



Pediatric Dental Implant: A Review

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Abstract:

Congenital hypodontia or trauma is a common cause of tooth loss in children. The absence of teeth causes loss of function and a lack of normal alveolar growth, as well as unpleasant aesthetics that impede the young child's psychosocial development. Conservative methods have traditionally been used to manage tooth loss in young children. Implant placement in a young child would be an ideal method of treating tooth loss. They restore function, preserve alveolar bone, and provide excellent aesthetics, helping the child regain confidence and social acceptance. As a result, this review article sheds light on the potential use of dental implants in pediatric dental patients.

Keywords: Children, Dental implants, Ectodermal dysplasia, Development.

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Introduction: A dental implant is described as "a prosthetic device made up of alloplastic material(s) implanted into the oral tissue under the mucosal or periosteal layer, and on or into the bone" to provide retention and support for a prosthesis.^[1] A significant majority of children lose their teeth at various ages. Children often lose teeth due to caries, trauma, and congenital hypodontia. Lack of teeth impairs a child's psychosocial development in addition to causing loss of function, stopping aberrant alveolar growth, and horrible looks. Children's tooth loss has traditionally been managed with space maintainers, removable dentures, and even permanent prostheses.

However, these methods of therapy have a number of drawbacks, including being

aesthetically incorrect, causing the prosthesis to repeatedly become loose, and necessitating continuous prosthesis replacement owing to differences in arch form and space.^[2]

Because the dental surgeon is concerned about mandibular and maxillary "growth spurts," implants are rarely used in teens. Predicting the success of the implants won't be a problem for the patient as long as he adheres to the indications and the perfect period for insertion. They can be utilized more often if the teenage implant insertion procedure is followed.^[3] This review article clarifies if dental implants might be used in pediatric dentistry patients.

Implants in developing bone: Implant placement in children and adolescents has



long been debated. Few researchers encourage its use in this category of patients, while others strongly oppose it. Bjork et al. (1962 & 1977) carried out one of the first investigations on the growth patterns of the dental arches and the replication of implant placement. He inserted 0.5 mm 1.5 mm tantalum pins in the jaws of developing youngsters as stable markers for longitudinal cephalometric investigations. Although the majority of pins were steady, those impacted by growth were not. Orthodontic tooth movement also moved the pins.

Almost all of the pins inserted into resorptive sites, such as the front mandibular ramus, were lost and had to be replaced. Furthermore, pins implanted in sites of appositional bone development were entrenched over time.^[4,5]

Dental implants were compared to ankylosed primary teeth by Oesterle et al. (1993) and Brahim et al. (2005). An osseointegrated implant acts similarly to an ankylosed primary tooth in the absence of alveolar development and dental eruption. These authors claimed that implants put in children's posterior maxillas may get buried to the point where the apical part becomes revealed when the nasal and antral floors develop.^[6,7] Implants should not be put posterior to the canines during active development, according to Odman et al. (1991). In children with a strong rotational pattern, posterior teeth continue to erupt and alveolar bone formation continues to maintain the occlusal plane, potentially leading implants to become deeply buried inside the mandibular alveolar process.^[8]

Dental Implant Placement in a Pediatric patient

Maxillary anterior quadrant: The absence of maxillary teeth may result in an undeveloped maxilla both sagittally and vertically, as well as poor alveolar ridge development. Among the several causes that may cause a pause in implant placing in the anterior maxillary area, the most important to mention is the high and divergent innate growth potential in anterior, posterior, and vertical dimensions, which results in an overall developmental rise. Furthermore, the presence of a mid-palatal joint, implant location producing no growth

stoppage, or uncoordinated width growth are all important elements that determine long-term success.

As a result, implant placement in the front maxilla should be postponed until the age of 15 in females and 17 in boys. Premature implantation necessitates repeated lengthening of transmucosal implant-to-prosthesis ratios and possible load amplification. Evaluation of skeletal age, preparation of permission document, and future implant prescription should all be considered throughout the treatment planning phase.^[9]

posterior quadrant of the maxilla: Diversity in anteroposterior and vertical growth, three times greater transverse growth than anteriors due to growth at the mid palatal suture, rotational development, mesial and rotational displacement of molars, nasal base resorption activity, alveolar bone deposition, and increased masticatory load on the implant are a few factors that delay implant placement in the posterior maxilla as opposed to the anterior maxilla.^[10,11]

Mandibular anterior quadrant: Because of its fewer development factors, the mandibular anterior affords optimal dental space for osseointegrated implant insertion prior to growth completion and skeletal maturity. Endosseous implant insertion in a 5-year-old kid resulted in favourable treatment outcomes, including early closure of the symphyseal suture and continued development with bone deposition, resorption in the labial and lingual surfaces, respectively. The prognosis of therapy in the front mandible is mostly determined by the selection of an optimal prosthesis supported by dental implants. Given the rapid growth of a young kid, the prosthesis should be retrievable, allowing for repeated modifications and an average rise of 5-6 mm in dental height as well as anteroposterior growth.^[12]

Mandibular posterior quadrant: Multiple treatment concerns in implant positioning on the mandibular posterior area are primarily due to dynamic three-dimensional growth and developmental changes such as active appositional growth at the alveolar border



(upward and outward on an expanding arc) with lingual resorption, increase in transverse dimension (expanding V pattern), growth in the anterior-posterior and vertical direction, and growth in the anterior-posterior and vertical direction coupled with rotational growth of condyle. The remodeling process in the mandible, characterized by apposition and resorption, as well as the independence of mandibular growth from the presence of teeth, advises deferring the insertion of osseointegrated implants until skeletal completeness in the late developing phase.^[13]

Dental Implants in Children with Ectodermal Dysplasia: Ectodermal dysplasia are a collection of illnesses characterized by the aberrant development of two or more ectodermal-derived tissues, including the skin, sweat glands, hair, nails, teeth, and mucous membranes. It encompasses a wide range of dental abnormalities, including anodontia, hypodontia, tapering, misshapen, and widely spaced teeth. Atypical alveolar ridge development is also possible. Sweat glands, scalp, hair, nails, skin color, and craniofacial structures can all be affected (e.g., cleft lip and cleft palate). Children with ED do not have normal development patterns, thus a risk-benefit analysis must be performed to determine the utility of implant placement, particularly in the anterior mandible, where lateral growth is often finished by the age of three.

In order to successfully treat anodontic mandible, various case studies have proposed using removable dentures around the age of 3 years until the end of lateral development and implant-supported overdentures in the canine area between the ages of 3 and 6 years after the median suture has closed. Studies show that implants in the maxilla should be avoided and that anodontia/severe oligodontia can be treated early with an implant-supported prosthesis in the mandible and monthly follow-up. In children with hypodontia, difficult decisions must be made based on a variety of considerations, including the number of missing teeth, the patient's gender, the location and size of the edentulous area, the need to preserve bone with dental implants, the need for necessary orthodontic

treatments, psychological considerations, and potential changes in skeletal and dental growth.

Because there are no reliable markers, studies indicate that implant placement is scheduled after assuming growth stoppage using serial cephalometric tracings (no visible skeletal change for 1 year). It is essential to keep parents informed and aware of the growth completion timetable for any additional corrective surgery or prosthesis installation.^[14]

Indications for implant placement in pediatric patients^[15,16]

- Ectodermal dysplasia patient
- Implant combination with bone grafting in a patient with an alveolar and palate cleft.
- Paediatric anodontia, partial anodontia, congenitally absent teeth, and teeth lost due to trauma.

Contraindications for implant placement in pediatric patients^[15,16]

- Pre-pubertal age group
- Individuals with pubertal growth spurts
- Inadequate space

Growth assessment: It is a critical consideration when contemplating implant implantation in children and teenagers. Chronologic age is not a reliable predictor of growth halt. Pubertal growth spurts in males (11-17 years) and girls vary greatly (9–15 years). There is no accurate sign to tell when growth has stopped, but a decent quality technique is to take serial cephalometric radiographs 6 months apart with overlay orthodontic tracings. If no changes occur during a one-year period, one might presume that growth is complete.^[17,18]

Treatment planning: A multidisciplinary approach involving an orthodontist, pedodontist, and a periodontist or implantologist skilled in soft and hard tissue management around implants, combined with a comprehensive treatment plan, may be able to successfully place dental implants in children suffering from congenital anodontia or multiple tooth loss. The dentist sees the kid patient at a young age and keeps him under his care for an extended length of time, allowing enough time for optimal treatment planning.



Primary tooth preservation until root resorption, caries prevention, or endodontic therapy to avoid periapical disease and subsequent bone loss are all necessary for later implant insertion. It inhibits arch length reduction and preserves alveolar bone height. The dentist should be able to manage the primary dentition in order to ensure a healthy oral cavity in the future. The orthodontist prepares the bone for implant placement and corrects the root angulations of permanent teeth. Proper root alignment lowers the likelihood of angular faults, which can contribute to bone loss.

Montanari et al. recommended a dental multidisciplinary team consisting of a paediatric dentist, an orthodontist, a prosthodontist, and an oral and maxillofacial surgeon for good implant outcomes. They used an implant-supported overdenture to do oral therapy on a youngster with hypohidrotic ED. At the age of two, the youngster received conventional dentures. A top conventional denture and a lower implant-supported overdenture were created at the age of 11 years and 11 months. Two tapered screw endosseous implants were inserted in the mandibular jaw's anterior side. After two months of recovery, the implants were revealed, and two ball attachments were attached to the implants to avoid a stiff connection. This was done to allow for proper mandibular development while minimizing interference with the patient's growth. The two ball attachments were used to link the prosthesis to the implants.

The mandibular implant-supported overdenture was well tolerated by the patient after three years of follow-up, who reported significant masticatory and aesthetic benefits.^[19] The time of implant placement in growing patients was reviewed in a Scandinavian Consensus Conference in Sonkoping, Sweden, where there was universal agreement that implant placement should be delayed until normal teenage skeletal development is completed or almost complete. However, in the case of oligodontia or anodontia, early surgery, particularly in the mandible, may be needed.^[20]

Conclusion: Dental implant insertion is one option for children patients suffering from disorders such as congenital partial anodontia and traumatic tooth loss. To attain the best cosmetic and functional results, therapy must be planned meticulously. Growth evaluation, in conjunction with the alveolar bone examination, is required when planning implant therapy. For better implant treatment outcomes, all surgical and orthodontic procedures should be started approximately a year before the scheduled implant placement.

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