

## Case Report

# Aesthetic and functional rehabilitation of missing teeth in growing patients with mini-implants: a contemporary approach

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**Received:** 27 August 2021

**Revised:** 24 September 2021

**Accepted:** 28 September 2021

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## ABSTRACT

Growing patients with missing teeth in aesthetically prominent areas pose a challenge in restoration of the same. Fracture of anterior teeth in these age groups is very common and often requires removal of the affected tooth. After the decision to maintain the space in the dental arch is made, some other factors have to be borne in mind before restoration of the space. Continuing growth of the alveolar bones, questionable cooperation of the patient and aesthetics are deciding factors that may limit the treatment options. The effective use of mini-implants for space preservation, alveolar bone width maintenance and aesthetics represents an elective way of successfully treating such cases. The aim of this article is to describe as well as highlight the advantages and ease of the procedure with the help of two clinical cases.

**Keywords:** Missing anterior teeth, Growing patients, Mini-implants

## INTRODUCTION

Traumatic subluxation and avulsion of permanent anterior teeth occur with varying prevalence in growing children.<sup>1</sup> The maxillary central incisors are most frequently injured teeth followed by maxillary lateral incisors.<sup>2</sup> Important predisposing factors reported for dental trauma are large maxillary overjet and incomplete lip closure.<sup>3</sup> Traumatic dental injury, especially the fracture of an anterior tooth is a distressing experience on a physical level, but may also have an effect on their emotional and psychological levels, presenting a negative impact on their quality of life.<sup>4,5</sup> Alleviation of these problems can be immediately addressed to with tooth replacement, substitution or space closure.<sup>6,7</sup> Traditionally a Maryland bridge or a resin tooth bonded to an acrylic plate are prescribed in a growing patient to

preserve the space till growth comes down to the minimal basal level, after which a prosthodontic implant is advised. The disadvantages of these approaches are loss of buccolingual width of alveolar bone by the time the patient completes growth or loss of the space to be preserved. Also, these two options do not fulfil the aesthetic requirements.

These traditional techniques can be superseded by miniscrew-supported transitional tooth replacement.<sup>8,9</sup> With this technique, alveolar bone height and buccolingual thickness are preserved, avoiding bone-grafting before prosthodontic implant placement. As the implant occupies a small area and does not osseointegrate, the final implant can be placed immediately after removal of the miniscrew.

Two cases are documented in this presentation in which an acrylic tooth supported with a mini-implant was given in place of a missing tooth and the cases are being followed up. The results show very aesthetic and functionally stable occlusion with no patient discomfort.

## CASE REPORT

### Case 1

#### History

A 12-year-old male patient reported with the complaint of forwardly positioned upper front teeth with one missing upper front tooth.

#### Extra oral assessment

On extra oral clinical examination, he was mesocephalic with a mesofacial pattern and had convex profile with incompetent lips.

#### Intraoral assessment

Intraoral examination revealed bilateral class II molar relationship, crowding in upper and lower arches with missing maxillary left central incisor (Figure 1).



Figure 1: Intraoral upper occlusal view of case 1.



Figure 2: Orthopantomograph of case 1.

#### Radiographic assessment

The lateral cephalogram revealed that the patient had a skeletal class II relationship with retruded mandible. The Orthopantomograph showed missing maxillary left central incisor and the space was being encroached by the adjacent teeth (Figure 2).

#### Treatment

##### Treatment aim

The treatment aim for this patient was reducing the prominence of upper front teeth, correcting the mandibular retrusion and replacing the missing tooth.

##### Treatment plan

The case was decided to be treated by extraction of all four first premolars. The mandibular retrusion and the class II molar relation were planned to be treated by placing a fixed twin block after space closure was completed.

##### Treatment progress

The space was opened and maintained with an open coil spring during the orthodontic phase of treatment. The patient's parents were explained the advantages and disadvantages of the conventional methods of tooth replacement and mini-implant supported acrylic pontic after active orthodontic treatment was completed. They opted for the mini-implant supported replacement. The patient was 14 years of age at the time of appliance removal.

### Case 2

#### History

A 12-year-old female patient reported with the complaint of missing upper front tooth.

#### Extra oral assessment

On extra oral clinical examination, she was mesocephalic with mesofacial pattern and had a convex profile. She had competent lips.

#### Intraoral assessment

Intra orally, she had class I molar relationship bilaterally with missing maxillary left central incisor (Figure 3).

#### Radiographic assessment

The lateral cephalogram showed that the patient had a skeletal class I relationship. The missing maxillary left

central incisor was evident in the orthopantomograph (Figure 4).



**Figure 3: Intraoral upper occlusal view of case 1.**



**Figure 4: Orthopantomograph of case 1.**

### **Treatment**

#### *Treatment aim*

The aim of this treatment procedure was to maintain the arch space in the growing patient aesthetically which can at the same time preserve the alveolar bone height without the complications of change in occlusion or patient un-cooperation.

#### *Treatment plan*

The case was decided to be treated by non-extraction. The available space was maintained with an acrylic tooth ligated to the archwire throughout the duration of active orthodontic treatment. The patient was 14 years of age at the time of appliance removal.

#### *Treatment progress*

After the transposition of the teeth was corrected in the maxillary arch, space was opened up for the replacement

of tooth in place of the missing maxillary central incisor. With completion of treatment, after the orthodontic appliance was removed, an acrylic tooth was selected with the matching shade. The shape of the selected acrylic tooth was slightly altered to match the adjacent permanent tooth. The gingival aspect of the tooth was altered to simulate emergence profile of a natural tooth.

### **Placement of mini-implant**

An 11 mm long and 1.5 mm diameter orthodontic mini-implant was selected. The cingulum portion of the acrylic tooth was hollowed out to match the shape of the implant head, preserving the tooth walls. The angulation of the implant to be placed was determined according to the angulation of the incisors in the patient and the hollowed-out area of the tooth was adjusted accordingly. The mesial and distal surfaces of the acrylic tooth were grooved to allow free sliding of the acrylic tooth in between the adjacent teeth and to prevent its rotation after cementation. The area was anaesthetized and the mini-implant was placed. A Mylar strip was placed over the implant penetrating it. The Mylar strip prevented the spillage of composite resin and gave a smooth finish (Figure 5). Primer was applied over the implant and composite resin was injected inside the acrylic tooth (Figure 6). The tooth was seated on the implant and cured and Mylar strip was pulled out. Minor composite irregularities were smoothed with a flame-shaped composite removing bur (Figures 7 and 8).

The posttreatment radiographs show the implants placed favourably (Figures 9 and 10).



**Figure 5: Mylar strip placed over the implant penetrating it.**

### **Retention**

The patients were seen after a period of 15 months (Case 1) and 5 months (Case 2) and the implant supported pontics examined. The mini-implants were stable with no signs of mobility. The patients were satisfied with the aesthetics and functional restoration of the missing teeth.





**Figure 6: Primer application over the implant.**



**Figure 9: Orthopantomograph after implant placement in case 1.**



**Figure 7: Frontal view of the completed crown in the case 1.**



**Figure 10: Orthopantomograph after implant placement in case 2.**



**Figure 8: Frontal view of the completed crown in the case 2.**

## DISCUSSION

Traditionally removable or fixed partial dentures or Maryland bridges are prescribed to preserve the space till growth comes down to the minimal basal level, after which a prosthodontic implant is advised. Removable partial dentures are bulky, not aesthetically pleasing and can often cause papillary hyperplasia.<sup>10</sup> Fixed partial dentures do not have these disadvantages but require extensive tooth preparation which is a risk factor in adolescent cases having large pulp chambers.<sup>11</sup> A Maryland bridge has multiple advantages including minimal tooth preparation and better aesthetics at an affordable cost but is still not free of complications. Debonding, tooth discoloration, recurrent periodontitis and caries are the most frequent ones encountered with Maryland bridges.<sup>12,13</sup>

Osseo-integrated implants along with aesthetic crowns are the best choice for missing anterior teeth but are contraindicated in growing patients. The continuous eruption of adjacent teeth, even after completed dental and skeletal development, may result in an infra-occluded implant-supported crown.<sup>14</sup> Also, marginal bone loss occurs between abutment connection and crown placement and buccally to the implants. The shorter the distance between the implant and the adjoining tooth surfaces, the larger the reduction of marginal bone level.<sup>15</sup>

The vertical dimension of the maxilla reaches its mature dimension around the age of 17 to 18 years in girls and somewhat later in boys. Between the ages of 9 and 25, the maxillary incisors move downwards about 6.0 mm having an average eruption velocity of 1.2 to 1.5 mm during active growth phase, and 0.1 to 0.2 mm per year afterwards. Dental implants placed at the age of 12 have shown a 5.0 to 7.0 mm infraocclusion four years later Thilander et al. As for assessing the right age for placement of osseo-integrated implants, various methods are available like MP3 radiographs, CVM method. But superimposition of serial cephalograms is the best method for assessing vertical growth coming down to minimal basal level.<sup>16</sup>

The cases presented here show satisfactory aesthetics, function and stability with reference to the mini-implant supported acrylic pontics. The advantages in such cases are that the pontics can be placed either shortly before or immediately after removal of orthodontic appliances and do not involve any reduction of the adjacent teeth. The miniscrew stimulates the alveolar ridge and thus helps prevent ridge atrophy, and it prevents the adjacent roots from drifting into the edentulous space, as stated by Graham. In a study on a canine model, the insertion of a mini-implant across the healing alveolar process resulted in increased density adjacent to the screws as well as in the region where a potential dental implant would be inserted. So, they concluded that in humans, the insertion of trans-cortical screws may maintain bone when insertion of a permanent dental implant has to be postponed.<sup>17</sup>

One important aspect to be considered here is that the involved implant with its pontic should be kept at least 0.5 mm clear of the occlusion with the opposing teeth to prevent stress concentration which can loosen the mini-implant. There was no reported discomfort on part of the patients while mastication or speech.

For better aesthetics a steel or light coloured mini-implant need to be used. In the cases described here the colour of mini-implants were seen to be evident through the acrylic pontic as light-coloured implants were not available. As the patients did not have any objection towards this issue so the implants were not changed.

Mini-screw implants placed at the crest of the alveolar ridge in growing patients may lead to impediment of vertical development of the alveolar ridge in some cases.<sup>18</sup> So inserting mini-screws perpendicular to the alveolar process from the palatal side have been found to be beneficial in those cases.<sup>19</sup>

The osseointegration as stated by Graham as in the case of a dental implant, may prevent the vertical development of the alveolar process related to growth.<sup>20</sup>

On the other hand, alveolar growth inhibition was rarely observed in some cases. The reason for this was the smaller dimensions of mini-implants compared to the dental implants.<sup>21</sup>

## CONCLUSION

The mini-implant supported temporary pontics offer a very suitable alternative for both the orthodontist and the patient in terms of efficiency, aesthetics and compliance. The advantages and affordable cost of mini-implants make this an obvious contemporary choice for replacement of the missing teeth in growing children.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: Not required*

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**Cite this article as:** Sarkar N, Goel S, Reddy S, Belludi A, Karunakara BC. Aesthetic and functional rehabilitation of missing teeth in growing patients with mini-implants: a contemporary approach. *Int J Res Med Sci* 2021;9:3472-7.