Mouth and Teeth

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Semi-permanent replacement of missing maxillary lateral incisors with orthodontic mini-implants: A biological approach

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Agenesis of lateral maxillary incisors can be treated by two alternative options: Closure of the spaces followed by reshaping of the canines that will be functioning as laterals, or maintenance of the spaces with replacement of the lateral incisors with an implant after presumed cessation of the development of the alveolar process. The first treatment choice is preferable when the shape of the canines allows for an acceptable reshaping, the premolar root allows for a suitable crown torque and the space closure will not have a detrimental effect on the patient's profile. If any of these preconditions are not fulfilled a replacement is indicated. As a bridge requires an intervention on the adjacent teeth the implants seem to be preferred [1,2].

While waiting for growth to cease,temporary replacement of the missing tooth by a removable plate with a tooth or a bonded bridge with or without preparation of adjacent teeth have been suggested. The disadvantage of the removable plate is obviously the demanding compliance in addition to the continuously coverage of the palatal mucosa. The adhesive bridge will often have a limited retention or require invasive procedures in healthy teeth. In addition several papers have demonstrated a significant decrease in both width and height of the alveolar ridge in patients with congenitally missing a maxillary lateral incisor who received orthodontic treatment to create space for a dental implant [3,4].

To overcome these problems TADs were suggested as a basis for temporary replacement of lateral incisors.5-9 Vertical insertion of TADs on the top of the edentulous area did on the other hand not allow for the the vertical development of the alveolar process as they did not follow the eruption of the adjacent teeth. The present paper shows an alternative method which can be used as semi-permanent replacement of the missing incisors. The approach allows for the maintenance and development of the alveolar process until maturity has been reached in the patients where a missing tooth is meant to be replaced by an implant at adult age [10,11].

Clinical procedure

After a mild infiltration anesthesia, an Aarhus mini-implant*[1] with a bracket-like head and a high collar is inserted perpendicular to the alveolar process palatally in the edentulous area, approximately corresponding to the coronal third of the length of the roots of the adjacent teeth.

The construction of the pontic was performed chair side the day of the insertion of the mini-implant without no lab procedure (Figure 1).

A 0.021x0.025 SS sectional wire is inserted into the slot of the mini-implant and ligated tightly by a metal ligature. The wire is extending from the miniscrew to the top of the edentoulus alveolar process where it is configurated so that it can generate retention for the composite shaped as a crown. A metal primer[2] is applicated to the wire and dried for 2-3 seconds followed by application of a bonding agent[3] which is light-cured for 40 seconds.The crown replacing the missing tooth is formed coarsely by adding layer after layer of composite[4] around the extension of the wire, polymerized for 20 seconds each time,starting from the gingival side, working labially and occlusally until the build up of the lateral incisor is accomplished.

In order to complete the gingival and lateral surfaces of the pontic, the wire with the pontic is loosened from the miniscrew , finishing is done extraorally and checked in the mouth until both form and function are acceptable.Then the pontic is refined with fine diamond

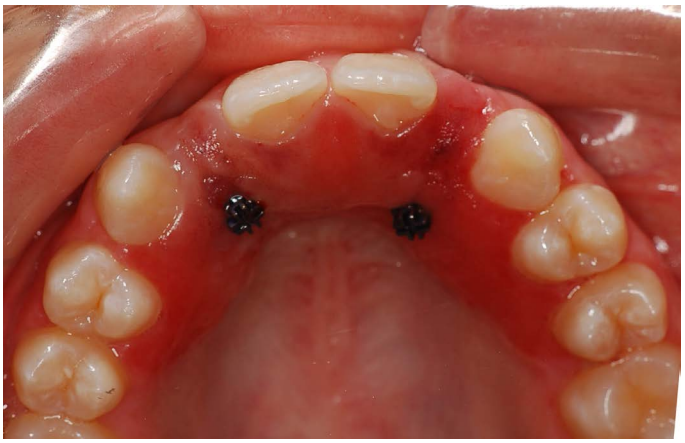

Figure 1A. Insertion of mini-implants.

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Figure 1B. Configuration of the wire.

Figure 1C. Final insertion of the pontic.

Figure 1D. Initial frontal introral view.

burs and silicon points and finally ligated tightly to the bracket-like head of the mini- implant. At the end a fluid composite[5] is applied over the head of the screw for comfort of the patient.

Following insertion it is crucial that the patients are instructed in flossing daily between the pontic and the mucosa. The passage of the floss under the pontic also ensures that no pressure is added to the edentulous alveolar process.

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

Discussion

The temporary replacement of missing maxillary lateral incisors have been followed up to 5 years from the insertion. The patients were seen every 6 month and the wire adapted so that the heigth of the pontic followed the eruption of the adjacent teeth and did not exert continuous pressure on the top of the aveolar process .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 the facility of 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 did sometimes occur but it disappeared increasing oral hygiene and daily chlorhexidine mouth rinses.

No bone resorption around mini-implants was noticed and the vertical development of the alveolar process followed the eruption of the adjacent teeth. The intermittent tipping moment generated with respect to the screw when the pontic was loaded during biting was well accepted and may have contributed to the maintenance of the density of the alveolar bone.12None of the mini-implants were lost.

A possible rare complication was breakage of the ligature wire which was then substituted by a wire of a larger dimension.

Gingival impingement will occur when the adjacent teeth erupt more than the distance between the pontic and the mucosa . The maintenance of a distance between pontic and alveolar mucosa is however extremely important in order to allow for a continuous vertical development of the alveolar process . Moving the pontic more occlusal can easily be done by straightening the wire connecting the pontic with the mini-implant. A small V bend on the wire when constructing the pontic allows for the adjustment without removal of the wire from the bracket head of the mini-implant.

In our sample some mini-implants were inserted bicortically. In CBCT images at 5 year follow-up control it was noticed that the buccolingual width of the alveolar process had been totally preserved during growth (Figure 2). In addition,the described technique to replace the missing teeth also facilitates the later insertion of a dental implant as it maintains both morphology and density of the alveolar bone in that region .

Based on these observation it can be recommended to assess the thickness of the alveolar process on a CBCT of the patient or by measuring the thickness of the alveolar process and mucosa directly in the mouth so that the length of the threaded part of the mini-implant corresponds to the horizontal dimension of the alveolus. Based on these measurements a surgical guide will ensure the correct insertion of the mini-implant.

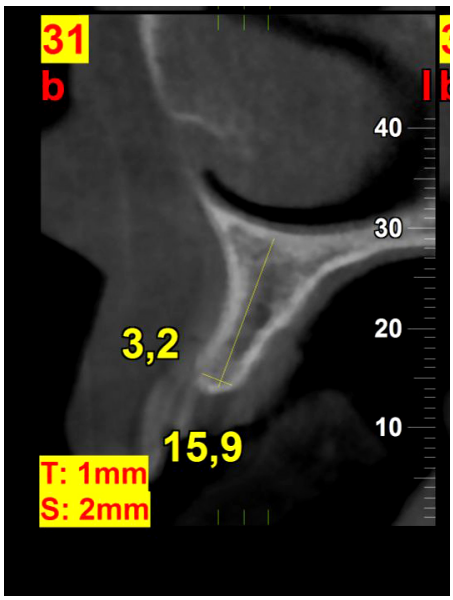

Figure 2A. Initial sagittal cone-beam section of the alveolar process.

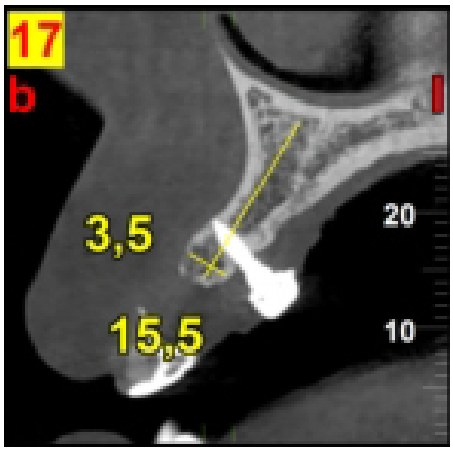

Figure 2B. Sagittal cone-beam section at 5 year follow-up.

Conclusions

The present report describes a solution to the replacement of missing maxillary lateral incisors. The method is compliance free, requires no invasive intervention on the adjacent teeth and allows for the normal development of the alveolar process both in height and width. It is not limited to a specific age and can possibly also be used as a temporary solution during a prosthetic reconstruction phase .

(Endnotes)

1. Arhus Anchorage System, Medicon Instrumente,15 Gansacker, Tuttlingen,D-78532
2. Alloy Primer,Kuraray Medical Inc.,1621 Sazaku Kurashiki,Okayama, Japan
3. Adper Scotchbond,3M-ESPE,St.Paul,MN 55144-1000
4. Filtek Supreme XT-Universal Restorative,3M-ESPE, St.Paul,MN 55144-1000
5. Filtek Supreme XT-Flowable Restorative ,3M-ESPE, St.Paul,MN 55144-1000

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