Hypodontia: Etiology, clinical features, and management

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Patients who are congenitally missing one tooth or more are frequently encountered in routine practice. The etiology, classification, and clinical features of hypodontia are reviewed, and treatment modalities are discussed. One case of mild-to-moderate hypodontia and one case of severe hypodontia are described. Osseointegrated implants have provided encouraging results, especially in patients who are missing anterior teeth or who have severe hypodontia. (Quintessence Int 2002;33:294–302)

Key words: hypodontia, osseointegrated implant, prosthesis

Hypodontia is defined as the developmental absence of one tooth or more. The absence of all teeth (anodontia) is rare. Hypodontia may present with varying degrees of severity, and severe hypodontia has been defined as the absence of six teeth or more, excluding third molars.1

The term oligodontia is used to define developmental absence of multiple teeth, usually associated with systemic manifestations.2 Partial anodontia, a contradictory term, was once widely used but is now obsolete.

ETIOLOGY

Hypodontia may arise as a familial condition; a high proportion of affected individuals are members of families with a previous history of the condition.3 The nature of the inheritance is complex and not well understood.4 Hypodontia may also arise in individuals with no hereditary history.5

Hypodontia is also a common presenting feature in a number of systemic conditions, such as hypohidrotic ectodermal dysplasia, Down syndrome, and chondroectodermal dysplasia.6

The developmental disruption arising from the presence of cleft lip and palate involving the alveolus may also result in an absence of teeth in that region, notably the maxillary lateral incisors.7,8

CLASSIFICATION

There is no consensus on classification of hypodontia in the literature. It is commonly classified according to the severity of the condition1:4:

1. Mild-to-moderate hypodontia: Absence of usually two teeth or more but fewer than six teeth, excluding third molars (Fig 1).
2. Severe hypodontia: Absence of six teeth or more, excluding third molars. It may be associated with microdontia (Fig 2).

PREVALENCE

Hypodontia in the permanent dentition occurs in 3.5% to 6.5% of the normal population; females are affected more frequently than males by a ratio of 3:2.9 Severe hypodontia of the permanent dentition occurs in 0.3% of the population. In the primary dentition, the prevalence is 0.1% to 0.9%, and there is no significant sex distribution.
The teeth most commonly affected are the maxillary lateral incisors, the mandibular and maxillary second premolars, and the mandibular incisors. Hypodontia involving the maxillary central incisors, the maxillary and mandibular canines, or the first molars is rare and mostly occurs in patients with severe hypodontia.2

CLINICAL PRESENTATION

A number of features have been shown to be associated with hypodontia. These complicate treatment planning and patient management:

1. The teeth are often microdontic, conical, or tapered, presenting esthetic and functional problems. Preparation of such teeth for fixed restorations may be difficult, and lack of undercut presents retention problems for removable restorations.
2. Eruption of permanent teeth may be delayed or abnormal.9
3. If the maxillary lateral incisors are microdontic or absent, the maxillary canines may follow an ectopic path.11
4. The retained primary teeth may become infraoccluded, resulting in loss of space because of tilting
of the adjacent permanent teeth. Usually these re-
tained teeth are ankylosed, and their surgical and
orthodontic implications must be considered.\textsuperscript{12}
5. The lack of teeth is often associated with a develop-
mental failure of alveolar bone, resulting in an
apparent atrophy of the ridge and lack of poste-
rrior support.

**TREATMENT MODALITIES**

In general, the options for treatment depend on the
severity of the hypodontia. Care requires a team ap-
proach, including pediatric, orthodontic, and restora-
tive specialists, and the patient must be treated at an
early age.\textsuperscript{15} The patient and parent must be fully informed
about the condition and the aims and objectives of
treatment.\textsuperscript{15} A number of factors must be taken into
account at the time of treatment planning:

1. The age of the patient
2. The number and condition of retained teeth
3. The number of missing teeth
4. The presence of carious teeth
5. The condition of supporting tissues
6. The occlusion
7. The interocclusal rest space

The following procedures may be considered during
treatment planning:

1. Timely extraction of primary teeth in cases of po-
tential crowding can result in spontaneous space
closure and may lessen the need for intervention
later.
2. Ectopic teeth may require surgical exposure to
facilitate eruption and orthodontic traction.
3. The removal of enlarged frena and crown-length-
ening procedures may help in provision of fixed
prostheses.
4. The removal of infraoccluded primary teeth may
be necessary to facilitate orthodontic or restora-
tive treatment.
5. Orthodontics may contribute to the overall man-
agement of hypodontia by closing or redistributing
spaces. This may involve a full range of functional,
removable, and fixed orthodontic appliances.

**Mild or moderate hypodontia**

The most common situation is absence of maxillary
lateral incisors. Patients with congenitally missing
maxillary lateral incisors may seek orthodontic ther-
apy as a part of a restorative plan.\textsuperscript{15-15}

**Treatment options.**\textsuperscript{20}

1. No treatment or simple improvement with resin
composite: Patients with minimal spacing may
feel that the appearance of their teeth is satisfac-
tory. For others, resin composite may be used to
improve tooth appearance by closing a small di-
astema.\textsuperscript{20}
2. Space closure: The space corresponding to miss-
ing lateral incisors may be closed by protraction
of the canines and the buccal segments; the final
objective is a Class II buccal occlusion. Selective
grinding and resin composite can be used to alter
the canines and first premolars to simulate the
lateral incisors and canines, respectively.\textsuperscript{21}
3. Space opening: The alternative to space closure
is to maintain or to create the necessary space
for a prosthetic replacement of the missing tooth.
Replacement options include removable partial
dentures, conventional fixed partial dentures,
resin-bonded fixed partial dentures, and single-
tooth implants.\textsuperscript{22-24}

**Case report.** A 17-year-old Saudi girl was treated in
the orthodontic clinic of the Riyadh Dental Center.
She was an intelligent, cooperative, college student
and conscientious about her oral health and esthetics.
She was undergoing orthodontic treatment to close
the diastemas in her maxillary anterior teeth.

Examination revealed good facial symmetry, Class I
occlusion on both sides, congenitally missing maxillary
lateral incisors, and retained primary lateral incisors.
The maxillary arch showed spacing between the ante-
rior teeth; in addition, there was minor crowding of the
mandibular arch. Radiographic examination revealed
an unerupted supernumerary tooth in the region of the
missing maxillary left lateral incisor (Fig 3a).

Objectives of the orthodontic treatment were to
provide adequate space for restoration of missing lat-
eral incisors, to close residual spaces in the maxilla,
and to correct the crowding of the mandibular ante-
rior teeth.

She was referred to a specialist to determine the
possibility of using implant-retained teeth to replace
the lateral incisors. Working in a multidisciplinary ap-
proach, the patient, orthodontist, oral surgeon,
restorative dentist, and dental technician agreed on
the following treatment goals:

1. To remove the supernumerary tooth carefully
without damaging the retained primary left lat-
eral incisor
2. To wait for 1 year to allow complete bone heal-
ing prior to placement of an implant
3. To restore the maxillary lateral incisors with im-
plant-supported crowns
Fig 3a  Management of mild-to-moderate hypodontia. Both permanent maxillary lateral incisors are missing, both primary maxillary lateral incisors are retained (left arrow), and a supernumerary tooth (right arrows) is present in the area of the left lateral incisor.

Fig 3b  Bone healing (arrow) after removal of the supernumerary tooth.

Fig 3c  Removable acrylic resin denture used as a space maintainer during the healing phase after stage 1 implant surgery.

Fig 3d  Removable acrylic resin denture in place during the healing phase.

Fig 3e  Periapical radiographs after stage 2 implant surgery.

Fig 3f  Periapical radiographs after cementation of the crowns.
The supernumerary tooth was surgically removed from a palatal approach after administration of local anesthesia (Fig 3b). One year following extraction, the area showed good bone healing.

Standard 13- and 15-mm Brånemark implants (Nobel Biocare) were placed in the regions of the missing right and left lateral incisors, respectively, under local anesthesia. The patient was given a removable acrylic resin pretrial denture as a space maintainer during the healing phase (Figs 3c and 3d).

After 4 months of healing, the orthodontic appliances were removed. Stage 2 surgery was carried out under local anesthesia. Soft tissue surgery was performed to achieve good interdental papillae. CeraOne (3-mm) abutments (Nobel Biocare) were secured in place and tightened with 32 nm of torque (Fig 3e). On the same day, provisional acrylic resin crowns were cemented.

Two weeks after the soft tissue healing, an impression was made, and porcelain-fused-to-metal crowns were fabricated. The provisional crowns were replaced with the permanent ones (Fig 3f). The emergence profile achieved was excellent, and the patient was very happy (Fig 3g).

At the 7-year follow-up, the patient had no complaints (Figs 3h and 3i).

Severe hypodontia

The aforementioned classification of severe hypodontia as a situation in which six permanent teeth or more are missing is essentially an epidemiologic definition. The term is a poor indicator of potential difficulties of treatment (eg, tooth size, shape, position, interocclusal rest space, and occlusion). Nevertheless, when larger numbers of teeth are missing, the need and demand for treatment is likely to be greater.
Treatment options. The age of the patient is a most important consideration during treatment planning.

1. Prerestorative orthodontics: Some patients may require orthodontic intervention to move teeth to a favorable position or to extrude submerged teeth before restorative procedures are initiated.7-10
2. Restoration with a removable partial denture: The potentially harmful effects of removable partial dentures are well documented11-15,17 and they should be used only as a diagnostic appliance or when they clearly represent the best method of treatment.
3. Restoration with a conventional fixed partial denture: As a general principle, fixed restorations are preferable to removable ones, particularly if adhesive techniques can be employed. In general, a conventional porcelain-fused-to-metal fixed prosthesis should be avoided in younger patients. A large-span fixed prosthesis always carries the risk of debonding.
4. Restoration with an implant-retained prosthesis: Implants are one of the best alternative treatment options for patients with severe hypodontia. Their advantages over removable and conventional fixed prostheses are well documented.18-21

Case report. An 18-year-old Saudi man, a regular patient of the Riyadh Dental Center, was referred to the implantology clinic for evaluation and possibly for replacement of missing teeth with implant-retained prostheses. The patient was a cooperative, intelligent, college student and hygiene conscious. He had maxillary and mandibular acrylic resin removable partial dentures, which he did not like to wear.

Examination revealed the following dental problems:

1. Missing teeth: 11(8), 12(7), 13(6), 22(10), 23(11), 24(12), 31(24), 32(23), 38(17), 41(25), 42(26), and 48(32) (Fig 4a)
2. Retained teeth: 54(B), 63(H), and 64(I)
3. Amalgam-filled teeth: 16(3), 17(2), 26(14), 27(15), 36(19), and 46(30)
4. Microdontia of the teeth that were present (Fig 4b)

Serial radiographs in his chart documented that tooth 11 had been removed because of previous trauma and tooth 21 was transposed in the area of tooth 22 (Fig 4b).

Clinical and radiographic examination of the alveolar ridges in the maxillary and mandibular anterior regions revealed that the width of available bone was not promising.

A diagnosis of a case of severe hypodontia with microdontia was established. The family history was noncontributory. He was the only child affected in the family. All the family members tested positive for hepatitis B surface antigen and antibody to hepatitis C virus. There was no history of previous blood transfusion. The cause of their hepatitis infection could not be substantiated. Results of tests of his liver function, prothrombin time, and partial thromboplastin time were within normal limits.

The patient was eager to replace the missing anterior teeth with implants. Conventional fixed partial dentures were contraindicated because of the need for a long span as well as the microdontia and retained primary teeth. The following treatment goals were established after discussion with the patient and his parents:

1. To evaluate the width of the anterior alveolar ridges under local anesthesia for the possibility of placing implants (The patient refused any bone augmentation procedures.)
2. To use selective grinding to modify the tooth in area 22 so that it would resemble a lateral incisor
3. To use a resin composite buildup on tooth 64 to simulate tooth 23

After administration of local anesthesia and under strict infection control, three implants (3.3 mm, Nobel Biocare) were installed in both the maxillary and mandibular anterior regions. A fixed partial denture design was selected rather than individual crowns. The direction of the implant in area 21 was not ideal because of a buccal bone deficit. The patient was prescribed antibiotics (amoxicillin, 500 mg, every 8 hours) for 5 days.

The postoperative phase was uneventful. The patient refused to wear dentures during the healing phase. Following 6 months of healing, stage 2 surgery was carried out under local anesthesia. Cover screws were replaced with the healing abutments, which were then changed to Mirus cone abutments (Nobel Biocare) (Figs 4c and 4d) 2 weeks later.

 Impressions were taken with silicone rubber, and provisional fixed partial dentures were fabricated. In the mandibular arch, four anterior teeth were missing, and space was available for more than four teeth. It was decided to increase one tooth rather than to increase the size of the mandibular incisor, which was esthetically not acceptable to the patient.

The esthetics achieved with the acrylic resin provisional prosthesis was not satisfactory, because of tooth 22 (Fig 4e). The insertion holes of the prosthesis were unfavorable in the areas of teeth 13 and 11. It was decided to fabricate a final metal framework in which porcelain crowns for teeth 12 and 11 would be one screw-retained unit and teeth 15 and 21 would be separate cement-retained crowns (Figs 4f and 4g).
Management of severe hypodontia. Maxillary and mandibular anterior teeth are missing, the teeth that are present are affected by microodontia, and three primary teeth are retained.

Panoramic radiograph showing missing teeth, retained deciduous teeth, and microdontia (arrows).

Stage 2 implant surgery.

Panoramic radiograph after the stage 2 procedure.

Placement of maxillary and mandibular prostheses.
Fig 4f  Maxillary right, central and lateral incisor crowns fabricated as a single unit and secured to the metal framework with a screw.

Fig 4g  Maxillary right canine and left central incisor crowns cemented to their metal frameworks.

Fig 4h  Panoramic radiograph after final treatment.

Fig 4i  Smile after treatment.

Fig 4j  Periapical radiograph of the maxillary prosthesis after 3 years of follow-up.

Fig 4k  Periapical radiograph of the mandibular prosthesis after 3 years of follow-up.
The final results achieved with the suprastructure were excellent, and tooth 22 was modified by selective grinding. The retained tooth 63 was so small that it could not be used to simulate tooth 23 (Figs 4h and 4i). At the 3-year follow-up, results were excellent, and the patient was very satisfied (Figs 4j and 4k).

DISCUSSION

Management of patients with mild-to-severe hypodontia has improved considerably in recent years, particularly as a result of the development of resin-bonded fixed partial dentures and the use of osseointegrated implants. Treatment planning should involve careful consideration of the patient's oral hygiene, socioeconomic background, and ability to follow maintenance instructions. Preparatory orthodontic treatment may be needed to align teeth, to create adequate space, and to establish an optimal axial inclination of the teeth adjacent to proposed implant sites. Early diagnosis of missing teeth is important, so that a multidisciplinary approach can be established at an early stage.**

CONCLUSION

Hypodontia, defined as the developmental absence of one tooth or more, occurs in 3.5% to 6.5% of the normal population. Osseointegrated implants have provided encouraging results, especially in patients who are missing anterior teeth or who have severe hypodontia.

REFERENCES