



## PEDIATRIC DENTAL IMPLANTS

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**Abstract:** Teeth are integral part of the stomatognathic system. Apart from teeth being absent congenitally, caries and periodontal breakdown may also be a reason for the absence of teeth from the dental arch. Dental implants are considered as a treatment modality for children.

Key Words- implants, Osseointegration.

**Introduction:** Teeth are integral part of the stomatognathic system. The primary function of teeth is to prepare food for swallowing as well as to initiate and facilitate digestion. Teeth are also necessary for the articulation of speech and proper looks.<sup>1</sup>

Apart from teeth being absent congenitally, caries and periodontal breakdown may also be a reason for the absence of teeth from the dental arch.<sup>2</sup>

Removable prosthesis has always been a choice in children with partially edentulous mouths. However, in younger patients they may lead to increased caries rate, increased residual alveolar

resorption and other periodontal complications. Since removable dentures and acid etch bridges are uncomfortable and cumbersome, young patients and their parents often insist to reduce the waiting time and insert implants as soon as possible.<sup>3</sup> Dental implants are thus considered as a new treatment modality for children.

**Dental Implant:** The Glossary of Prosthodontic Terms defines an implant as “a prosthetic device or alloplastic material implanted into the oral tissues beneath the mucosal or/and periosteal layer, and/or within the bone to provide retention and support for a fixed or removable prosthesis.”<sup>4</sup>

Implant placement in adults mainly depends upon the quality and quantity of bone, treatment plan, surgical technique, optimal restorative prostheses and good long term oral hygiene. These factors also apply to implants in children but the only difference is that children have an ongoing dental and skeletal growth which may make outcomes less predictable.<sup>5</sup>

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Received on: July 2016

Accepted after revision: August 2016

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Owing to the biocompatibility of titanium due to formation of stable oxide layer on its surface, it is being successfully used as an implant material.<sup>6,7</sup>

**Biological Basis in Implants<sup>8</sup>:** The relationship between endosseous implants and bone consists of one of 2 mechanisms:-

- Osseointegration where the bone is in intimate but not in an ultra-structural contact with the implant
- Fibrous integration in which soft tissues such as fibers and/or cells are interposed between the two surfaces.

**Implant Classification:** Dental implants may be broadly classified in relationship to the bone and the biomaterials used. They may be endosteal, periosteal, transosteal in relationship to the bone.

The classification given by Misch CE (1999) is listed below –

1. Endosteal Implant
  - Root form
  - Crest Mince (Thin Ridge) and Other Mini Implants
  - Plat or Blade form
  - Ramus frame form
2. Transosteal Implant
3. Subperiosteal Implant
4. Other Implant
  - Endodontic stabilize
  - Intra mucosal Inserts

**Endosteal Implant<sup>10,11,12</sup>:** Endosteal implant is placed directly into the jaw bone. The bone area must be sufficient to support the implant in height, width and length. Endosteal Implants are commonly referred to as one stage or two stages. Those that are equipped with an integral abutment at the time of insertion are referred to as one stage implant and those that require attachment of abutments at a visit subsequent to the insertion are referred to as two stage implant system.

**Transosteal Implant:** These are one piece, transmandibular complex implants or are available as individual abutments.<sup>13</sup> A submental skin incision is required under operating room conditions when this modality has been selected. They require 6mm vertical bone height and 5mm bone width<sup>13</sup>

**Subperiosteal Implants:** Subperiosteal implant is placed under the periosteum and against the bone rather than within the bone. It is used in cases of advanced alveolar resorption, in which the volume of the residual bone is insufficient for the insertion of an endosteal implant.<sup>14</sup> The implant is retained by Periosteal Integration.<sup>13</sup>

**Others**

- Endodontic Stabilizer Form Implant: - They extend the functional length of an existing tooth root to improve its prognosis and when required can function to support bridgework.<sup>15</sup>
- Intramucosal Implant: - These implants differ in form, function and concept from other modalities. They are mushroom shaped titanium projections that are attached to the tissue surface of a partial or total removable denture in the maxilla<sup>16</sup> and plugged into the prepared soft tissue receptor sites in the gingivae to provide additional retention and stability.<sup>11,16</sup>

**Guidelines for Implant Placement:** Over the last decade, Misch et al (2005) has compiled four guidelines for implant placement in younger patients.<sup>17</sup> These are as follows:-

(i) Chronological Age of the patient: Implant insertion in the anterior maxilla is delayed for female patients until at least 15 years and male patients until 18 years of age.<sup>17</sup> However, this guideline is too variable to be used alone. Ideally, age is related to patients' biological age more than his or her chronological age.

(ii) Endocrine Changes: This factor is more or less quite relative. The female patient should be able to menstruate and the male patient should have body hair, voice changes, and most often need to shave.<sup>17</sup>

(iii) Size of the Child: The prospective implant placement should have greater height than their same-sex parent. The size of the patient is more important than the age of the patient.

(iv) No growth during last 6 months: No suture growth should have occurred in the last 6 months, then growth and development of the jaws is considered to be near completion.

**Implants in Pedodontic Practice<sup>18</sup>:** Adolescents with partial and complete anodontia are divided into 3 groups. These three

groups need to be treated very differently with respect to the timing of implant placement.

Group I: Children who are congenitally missing a single tooth and have adjacent permanent teeth.

Group II: Children who are missing more than a few teeth but have permanent teeth present adjacent to the edentulous sites.<sup>18</sup> This group of patients includes those that are not included in Group I or Group III.

Group III: Children who are completely edentulous in one arch or have one or two teeth in poor positions in the arch.<sup>18</sup>

**Treatment Considerations:** GROUP I: Children missing a single permanent tooth with adjacent permanent teeth

For patients in this group, the skeletal development is a more important consideration than chronological age. The concern here is the dentoalveolar development adjacent to the edentulous space. With growth there is downward and forward development of the alveolus in the maxilla and height increase of the alveolus in the mandible. If an implant is placed before dentoalveolar growth is complete, the implant will become submerged relative to the adjacent teeth. The implant and tooth would therefore appear apical to the adjacent teeth with a discrepancy in the free gingival margin.

To avoid the complications of implant and dentition height discrepancies in the growing child, the authors recommend not placing implants until two annual cephalograms show no change in the position of the adjacent teeth and alveolus.<sup>19</sup> Completion of dentoalveolar development/growth can be seen as early as age 16 in girls and as late as age 22 in boys.<sup>18</sup>

GROUP II: Children missing more than a few teeth but have permanent teeth present adjacent to the edentulous sites

The initial objective is to orthodontically optimize the position of the teeth present and to consolidate edentulous spaces. The safest approach is to wait until dentoalveolar development is complete as assessed by no change in lateral cephalograms taken one year apart. However, for some patients implants may be placed before growth is completed, in order

to provide the psychological benefit of having a more functional, stable, and esthetic solution.<sup>3,18</sup>

GROUP III: The Edentulous Arch

Patients in this group usually have a diagnosis of ectodermal dysplasia. Because teeth are not present, one does not need to be concerned about dentoalveolar growth. The only concern is the down and forward growth of the entire mandible. This can result in a jaw size discrepancy, but the implant position will not be adversely affected.<sup>18,20</sup>

**Recommendations by Area for Placing an Implant**<sup>3,21</sup>

> Anterior Maxilla: It is the most risky site for early implantation due to the unpredictability of growth in the area, especially in the presence of natural teeth. Premature implant placement can necessitate a repeated lengthening of the transgingival or transmucosal part of the implant, resulting in a poor implant - prosthesis ratio and adverse load magnification. It is advised to delay implant insertion until after skeletal growth is completed.<sup>3</sup>

> Posterior Maxilla: An early inserted implant can become submerged occlusally and exposed apically because of resorption of bone in the maxillary sinus/floor of the nose. It is recommended to delay an implant placement until after cessation of growth.<sup>3</sup>

> Anterior Mandible: This site seems to hold the greatest potential for early use of an implant supported prosthesis. However use of early implants in combination with teeth is not advisable due to the significant compensatory change in the dentition in this area during growth.<sup>3</sup>

> Posterior Mandible: It is recommended to delay implant placement until skeletal growth is completed as progressive infraocclusion of the implant and harm to adjacent teeth preclude the early placement of implant in this site.<sup>3</sup>

**Indications for Use of Implants in Adolescents**

> Pediatric patients with ectodermal dysplasia<sup>22</sup>

> Implants combined with bone grafting in patients with cleft of the alveolus and palate<sup>23</sup>

> Children and adolescents having anodontia, partial anodontia, congenitally missing teeth, teeth lost as a result of trauma<sup>5</sup>

- Uncooperative children who find it difficult to adjust to removable appliances.

### Contra-Indications for the Use of Dental Implants

- Pre-pubertal age group<sup>3,24</sup>
- Individuals with pubertal growth spurt<sup>3,24</sup>
- Inadequate mesiodistal space.<sup>3,25</sup>

**Conclusion:** For the success of implants, proper indications and timing of placement of implants need to be followed. If the proper protocol for implant placements in adolescents is followed, their success is guaranteed and they can be used more routinely<sup>3</sup>

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