Dentoalveolar development in subjects with normal occlusion. A longitudinal study between the ages of 5 and 31 years

Birgit Thilander


The aim of the present study was to examine dentoalveolar development in subjects with an 'ideal' (normal) occlusion. The material comprised 436 study casts of 189 male and 247 female subjects of Swedish origin between the ages of 5 and 31 years with no history of orthodontic treatment. Tooth width, and arch length, width, and depth, as well as palatal height were measured. The data were analysed with a Student's *t*-test. The results verified that continuous changes of the dental arches occur from the primary until the adult period, with individual variations. This change could be interpreted as a biological migration of the dentition, resulting in anterior crowding especially in the mandible, even in subjects with congenitally missing third molars. The occlusion should be regarded as a dynamic rather than a stable interrelationship between facial structures. This natural development has to be considered in orthodontic treatment planning as well as in assessment of stability following orthodontic treatment. A continuous increase of palatal height up to adulthood seems to be an effect of a slow continuous eruption of the teeth. This finding is also of significance in explaining the infraposition of implantsupported crowns.

Implant Failure in Young Children with Ectodermal Dysplasia: A Retrospective Evaluation of Use and Outcome of Dental Implant Treatment in Children in Sweden

Birgitta Bergendal, LDS/Agneta Ekman, LDS, Odont Dr/Peter Nilsson, LDS, Odont Dr


**ABSTRACT:**

Purpose: This study surveyed dental implant treatment in children up to age 16 years in Sweden between 1985 and 2005, with special reference to young children with ectodermal dysplasia (ED) and anodontia in the lower jaw. Materials and Methods: A questionnaire was sent to Swedish specialist clinics in oral and maxillofacial surgery and prosthetic dentistry. Also, the teams who had treated children with ED were
asked to submit their records for these children for a discussion on reasons for implant failure.

Results: Six out of 30 specialist centers (20%) in Sweden had treated 26 children with dental implants between 1985 and 2005. Twenty-one patients had received 33 implants to replace teeth missing from nonsyndromic agenesis or trauma at ages 14 or 15 years; 2 (6.1%) of these implants were lost. Five children with ED received 14 implants at 5 to 12 years of age; 9 (64.3%) of these implants were lost before loading.

Conclusions: Dental implant placement has been a rarely used treatment modality in Swedish children less than 16 years old in the last 20 years. The failure rate in children treated because of tooth agenesis was only slightly higher than that reported for adult individuals, whereas in young children with ED and anodontia in the mandible, implants seemed to present special challenges, and the failure rate was very high. The small jaw size and peroperative conditions, rather than ED per se, were thought to be the main risk factors. Centralizing implant operations in young children with ED and monitoring outcomes in implant registers are strongly advocated.

Concepts for the treatment of adolescent patients with missing permanent teeth.

Behr M, Driemel O, Mertins V, Gerlach T, Kolbeck C, Rohr N, Reichert TE, Handel G.


Abstract

INTRODUCTION: Missing permanent teeth is observed with syndromes or is frequently hereditarily propagated in families. The treatment of these patients is a multi-task of specialists of oral surgery, orthodontics and prosthodontics. DISCUSSION: Despite functional and aesthetic considerations, the main problem of all treatment is that it had to be performed in a growing child. This article discusses the conventional and implant-driven concepts to treat patients from childhood to adolescence with selective or multiple missing permanent teeth.
When should we extract deciduous teeth and place implants in young individuals with tooth agenesis?

Bergendal B.


Abstract

The aim was to systematically review and find evidence to determine when to extract deciduous teeth and place implants in young individuals with tooth agenesis. A search was made in MEDLINE on combinations of the terms 'tooth agenesis', 'deciduous teeth' and 'dental implants'. Publications with an abstract and written in the English language only were included. To give a background to the clinical management of young individuals with agenesis of teeth, publications on epidemiology of tooth agenesis, persistence of deciduous teeth, treatment outcomes after multi-disciplinary treatment planning and experiences of treatment with dental implants in young individuals were also reviewed. A search on the terms 'tooth agenesis', 'deciduous teeth' and 'dental implants' resulted in nine references and a search on 'dental implants' and 'tooth agenesis' gave 132 references; 46 met the inclusion criteria. Only two were prospective studies on treatment with implants in young individuals. A vast majority of publications on the clinical management of young individuals with tooth agenesis are reflections of clinical experiences and single case reports. Deciduous teeth are extracted for different reasons and at different ages in an optimal plan for a good treatment result from aesthetic and functional point of view. For ethical reasons, randomized clinical trials on when to extract deciduous teeth and place implants cannot be made in young individuals. There was only limited, low level evidence on when to extract deciduous teeth and place implants. Recommendations on treatment are based mainly on clinical experience.

Dental implants in children.

Brahim JS.


Abstract

Some children and adolescents have anodontia, partial anodontia, congenitally missing teeth, and lost teeth as a result of trauma, and they may benefit from early placement of dental implants. Clinicians should have an understanding of the potential risks involved in placing implants in jaws that are still growing and developing and consider the effect that implants have on craniofacial growth. Implants may act as ankylotic teeth and fail to move together with the surrounding structures, which produces an infraocclusion that leads to difficulties with prosthetics. Young patients may require general anesthesia for the procedure and there may be limited cooperation in maintaining good oral hygiene.
Management of a congenitally missing maxillary central incisor. A case study.

Tichler HM, Abraham JE.


Abstract

When a maxillary lateral incisor is missing, often the treatment options can be clearly defined, that is, substitute an adjacent tooth for the missing one; open the space for an implant, a bonded bridge or fixed bridge. When a maxillary central incisor is missing and the space for the tooth is absent, the treatment choices become complicated, especially in a growing child. There must be multi-disciplinary coordination among the restorative dentist, the oral surgeon or periodontist, and the orthodontist to obtain the optimum result. At the initiation of treatment, this information must be relayed and the treatment plan agreed upon by the patient or the parents of the patient.

Determining the cessation of vertical growth of the craniofacial structures to facilitate placement of single-tooth implants.

Fudalej P, Kokich VG, Leroux B.


Abstract

INTRODUCTION:

Single-tooth implants are commonly used to replace congenitally missing teeth in adolescent orthodontic patients. However, if implants are placed before cessation of facial growth, they will submerge relative to the adjacent erupting teeth. Therefore, it is important to know when facial growth is complete in postpubertal orthodontic patients. The purposes of this study were to determine and quantify the amount of vertical growth of the facial skeleton and the amount of eruption of the central incisors and the maxillary first molars after puberty.

METHODS:

Two or 3 lateral cephalograms taken at pretreatment, posttreatment, and 10 years postretention of 142 males and 159 females were evaluated. Linear regression models were used to determine changes in the parameters with increasing age.

RESULTS:

The findings indicate that (1) the growth of the facial skeleton continues after puberty; (2) there is a difference in the amount of growth between the sexes during the second decade of life, and after age 20 the intergender difference is substantially diminished; and (3) the rate of eruption of the maxillary central incisors in females seems to be greater than in males. Prediction tables are provided to help the clinician determine when to take cephalometric radiographs to assess the cessation of facial growth.

CONCLUSIONS:
The growth of the facial skeleton continues after puberty, but the amount of growth decreases steadily and after the second decade of life seems to be clinically insignificant.

**Clinical evaluation of small-diameter ITI implants: a prospective study.**

Zinsli B, Sägesser T, Mericske E, Mericske-Stern R.


PURPOSE:

Dental implants with a reduced diameter are designed for specific clinical situations, such as placement of implants where bone width is narrow or between adjacent teeth that have only a narrow space between them. They are particularly useful when replacing small teeth such as lateral maxillary and mandibular incisors. The aim of the present study was the clinical evaluation of 2-part ITI implants (full-body screws with a 3.3-mm diameter).

MATERIALS AND METHODS:

One hundred forty-nine partially or completely edentulous patients received a total of 298 2-part ITI implants over a 10-year period. After a standard healing period (3 to 6 months), the implants were restored with fixed restorations such as single crowns or fixed partial or complete prostheses or overdentures. Complete prosthesis or overdenture in the edentulous jaw was the predominant type of restoration. All patients followed a strict maintenance program, with regular recalls at least once a year. The survival rate of the implants was analyzed, and prosthetic complications were assessed.

RESULTS:

Three implants were lost during the healing phase on account of peri-implant infection. Two implant body fractures with an osseous length of 8 mm were observed (one after 2 years of observation, the other after 6 years). Four implants exhibited transient peri-implant inflammation that was treated successfully by interceptive therapy. The cumulative 5-year survival rate of the implants was 98.7% (96.6% after 6 years). Prosthetic complications were mostly limited to loose occlusal screws and sore spots caused by the denture base.

DISCUSSION:

Within the limited observation period, failures of small-diameter implants were infrequent. Prosthetic complications were not dependent on the use of small-diameter implants.

CONCLUSION:

The use of 3.3-mm ITI implants appears to be predictable if clinical guidelines are followed and appropriate prosthetic restorations are provided. However, fatigue fracture may occur after a long period of function.
**Facial development, continuous tooth eruption, and mesial drift as compromising factors for implant placement.**

Heij DG, Opdebeeck H, van Steenberghe D, Kokich VG, Belser U, Quirynen M.


**Abstract**

The replacement of teeth lost by children because of trauma can be an important indication for early implant therapy. Osseointegrated dental implants, like ankylosed teeth, alter position as growth-related changes occur within the jawbones (displacement, remodeling, mesial drift). Facial growth of the child and even of the adolescent, as well as the continuous eruption of the adjacent anterior teeth, create significant risk of a less favorable esthetic and/or functional outcome. For patients with a normal facial profile, the placement of an implant should be postponed until growth is complete. For patients with a short or long face type, further growth, especially the continuous eruption of adjacent teeth, creates a serious risk even after the age of 20 years, as illustrated by some recent clinical studies. This review aims to explain these phenomena and provides some recommendations for implant placement.

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**Using implants for the growing child.**

Sharma AB, Vargervik K.


**Abstract**

The use of implants for the growing child is not routinely recommended. The concerns about placing implants for patients in this age group are related to jaw growth. However, not all children with missing teeth need to wait for growth to be completed prior to implant placement. In this paper, the authors will discuss the indications for implant placement in the growing child. The decision for implant placement is based not only on growth, but also the number and location of the missing teeth.

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Osseointegrated implants in adolescents. A three year study.

Thilander B, Odman J, Gröndahl K, Friberg B.


Abstract

In 15 adolescents (age 13.2 to 19.4 years) in the late dental stage implants (n = 27) were chosen to replace missing teeth due to congenital absence or trauma. The patients were followed for at least 3 years. No fixture losses occurred. Only minor loss of bone support at the fixture was observed, while adjacent tooth surfaces showed some loss. Infra-occlusion of the implant restorations was noticed in patients with residual craniofacial growth. Thus, the dental and skeletal maturation, and not the chronological age, must be taken into account to avoid infra-occlusion. Furthermore it is important to gain enough space for the fixture in the mesio-distal direction in order to avoid the risk of marginal bone loss at teeth adjacent to the implants.

Osseointegrated implants in adolescents. An alternative in replacing missing teeth?

Thilander B, Odman J, Gröndahl K, Friberg B.


Abstract

In 15 adolescents (13 years 2 months-19 years 4 months) in the late dental stage, Brånemark implants (n = 27) were chosen to replace missing teeth due to congenital absence or trauma. The patients were followed for at least 3 years, at yearly intervals, biometrically and radiographically. No fixture losses occurred. Only minor loss of bone support at the fixtures was observed, while adjacent tooth surfaces showed some loss in some cases. Infra-occlusion of the implant restorations was noticed in patients with residual craniofacial growth. Thus, the dental and skeletal maturation, and not the chronological age of the patient, must be taken into consideration to avoid infra-occlusion of the fixture crown. Furthermore, it is important to gain enough space for the fixture in the mesio-distal direction, to avoid the risk of marginal bone loss at teeth that are adjacent to it.
Tissue reactions towards titanium implants inserted in growing jaws. A histological study in the pig.

Sennerby L, Odman J, Lekholm U, Thilander B.


Abstract

In this investigation, the tissue reactions towards titanium implants inserted in growing jaws of pigs were studied by means of histology. At the age of 12 weeks, 5 test pigs each received 4 Brånemark System titanium implants (fixtures). The fixtures were inserted immediately after extraction of the mesial root of the second deciduous premolar (P2) and the deciduous canine (C) on one side of the mandible and the mesial root of the first deciduous premolar (P1) on the other side. The fourth implant was placed after extraction of the deciduous lateral incisor (L) on one side in the upper jaw. Furthermore, 1 pig in which no extractions or fixture installations were performed served as a control. All pigs were followed for 165 days with clinical, radiographic and biometric examinations, the results of which have been previously presented. In this study, 10-microns-thick ground sections were produced for histology after the jaws had been fixed by immersion in formalin and further processed and embedded in plastic resin. Six of the fixtures originally inserted were lost during the experimental period, and the remaining implants were found to be involved with mineralized bone to varying degrees. Regarding the fixture-to-teeth relationship, it was found that, in the premolar region of the lower jaw, the teeth were positioned superior to and buccally angulated in relation to the fixtures. In the upper jaw, the implants were positioned below the adjacent teeth but centrally in the alveolar process. Tooth germs adjacent to the fixture had a displaced eruption path, buccally or lingually to the fixture. If the bud developed in close contact with the fixture, a changed morphology of the germ could be observed.

Aspects on osseointegrated implants inserted in growing jaws. A biometric and radiographic study in the young pig.

Thilander B, Odman J, Gröndahl K, Lekholm U.


Abstract

The aim was to study if osseointegrated implants behave like teeth in the growing jaw. Six young pigs were used, one of them randomly selected as a control. The test pigs received four fixtures each in regions with various dento-alveolar development. The biometric and radiographic findings, after an experimental period of 165 days, showed that the osseointegrated implants do not become secondarily displaced in sagittal and transversal dimensions and, thus, do not behave like normal teeth. Consequently, the osseointegration technique is not to be recommended in the lateral regions in young children.
The effect of osseointegrated implants on the dento-alveolar development. A clinical and radiographic study in growing pigs.

Odman J, Gröndahl K, Lekholm U, Thilander B.


Abstract

In an attempt to study the effect of osseointegrated implants on vertical dentoalveolar development, six growing pigs of the Pigham strain were used, one of them randomly selected as a control. The test pigs received four fixtures each, three in the lower jaw and one in the upper. The fixtures were placed in areas where different patterns of the dento-alveolar development were expected. The clinical and radiographic findings have clearly shown that the implants do not behave like normal erupting teeth during the development of the dentition. Neither do the fixtures move together with the adjacent teeth, but behave more like ankylosed teeth.

Maxillary implants and the growing patient.


Oesterle LJ, Cronin RJ Jr, Ranly DM.

Abstract

Maxillary skeletal and dental growth results in dramatic changes in all three dimensions during active growth. Experimental evidence and the behavior of ankylosed teeth suggest that an osseointegrated object remains stationary in the bone surrounding it and does not move or adapt to bone remodeling. Growth changes may result in the burying or loss of implants depending on the placement site. Hence, implants placed in the early mixed dentition have a poor prognosis of continued usefulness through puberty. When placed early, implants may disturb growth or have to be replaced. Implants placed during late puberty or early adulthood have the best chance for long-term usefulness.

Implants in adolescents: a literature review and case reports.

Westwood RM, Duncan JM.


Abstract

A retrospective review of a limited number of adolescents with implants was conducted to compare the behavior of these implants with studies in which implants had been placed in growing animals. Growth of the facial skeleton is also reviewed. Implants placed in the growing alveolus behave like ankylosed teeth and become submerged as the surrounding
bone grows. Cessation of facial growth should occur prior to implant placement in adolescents.

**Interdisciplinary management of hypodontia: oral surgery.**

Meechan JG, Carter NE, Gillgrass TJ, Hobson RS, Jepson NJ, Nohl FS, Nunn JH.


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**Dental implants in patients with ectodermal dysplasia and tooth agenesis: a critical review of the literature.**

Yap AK, Klineberg I.


**Abstract**

**PURPOSE:**

The aims of this article are to critique the available literature on dental implants in patients with ectodermal dysplasia (ED) syndrome and tooth agenesis, review the outcomes of implant therapy in these patients, and provide recommendations on the timing of implant placement for these patients.

**MATERIALS AND METHODS:**

Searches were performed using Medline, Embase, All EBM Reviews, and Pre-Medline for articles relating to implant patients suffering from ED. Articles unrelated to the topic of dental implants in patients with ED and tooth agenesis, without abstracts, or in languages other than English were excluded. Selected articles were graded according to levels of evidence based upon guidelines set forth by the Agency for Health Care Policy and Research. Articles found to have a level of evidence of IV were excluded from this study.

**RESULTS:**

The literature on dental implants in patients with ED and tooth agenesis was found to be scarce. No randomized controlled or case-controlled studies were found. Only 12 articles were found to satisfy all inclusion criteria.

**CONCLUSION:**

Implant survival rates vary between 88.5% and 97.6% in patients with ED and between 90% and 100% in patients with tooth agenesis. Implants placed in adolescent ED patients do not have a significant effect on craniofacial growth, while implants placed in ED patients younger than 18 years have a higher risk of failure.