



## Mini Implants: Bigger problems, Smaller solutions.

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### ABSTRACT:

**Introduction:** Implants are a new era in dentistry, but their placement in paediatric patients remains a challenge due to the rarity of congenital hypodontia, anodontia, and oligodontia. However, implant placement can be a viable treatment option for growing children. Mini implants are now being used in paediatric dentistry as a promising alternative to crown anchorage, especially in oral rehabilitation. They provide good aesthetic and functional results, improving the child's quality of life, social integration, and self-esteem. The management of tooth loss in children is distinct from that of adults, as the morphology of primary teeth differs from permanent. Mini implants offer a simple, versatile, and biocompatible solution for dental care.

**Objectives:** The objective of this article is to critically evaluate the current state of knowledge regarding mini-implants, including their clinical applications, success rates, advantages, limitations, and potential complications. This article will also explore advancements in mini implant technology, compare them with conventional dental implants, and highlight areas for future research to enhance their efficacy and broaden their clinical use in paediatric dentistry.

**Methods:** A literature search was conducted using the keywords “mini implants” and “paediatric dentistry” published since 2004 in English, Spanish and Italian in the following databases: PubMed, CINAHL, Med Line. Excluding items which did not meet the inclusion criteria, 28 articles were included in the review.

**Conclusions:** Mini implants offer promising potential in pediatric dentistry, particularly in cases where conventional dental implants may not be feasible due to anatomical or developmental constraints. The minimally invasive nature, reduced healing times, and versatility in various orthodontic and restorative treatments make them a valuable tool in managing pediatric dental cases. However long-term studies on the success rates, durability, and potential complications in younger patients are still limited. Future research should focus on refining the applications of mini-implants in pediatric dentistry, optimizing treatment protocols, and addressing any concerns related to their long-term effects on developing dentition and oral structures.

### 1. Introduction

Adolescent tooth loss is a common issue, affecting both aesthetics and function. It can be caused by various factors such as carious diseases, congenital hypodontia, and trauma.<sup>1,2</sup> Children without anterior teeth often face humiliation and ridicule from peers, leading to issues

like malocclusion, periodontal disease, and incorrect pronunciation.

Treatment strategies take into account a variety of aspects to address tooth loss, including the quantity of missing teeth, the hard and soft tissue structure, the cranium, maxilla, and mandible's developmental stage,



and each patient's general health.<sup>3,4</sup> Dental implants, made of alloplastic materials, are a solid, long-lasting, and hygienic solution for missing teeth. They provide aesthetics, maintain alveolar bone, and restore function, helping individuals regain confidence and social acceptability.<sup>5</sup>

The increased predictability of root form dental implants has led to renewed interest in their use in growing children.<sup>6</sup> They are used to save bone and stimulate alveolar bone formation. Factors that may favour implant placement include adequate local blood supply, easy osseous healing, and immune-biologic resistance.<sup>7</sup>

However, the main risk with implant placement is that they may become lodged, moved, or displaced as the jaw expands.<sup>8</sup> Dentists must understand the potential risks and design changes required to accommodate growth changes to ensure the best possible outcome for children.<sup>9</sup>

This article aims to present an in-depth review of use of mini implants in paediatric dentistry.

## 2. Shortcomings of traditional implants

Traditional implants are not advised for patients who are still growing since they impede the maxilla's sagittal and transverse development. Traditional implant placement during jaw development has been linked to dental follicle damage, poor tooth eruption, and delayed orofacial structure development.<sup>10</sup> Cronin claims that traditional implants that are placed before the full development of the craniofacial structure mimic the appearance of ankylosing teeth. Traditional implants are not recommended for patients who are still growing, according to numerous studies. Their use at an inappropriate age, particularly in the upper jaw, may cause the alveolar bone to stop developing and the constructions to fall into infra-occlusion.<sup>11</sup> On investigating the likelihood of an effective prosthesis using traditional implants in teenagers, the following key elements were enumerated :

- Implantation ought to be carried out following the conclusion of skeletal development.
- Every kid should have their precise inverse age determined by a cephalometric examination under orthodontic supervision

- Treatment must begin no later than 15 years of age for girls and 18 years of age for guys. Because there have been the fewest recorded alterations in the lower frontal area, this is the only spot where a prosthesis might be placed before achieving skeletal maturity.<sup>12</sup>

## 3. What are mini implants?

Mini implants have become an evolutionary development in the stage of implant implantation.<sup>10</sup> They are smaller-sized alternatives to standard dental implants. Early in 1985, Dr Victor I Sendax of New York developed the first micro implant. Mini implants range in diameter from 1.8mm to 2.7mm and are offered in a one-piece, ball-shaped construction. These are available in a variety of tip, thread, body, and head sizes. Mini-implants' length, shape, and thickness are dictated by the bone's height and anatomical properties. Mini implants are temporary anchorage devices constructed of pure titanium or titanium alloys. They are biocompatible and very inert. The tiny screw implant helps to prevent ridge atrophy by promoting the alveolar ridge and preventing neighbouring roots from sliding into the edentulous area.<sup>13</sup>

Since, mini-implants feel like natural teeth, they provide children with a psychological boost over prosthetic replacements. Even in cases of transverse bone loss, fixture installation is possible due to their comparatively modest diameter. Furthermore, these implants provide the retention of soft and bone tissue volumes until the child reaches adulthood because of their restricted osseointegration. Finally, their removal causes no additional deficits and is non-traumatic.<sup>14</sup> Youngsters and teenagers with partial and total anodontia are essentially split into three categories:

**Group 1:** Children who have neighbouring permanent teeth and a congenitally missing tooth

**Group 2:** Children who have multiple missing teeth yet still have permanent teeth next to the missing area

**Group 3:** Children with one or two teeth positioned poorly in the arch or those who are totally dentate in that arch<sup>15</sup>



#### 4. Parts of mini implants:<sup>14</sup>

Mini implants are made up of three parts: head, neck, and body. (Fig. 1)



Fig. 1

**HEAD:** The head section of the micro implant is in contact with the oral environment and is primarily intended to accept attachments such as elastics or wires.

**NECK:** The part that connects the head with the body. It has three different heights—1 mm, 2 mm, and 3 mm—to suit variable soft tissue thicknesses at different implant locations.

**BODY:** The implant body has a consistent shape. It's either self-tapping or self-drilling. Threads and grooves are used to facilitate the micro implant's interlocking with the bone.

#### 5. Indications:<sup>16</sup>

1. Kids with Ectodermal Dysplasia
2. Patients with Cleft Palate and Alveolus are treated with implants in addition to bone grafts
3. Children and adolescents with congenitally missing teeth, anodontia, partial anodontia, and trauma-related tooth loss
4. Little ones who have trouble donning detachable devices.

#### Contraindications:

1. Children with little mesiodistal space<sup>17</sup>
2. Prepubertal age group<sup>18</sup>
3. Pubertal growth spurt sufferers

#### 6. The insertion site selection:<sup>19,20</sup>

The practitioner should consider some factors while choosing a site for the implantation of a mini-implant. They are as follows:

- **Fail-safe area:** It is best to stay away from areas where there is a significant chance of seriously harming vital anatomic structures.
- **Accessibility:** It facilitates appropriate surgical techniques and adequate stability.
- **Pain:** Implants ought to be positioned in areas where patients experience the least degree of discomfort.
- **Hard tissue features (amount and quality of cortical bone):** The cortical bone must be thick enough to offer the required stability, especially mechanical stability immediately following implantation.
- **Usability:** The implant should be positioned in a way that is biomechanically favourable and allows the necessary orthodontic force to be applied.

#### 7. Methodology:<sup>14,20</sup>

- The placement should be taken into consideration when selecting mini-implants.
- The tissues at the specified location receive a light anaesthetic application.
- A complete flap incision is usually not necessary when placing a little implant. However, a small crestal incision is recommended when dealing with a narrow ridge or large amounts of soft tissue.
- This method guarantees that the implant is positioned precisely at the right angle inside the bone.
- Each little implant is positioned at its precise location by drilling a tiny hole into the bone.
- At the predetermined spot, the implant is screwed in and then tightened with a winged wrench to guarantee it is securely fastened.
- The transmucosal placement of the implants will occur at the occluso-gingival level.
- In order to match the current gum line structure and replicate the characteristics of the missing tooth, acrylic resin is used.
- By saving room and taking on the role of ultimate retention, the temporary crowns accomplish two goals.
- It is crucial to guarantee a clear transmucosal profile region.
- The final link is created by partially filling the hollow, about 1 mm below the alveolar ridge, with



acrylic resin while it is still pliable. This makes it possible for the heads and crowns of the mini-implants to mechanically interlock when the resin has dried.

- Sutures are not usually required, and patients usually feel little discomfort after the operation. In order to encourage natural contacts during typical biting and side-to-side movements, occlusion changes are made beyond this point.

## 8. Advantages:<sup>21,22,23</sup>

Despite being smaller and less invasive than regular implants, mini-implants have many of the same benefits.

- They typically cause less inflammation at the implant site, which promotes faster healing and allows loading right away.
- The patient has little discomfort from the simple surgical procedures required to place these implants.
- Additionally, they show less circumferential or linear percutaneous exposure, which lessens their vulnerability to bacterial assaults around the implant-gingival attachment.
- Nowadays, mini-implants are the treatment of choice for narrow residual ridges.
- Since its introduction, ridge augmentation and grafting treatments have become less necessary, providing a more affordable option than regular implants.
- In the event that an implant fails, mini-implants can be removed with little difficulty and little surgical trauma.

## Limitations:<sup>22,24</sup>

- Mini-implants should not be placed in situations with restricted inter-arch space, in ridges with inadequate vertical height, or in people with parafunctional habits.
- Because of their narrow diameter, implants are more likely to fracture during implantation.
- Because of their one-piece design, implants lack parallelism, making the insertion of several implants necessary because of the unpredictable nature of failure and the lack of established scientific criteria and expertise in this area.

- Moreover, there is a dearth of reliable scientific information about the long-term viability of these implants.
- Mini-implant-supported fixed restorations require careful case selection, accurate treatment execution, and a thorough understanding of biomechanics to be clinically successful.

## 9. Scope of Mini-implants in Paediatric Dentistry:

Dental implants are a prominent therapeutic option in adults, but its application in paediatric dentistry is still in its early stages. Mini implants as a prosthetic replacement provide a psychological advantage to the child by giving him/her the sensation of having their own teeth. The relatively small diameter allows the fixture to be placed even in the presence of transverse bone loss. Mini-implants have minimal osseointegration and, as a result, allow the volumes of soft and bone tissues to be maintained until growth is complete; and their removal is non-traumatic and does not result in any additional deficit. The mini-screw stimulates the alveolar ridge, which helps to avoid ridge atrophy, and it keeps nearby roots from migrating into the edentulous region.

Children who are lacking permanent teeth can have their lost teeth effectively restored using artificial tooth-supporting orthodontic implants.<sup>25</sup> Mini-implants do not significantly damage bone following surgery when loaded right away.<sup>26</sup> Mini-implants are especially well suited for temporary prosthetic therapy in children throughout the period of jaw bone growth because of their ease of insertion, lack of recovery time, and inexpensive cost when compared to regular implants.<sup>27</sup> This method can be utilized as a space maintainer until the patient's overall development is finished and they are financially stable enough to have more restorative care. It is meant to temporarily meet the patient's aesthetic demands.<sup>28</sup>

## 10. Conclusion:

A toothless smile may appear charming in an infant, but if it persists, parents and the child should be extremely worried. Due to their ease of use, adaptability, and excellent biocompatibility, mini-implants are emerging as a viable substitute for crown anchoring in the anterior area, particularly in the context of oral rehabilitation for developing patients. It is a straightforward one-time



appointment that is technically better despite its constraints. It produces pleasing visual and practical outcomes that enhance the child's quality of life, social integration, and self-esteem.

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