

Table 2
Surgical assessment of a patient who presents with hypodontia.

History:
Age at presentation
Pregnancy and birth history
Medical history (Down syndrome, Apert syndrome, diabetes)
Family history (hypodontia or anodontia)
Examination:
Full dental assessment including oral hygiene and periodontal
Skeletal relations, facial proportions, facial assessment
Space: (anteroposterior, buccal-lingual, and interarch dimensions)
Ridge form (Cawood and Howell classification)[14]
Investigations:
Imaging (orthopantomogram, periapical radiographs, cone-beam computed tomography)
Assessment of vitality of teeth
Treatment:
Planning (articulated study models with diagnostic wax up, computer visualisation)
Orthodontic camouflage (alignment, maintenance of space or closure)
Preorthognathic orthodontics (alignment, coordination, decompensation)
Orthognathic surgery
Preimplant surgery (bone graft, sinus lift, transposition of nerve)

History

Although congenitally absent teeth may affect the deciduous dentition, it is rare for such patients to present before the eruption of the permanent dentition at the age of six.[13] The most common presentation will be delayed eruption of adjacent teeth and retention of deciduous teeth. The exceptions to this will be those patients with recognised syndromes such as Apert or Down syndromes, who may already be under the care of the paediatric dental service. Ideally all patients with hypodontia (with the exception of absent third molars) should be referred to a secondary care hypodontia service.[8] The patient's medical and social history should be clearly recorded so that any genetic or environmental factors that may have been contributory are known, and previous dental extractions can be excluded (Table 2).

Examination

Examination should take into account both the intraoral presentation and the patient's craniofacial and jaw relations. Full general dental and periodontal examination must include accurate recording of missing teeth, teeth that have been restored, or need restoration; basic periodontal examination; and assessment of oral hygiene. The suitability of each individual patient for particular types of treatment will depend on the general dental health and their compliance with modifications of behaviour, and advice. In addition, assessment of the edentulous areas should include size of space, form of eden-