

Semipermanent replacement of missing maxillary lateral incisors by mini-implant retained pontics: A follow-up study

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Agensis of maxillary lateral incisors can be treated either by closing the space and substituting the canines for the missing lateral incisors or, in adults, by replacing the missing teeth with fixed prosthetics or implants. This article illustrates a method that can be used for a semipermanent implant replacement of the missing incisors in adult patients. An Aarhus mini-implant was inserted perpendicular to the palatal mucosa of the alveolar process of the edentulous area. A pontic was made at chair side of composite material around a stainless steel wire extending from the mini-implant. This replacement approach allowed for the vertical development of the alveolar process and maintained the bone density and morphology of the alveolar process. Five years after placement, periapical radiographs showed that the alveolar process was following the vertical development related to the eruption of the adjacent teeth, and that the morphology and the bone density were maintained, making the later insertion of a dental implant possible without additional surgical buildup. (*Am J Orthod Dentofacial Orthop* 2017;151:989-94)

Agenesis of maxillary lateral incisors occurs with a variable prevalence in different ethnic groups. According to Bozga et al,¹ the range is 2.2% to 10.1%, whereas most analyses report a prevalence between 6% and 8%. According to a PubMed advanced search, the first reports dealing with missing maxillary lateral incisors focused on their prevalence and etiology.^{2,3} The treatment options were limited to space closure or fixed prosthodontic bridges involving invasive preparation of abutment teeth. With the introduction of bonding materials and later of implants, replacements with less or no preparation of the neighboring teeth were possible. The introduction of temporary anchorage devices (TADs) also made space closure easier, but in some patients the facial profile indicated that replacement would be the best treatment. Yet, a problem remained in relation to the

ongoing growth-related development of the alveolar process.^{4,5} The effect of the vertical alveolar development was at the beginning underestimated; consequently, the recommended timing for insertion of permanent replacements has repeatedly been postponed.

Although several attempts have been made, a consensus regarding space closure or space maintenance with later replacement has not been reached.^{6,7} An explanation may be the interaction of many individual factors such as facial morphology, tooth morphology, lip length, and function, each of which has an important impact on the decision. Although the trend has been to recommend space closure, in patients where the replacement solution has been chosen, there is a need for a temporary replacement until maturity has been reached.

The options frequently described have been a removable plate with a tooth replacing the missing tooth and a bonded bridge with or without preparation of adjacent teeth. The disadvantage of the removable plate is obviously the required compliance in addition to the continuous coverage of the palatal mucosa. In relation to the bonded bridge, occlusal contacts on the adjacent teeth may have a negative influence, hampering the stability or making invasive preparation necessary. As an alternative, TADs have recently been suggested as temporary replacements. This may, on the other hand, lead to another problem because TADs, although not surface prepared as

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Table. Patients in the study

Patient	Sex	Age (y)	Treatment time (mo)	Age at insertion (y)	Right/left/bilateral
1	F	13.2	13	14.3	Right
2	F	10.10	30	13.4	Bilateral
3	M	11.9	14	13.1	Right
4	M	13.3	18	14.9	Left
5	F	11.2	24	13.3	Left

F, Female; M, male.

dental implants, do osseointegrate. A vertically inserted TAD may therefore prevent the surrounding bone from following the vertical development related to the eruption of the adjacent teeth. If, on the other hand, the space opened for a later implant is left untouched, significant decreases in both width and height of the alveolar ridge may occur while waiting for the dental implant. Consequently, the necessity is high for a later bone graft when the implant must be inserted.^{8,9}

The aims of this article were to describe a method for temporary fixed replacement that allows for the development of the alveolar process and to report the changes occurring clinically and radiographically over 5 years.

MATERIAL AND METHODS

Five patients (from 10 years 10 months to 13 years 3 months) with agenesis of maxillary lateral incisors received 6 mini-implants that supported temporary replacements after orthodontic space opening (Table).

An Aarhus mini-implant (Medicon Instrumente, Tuttingen, Germany) with a bracket-like head and a high collar was inserted perpendicular to the alveolar process palatally in the edentulous area, approximately corresponding to the coronal medium third of the length of the roots of the adjacent teeth.

The pontic was constructed at chair side on the day of insertion of the mini-implant. A 0.021 × 0.025-in stainless steel wire section (American Orthodontics, Sheboygan, Wis) was inserted into the slot of the mini-implant, and a small loop was bent on the top of the alveolar process. The wire was adapted with a distance from the mucosa of 0.5 to 1 mm, with no occlusal interference and ligated with a tight metal ligature (American Orthodontics).

The loop was configured so that it could generate retention for the composite shaped as a crown. A metal primer (Kuraray America, New York, NY) was applied to the wire and dried for 2 to 3 seconds, and then a bonding agent (Adper Scotchbond; 3M ESPE, St. Paul, Minn) was added and light-cured for 40 seconds. The crown replacing the missing tooth was formed by adding layer after layer of composite (Filtek Supreme XT Universal

Restorative; 3M ESPE) around the extension of the wire, polymerized for 20 seconds each time, starting from the gingival side until the buildup of the lateral incisor was accomplished.

To complete the gingival and lateral surfaces of the pontic, the wire with the pontic was loosened from the miniscrew. Then the pontic was refined with fine diamond burs and silicon points and checked in the mouth until both esthetics and function were acceptable. Once the pontic was finished, the wire was ligated tightly to the bracket-like head of the mini-implant, and the ligature was covered with fluid composite (Filtek Supreme XT Flowable Restorative; 3M ESPE) for comfort (Fig 1). Finally, the patients were instructed about flossing daily between the pontic and the mucosa.

As retention for the orthodontic tooth movement, performed for the opening of the space for the missing lateral incisor, the canine and the central incisor were splinted with the adjacent teeth and not with the pontic that remained separated from the retention.

The 5 patients in this study were monitored every 6 months for 5 years. The distance between pontic and mucosa was increased by straightening the wire maintaining the pontic. Intraoral and radiographic images were taken immediately after insertion of the mini-implant (Figs 2 and 3) and at the 2-, 3-, and 5-year follow-ups (Figs 4 and 5).

RESULTS

The soft tissues adapted well to the pontic over the years. No inflammation of the soft tissues around the pontic was detected, most likely due to dental flossing in this area. The intermittent pressure exerted to the central part of the mucosa during function might have contributed to the generation of papillae between the pontic and the adjacent teeth.

Inflammation of soft tissues around mini-implants occurred twice in 1 patient, but it was cured in a few days by increasing oral hygiene and by daily chlorhexidine mouth rinses.

No bone resorption around the mini-implants was noticed; on the contrary, the vertical development of the alveolar process followed the eruption of the adjacent teeth. The loading of the pontic during biting generated a tipping moment to the screw that appeared to be acceptable, since no mini-implants were lost. The ligature wire broke twice in 1 patient and was replaced with a larger wire. Discoloration of the pontic was noted in 1 patient, most likely caused by strong colors in the diet. Figure 4, C, shows that the composite in the central area of the right pontic was replaced to eliminate the discoloration.

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