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*Pacific Northwest Prosthodontics specializes in fixed, removable and implant Prosthodontics as well as being highly trained in fully edentulous immediate implant provisionalization (aka all on 4) options for your patients with failing or missing dentitions.*



## The Use of Dental Implants in Children and Adolescents

*Young individuals who present with reduced dentition from trauma disease or congenital abnormalities may face esthetic concerns, decreased function, limited masticatory ability and speech problems, which can harm their physical, intellectual and psychosocial well-being. Using dental implants for prosthodontic rehabilitation may seem attractive. But early surgical placement of implants in growing jaws has been associated with compromised three-dimensional implant positional stability over time, as well as concerns regarding esthetics, implant restorability and peri-implant tissue health. These issues tend to vary depending on the stage of growth and the implant placement site, making the use of implants in growing patients a challenge to manage predictably. This issue of Prosthodontics Newsletter examines the many issues related to using dental implants in growing patients.*

## Dental Implants in Growing Patients

**C**hildren and adolescents who lose teeth from trauma or congenital abnormalities face esthetic, functional, mastication and speech impairment that can negatively impact their intellectual and psychological well-being. Implants have proven to be a successful strategy for rehabilitating partially or fully edentulous jaws in adults. In children and adolescents, several issues complicate the question. Some published articles suggest that implants can be employed in patients as young as 5 years old; others say that implant placement should be delayed until patients complete their growth and development.

Elagib et al from King Khalid University, Saudi Arabia, conducted a systematic review and meta-analysis of the available evidence. From reports published between 1980 and 2021 concerning the use of dental implants in children and adolescents without systemic disease, 34 met the inclusion criteria and were included in the systematic review and meta-analysis. Data included the type of study, number and age of patients, number of implants placed, history of dental trauma, congenital absence of teeth, partial and complete edentulism, years of follow-up, complications observed and implant success percentage. Most

research involved prospective studies, followed by retrospective studies, randomized controlled studies and case-control studies.

Only 33.5% of the studies reported no complications; 47.2% reported

*(continued on next page)*

### Inside this Issue

- Implant Risks in Children and Adolescents
- Evaluating Implant Research in Young Patients
- Adverse Effects of Implants in Young People
- Overdentures in Preteen Patients



## Dental Implants in Growing Patients

(continued from front page)

some implant failures and 13.2% reported a complete failure of implants. Complications included failure of implants, bleeding on probing, change in implant position, exposure of implant threads, bone loss, peri-implantitis, lack of retention, supraocclusion, infraocclusion, loosening of implants and inclination of implants.

### Comment

Because implants do not follow the growth trajectory of surrounding structures, the stage of jaw development must be considered if planning a restoration with implants. Unfortunately, complications due to changes in the position of the implant during growth are rarely correctable and may cause failure of restorative procedures. Conservative treatment in young patients with missing teeth is recommended until the patient's growth stops, although some young patients successfully undergo implant-based restoration with treatment planning that considers the phase of the patient's growth and proper follow-up.

*Elagib MFA, Alqaysi MAH, Almushayt MOS, et al. Dental implants in growing patients: a systematic review and meta-analysis. Technol Health Care 2023;31: 1051-1064.*

## Implant Risks In Children and Adolescents

**N**o consensus exists as to the ideal age, positioning or number of dental implants

in children and adolescents with an absence of permanent teeth due to congenital aplasia or dental trauma. In general, implant-supported prostheses in young patients are well accepted, with studies of up to 6 years of follow-up showing esthetic and functional success. However, dental implants placed in growing bone may act as ankylosed teeth and do not follow the growth trajectory of the surrounding structures, leading to changes in the implant position, which for the most part cannot be corrected.

Bohner et al from Münster University Hospital, Germany, undertook a systematic review of studies describing the treatment and follow-up of dental implants placed in growing jaws with the intent of answering 2 questions:

- What complications are related to the placement of dental implants in growing jaws?
- Is there a specific protocol that provides a favorable outcome of treatment?

They found 28 studies published through 2018 that reported on 493 implants placed in 147 patients aged 3–17 years. Follow-up ranged from <1 year to 24 years. Osseointegration periods between implant placement and restoration procedure ranged from 3 to 10 months, except for 2 reports (13 patients) in which the protocol called for early loading. Two studies used a prosthesis divided at the midline, while another study made teeth wider to improve chewing.

The minimum age for implant placement in patients with ectodermal dysplasia was 3 years old; in patients with dental trauma, 10 years old. The main complication reported for maxillary single crowns and restorations supported

by fixed implants was infraocclusion of the prosthesis, primarily due to vertical growth, while 3 studies reported rotation of mandibular dental implants due to growth of the mandible. However, placement of implants in the anterior region of the mandible appeared to be safer than placement in the maxilla. Nine studies reported no surgical or prosthetic complications during the follow-up period. Implant survival rate was 76.6%, a rate lower than that reported for adult and elderly patients; survival rate was lower among patients with ectodermal dysplasia than in those with dental trauma.

### Comment

The authors concluded that, although dental implants placed in growing jaws are susceptible to altered positioning resulting from jaw growth, treatment with implants may be suitable for the anterior maxilla and mandible in patients ≥10 years of age if planned with sufficient consideration of the growth phase and a schedule of follow-up consultations is maintained.

*Bohner L, Hanisch M, Kleinheinz J, Jung S. Dental implants in growing patients: a systematic review. Br J Oral Maxillofac Surg 2019;57:397-406.*

## Evaluating Implant Research In Young Patients

**W**ith regard to controversy about the best treatment of patients, systematic reviews of literature provide the best synthesis of the available evidence, but the value of systematic reviews varies depending on the quality of the systematic review and its underlying studies. To

evaluate previously published systematic reviews reporting the use of dental implants in young people, Cherian et al from Christian Dental College, India, employed the AMSTAR-2 tool to evaluate systematic reviews and assess the quality of the research.

After reviewing major databases of medical literature for “dental implants in adolescents” and “dental implants in growing patients” published through 2020, the authors found only 4 systematic reviews that covered studies of dental implant placement in children and adolescents  $\leq 17$  years of age. The 4 included systematic reviews had similar PICO (population, intervention, comparison, outcome) components in their research question and inclusion criteria (Table 1). The number of reported studies included in each systematic review ranged from 8 to 42 and the number of implants from 16 to 493. More than 10 different types of implants were used, from single crowns to bilateral fixed prostheses or complete implant-supported dentures.

The AMSTAR-2 tool reported moderate overall confidence in the results of the systematic review conducted by Bohner et al (reviewed in this issue). Another was graded as low overall confidence, while the remaining 2 were graded as critically low overall confidence.

### Comment

This assessment found that research and evidence-based literature on the use, prognosis and result of dental implant-based restorations in children is of poor quality and insufficient to reach any firm conclusions. The authors noted “the major disparity between knowledge and practical application in the field of dental implants used in children” and that “the limited quantity and quality of literature should be a source of concern for all pediatric practitioners.” More research that adheres to quality assessment guidelines is necessary.

*Cherian JM, Samuel S, Sabu AM, et al. Dental implants in growing patients: a quality assessment of systematic reviews. J Oral Biol Craniofac Res 2023;13:610-615.*

## Adverse Effects Of Implants in Young People

**T**he use of removable dental prostheses in children and adolescents with partial or complete edentulism has several drawbacks: retention problems, failure of alveolar ridge development, lack of cooperation in wearing the prosthesis, and psychological and emotional disturbances. Yet the alternative, implant-supported prostheses, brings its own set of diffi-

culties, especially their potential impact on a growing child’s changing dentition and jaws. Kamatham et al from Narayana Dental College and Hospital, India, reviewed the evidence of adverse effects resulting from placing dental implants in healthy, growing children.

Studies published between 1990 and 2017 of endosseous single implants placed in growing children aged  $< 19$  years after traumatic tooth loss or tooth extraction due to untreatable caries were reviewed. All types of implants, regardless of abutment-connection type, implant material, loading protocol and position in the dentition, were included. Studies of mini-implants placed in children with congenital absence of a single tooth, partial or complete anodontia, oligodontia, multiple aplasia, ectodermal dysplasia or other syndromes were excluded.

Eight case reports or series involving 16 implants placed in 11 young people met the inclusion criteria. The age of the patients at the time of implant placement ranged from 10 to 17 years, with follow-up ranging from 4 months to 13 years. Neither pain, paresthesia, mobility nor peri-implant radiolucencies were reported in any publications, suggesting satisfactory osseointegration. None of the publications mentioned probing depth or implant esthetics; only 1 reported radiographic crestal bone loss in adjacent tooth bone. Infraocclusion was reported in

**Table 1.** PICO information of included studies.

| Population                                      | Intervention                             | Comparison                                                                            | Outcome                                                                                                                                 |
|-------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Children and adolescents $\leq 17$ years of age | Single tooth or multiple dental implants | Conventional prosthetics, natural teeth, orthodontic treatments, position of implants | <b>Primary:</b> Success, survival or failure of dental implant<br><b>Secondary:</b> Difference in vertical growth of teeth and alveolus |



6 patients; it was addressed with a new prosthetic restoration in 1 patient and orthodontic correction of adjacent and opposing teeth in another.

## Comment

Although the only widely reported adverse effect was infraocclusion, the small sample size and lack of agreed-upon outcome results make the findings of this systematic review less than ideal. The authors suggested the use of mini-implants to achieve esthetic and functional success; they can be easily unscrewed if infraocclusion occurs. Overall, the evidence is insufficient to support or contradict the use of implants in growing children.

*Kamatham R, Avis P, Vinnakota DN, Nuvvula S. Adverse effects of implants in children and adolescents: a systematic review. J Clin Pediatr Dent 2019;43:69-77.*

## Overdentures in Preteen Patients

**H**ypohidrotic ectodermal dysplasia (HED) is a rare genetic condition characterized by significantly decreased or absent sweat and mucous glands; sparse, fine hair; thin skin; and missing or cone-shaped teeth. Because sparse hair and absent teeth are common early in life, diagnosis often does not occur until later in childhood. The most frequent dental findings are anodontia or oligodontia, cone-shaped incisors and canines, and second molars affected by taurodontism. An essential part of HED management is early prosthetic dental rehabilitation. However, the use of conventional dentures in young HED patients is problematic, due to their anatomically

**Table 2.** Distance between the apex of the implant and the lower mandibular edge (in mm).

|          | Initial | After 5 years |
|----------|---------|---------------|
| Range    | 5–7     | 6.5–10        |
| Median   | 6       | 9             |
| Variance | 0.81    | 0.70          |

abnormal teeth and reduced alveolar bone ridges, leading to poor retention and stability and the likelihood that young patients may not fully cooperate in wearing the prosthesis.

Implant-supported overdentures provide increased retention and prosthesis stability, leading to improvement in function and esthetics; fixed restorations are less likely to create social problems that young people may face wearing full or partial dentures. Montanari et al from the University of Ferrara, Italy, reported on a cohort study that evaluated the skeletal growth, implant and prosthetic survival rate, and complications in 8 patients aged 9 to 12 years with HED who received conventional maxillary dentures and implant-supported mandibular overdentures.

After 4 months to allow healing and osseointegration of 2 mandibular implants, the patients received a specially designed restoration with a prosthetic bar divided into 2 halves capable of sliding and an implant-supported overdenture sectioned into 2 parts connected by a sliding transversal plane, allowing both the bar and the prosthesis to expand as mandibular transversal growth occurred. Patients were followed monthly for the first year and semiannually thereafter.

Mean follow-up was 8.1 years. Implant and prosthesis success and survival rates during follow-up were 100%. No biological complications were recorded. The distance between the apex of the implant and the lower mandibular edge ranged from 5 to 7 mm initially and from 6.5 to 10 mm after 5 years (Table 2).

## Comment

Despite these patients' extremely thin mandibles, the innovative use of the sliding bar anchoring the overdenture allowed for mandibular transverse growth. Radiography showed that implants followed the mandible growth while keeping their original relationship with the jawbone. This success may suggest a way forward for oral rehabilitation of young patients with implant-supported overdentures.

*Montanari M, Grande F, Lepidi L, et al. Rehabilitation with implant-supported overdentures in preteens [sic] patients with ectodermal dysplasia: a cohort study. Clin Implant Dent Relat Res 2023;25:1187-1196.*

## In the Next Issue

**Oral health-related quality of life: conventional complete dentures vs implant overdentures**

*Our next report features a discussion of this issue and the studies that analyze them, as well as other articles exploring topics of vital interest to you as a practitioner.*

Do you or your staff have any questions or comments about **Prosthodontics Newsletter**? Please write or call our office. We would be happy to hear from you.

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