

Replacing Congenitally Missing Central Incisor: A Case Report with a Special Method to Achieve the Optimal Emergence Profile

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Abstract

Aim: In this case report a male patient is presented with a congenitally missing right upper central incisor. Different treatment methods have been combined, including ridge-split technique and flapless surgery.

Methods: The internal tri-lobed implant was placed during the bone splitting procedure. Presurgical orthodontic treatment and post-surgical soft-tissue manipulation is described.

Results: The high esthetic outcome, achieved with the screw-retained crown, evaluated with the PES and PI are presented. Results are documented right after final restoration and after one year.

Conclusion: The use of screw-retained temporary composite crowns for soft-tissue contouring is affirmed. One year after rehabilitation the screw-retained press-ceramic crown is still in function without any esthetic compromise. The surgical method described and used in this case report still needs long-term evidence-based evaluation and verification.

Keywords: Central incisor; Flapless surgery; Ridge-split; Screw-retained crown; Press-ceramic crown; Soft-tissue contouring

Introduction

Dental patients with congenitally missing front teeth may present with undeveloped alveolar bone, causing challenges in implant reconstruction [1,2]. While missing teeth have been successfully replaced by titanium implants in the last decade, dental restoration and surgery still struggles with cases of restoring anterior teeth where the use of implant supported restorations is still a technically sensitive issue [3].

Restoration and management of congenitally missing lateral incisors is well documented in literature [4-9]. Maxillary lateral incisor agenesis occurs in 0.8 to 2% of the population in the permanent dentition phase [10-12]. The agenesis of central incisors is occurring much infrequently, and the presence of congenitally missing central incisor without any combined developmental lesion is real rarity. Therefore it is hard to find any documentation and literature description. Some cases have been described about prosthetic restoration of missing central incisors with implant supported dental bridgework. Abbo and Razoog [13] reported cases of the placement of narrow platform, internal tri-lobed implants, with the restorative solution of 4-unit zirconium fixed partial denture in order to restore the missing mandibular central incisors. Description of the prosthetic replacement of a missing central incisor has also been published, where transformation of the anterior teeth were achieved, with laminate veneers, to simulate a complete dentition. The first premolar was transformed to mimic the esthetics of a canine, the canine to a lateral incisor and the lateral incisor to a central incisor [14].

Implant restoration of a single missing central incisor is rarely documented in the literature, and guidelines, so treatment protocols may vary and depend on the clinicians and the team performing the orthodontic and prosthetic restoration of the patient. In cases of missing central incisors with insufficient space for the tooth, only complicated treatment choices can achieve the planned result.

Moreover, in a growing child or adolescent multi-disciplinary cooperation between the prosthodontist, the oral surgeon and the orthodontist can lead to an optimal outcome [15].

The success of implantation is mainly determined by

osseointegration, achieving a stable anchorage between the dental implant and the bone structure [16]. However positive esthetic outcome is not always in correlation with osseointegration. Patients' rising esthetic demand, together with inadequate pre-surgical anatomy will challenge clinicians [17]. Furthermore, a unique challenge is presented to the dental implant surgeons at sites with atrophic bone [18]. As the current concept of the treatment has moved from "bone driven implantology" to "restoration driven implantology", and the demand for aesthetic restorations and healthy soft tissues around the implant has increased [19], the esthetic success of the implant needs to be planned and evaluated carefully.

For the ideal position of the implant the recipient site often needs modification of, where previously onlay grafts harvested from the hip, maxilla or chin have all been used with success. However, as onlay grafts require secondary surgical site, the harvesting of bone with burs and chisels can cause postoperative morbidity [18]. Among alveolar ridge augmentation techniques, the ridge-split procedure demonstrates many benefits, including no need for a donor surgical site, rare risk of inferior alveolar nerve injury, less pain and swelling, and others [20]. Demetriades et al. [21] have concluded, that "the split crest bone augmentation technique is a valid reconstructive procedure that can be used to augment the buccolingual alveolar defect prior to implant placement providing good bone foundation for placement of implants with desirable width in favorable angulations". Comparing to bone graft techniques, ridge-split bone augmentation will allow placement of implants simultaneously or 3 weeks postoperatively.

To optimize the soft-tissue esthetics, flapless surgical procedures can provide perfect solution, however both flapless and flap implant

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placement protocols can result in high success rate, but a flapless protocol may provide a better short-term esthetic result [22]. Oliver et al. have concluded, that “flapless procedure for dental implant placement is advantageous for preserving crestal bone and mucosal health, so that this technique increases the success rate of dental implants” [23].

The final outcome of such a case can be described with evaluation of the alterations of soft tissue around the implant with the Pink Esthetic Score (PES) and Papilla Index (PI) at the time of crown placement and 1 year post-loading [24-26].

Diagnosis and Etiology

A male patient is presented with a congenitally missing right upper central incisor (Figures 1-4). The patient had received a removable denture from his dentist to replace the missing tooth at the age of 16. In order to achieve the optimal esthetic outcome, an orthodontic treatment was performed until the age of 18. The lateral incisors and the left central incisor were moved to the ideal position, and the orthodontic appliance was kept in situ in order to maintain the space until the final prosthetic restoration.

Treatment objectives

As the available bone was insufficient in the oro-vestibular dimension (Figures 5a and 5b), a bone-condensing technique was used (Meisinger Split Control Bone Expansion Kit, Meisinger USA, LLC, Jacksonville, Fla). The crestal split ridge bone augmentation [22] enabled sufficient bone for the placement of the needed dental implant (Figure 6).



Figure 1: A male patient is presented with a congenitally missing right upper central incisor.



Figure 2: A male patient is presented with a congenitally missing right upper central incisor.



Figure 3: A male patient is presented with a congenitally missing right upper central incisor.



Figure 4: A male patient is presented with a congenitally missing right upper central incisor.

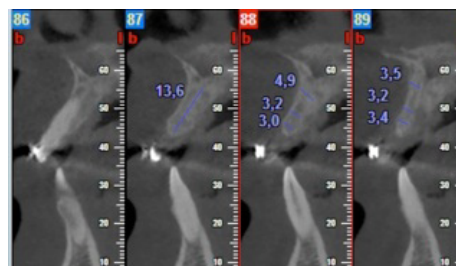


Figure 5a: The oro-vestibular dimension.



Figure 5b: The oro-vestibular dimension.



Figure 6: The crestal split ridge bone augmentation.

The proper implant selection and mesiodistal, apicocoronal, and orofacial implant position was determined following the guidelines of Buser et al. [17].

A minimal invasive, transgingival flap design was used, performed with a tissue punch, in order to minimize the surgical trauma to the soft and hard tissues. A precise wound closure was performed with 5.0 non-absorbable synthetic monofilament sutures repositioning the removed soft tissue, suturing was performed under magnification.

An internal tri-lobed 13 mm long narrow platform implant was placed (Nobel Replace Tapered Groovy, Nobel Biocare, Göteborg, Sweden) in the site 11 with a cover screw and three months of healing period has followed with monthly control.

During the healing period a composite crown was attached to the orthodontic wire.

Restoration

After osseointegration a screw-retained composite crown (Empress Direct, IvoclarVivadent, Schaan, Liechtenstein) was fabricated to form the soft-tissues and achieve esthetic emergence profile (Figure 7). During a three-week period composite was periodically added to the gingival site of the crown, to passively form the attached gingiva (Figure 8). After achieving the optimal gingival contour and the needed form for the planned emergence profile, an impression was taken with two-phase, one time method, using A-silicone impression material (Honigum, DMG Hamburg, Germany).

For final restoration a screw-retained one-piece eMax press-ceramic crown (IvoclarVivadent, Schaan, Liechtenstein) was fabricated.

The final outcome of the treatment was evaluated using the PES and PI (according to Jemt) immediately (Figure 9) and one year after (Figure 10) coronal restoration [26]. Digital photographs were used for the evaluation of the papilla levels.

The photographs were taken perpendicular to the buccal surface at 1:1 magnification, using a Canon EOS 350D digital camera (Canon, Tokyo, Japan) with macro lens and ring flash [27].

Results

Within the limitations of a case report, the use of screw-retained composite crowns for temporary and screw retained press-ceramic crowns as final restorations can be affirmed. In this current case the combination of split ridge bone augmentation with flapless surgery resulted in a sufficient outcome. The PES was 10 rights after placing the final restoration and 14 at the one year control. PI was at the mesial papilla equally 3 right after restoration and at one year recall, but 2 at the distal papilla at the first measure. This has changed to 3 at the one year follow up also at the distal papilla.

The detailed PES and PI results can be seen in table 1. Pink esthetics and papillae have been successfully formed with this method.

Discussion

Congenitally missing central incisors can challenge the operator in restoring both function and esthetics. As the restoration has been described and well documented in the literature for lateral incisors and also extracted central incisors, some modifications and combinations of certain treatment options can result in high esthetic outcome with optimal function. The high esthetic demands of the patients and the lack of treatment protocols in such cases can lead the operator to combine different treatment options and solutions.



Figure 7: Esthetic emergence profile.



Figure 8: Attached gingival.



Figure 9: Evaluated using the PES and PI.

| | Immediate after restoration | 1 year control |
|-----------------------------|-----------------------------|----------------|
| PI | | |
| Mesial | 3 | 3 |
| Distal | 2 | 3 |
| PES | 10 | 14 |
| Mesial papilla | 2 | 2 |
| Distal papilla | 1 | 2 |
| Level of soft-tissue margin | 2 | 2 |
| Soft-tissue contour | 1 | 2 |
| Alveolar process | 2 | 2 |
| Soft-tissue color | 2 | 2 |
| Soft-tissue texture | 1 | 2 |

Table 1: Papilla Index (PI) and Pink Esthetic Score (PES) immediate and one year after final restoration. (Note: the composite filling in tooth 21 has been changed after the final restoration, but before the one year control).

In this case the flapless surgery protocol that has a positive effect on preserving the crestal bone [23,24] has been combined with the well documented ridge-split technique [20]. This method has provided sufficient oro-vestibular bone thickness with leaving both oral and palatal mucosa intact, assuring better wound healing and more predictable esthetic result. Combining these methods might end up in such positive outcome, but the limitations of this technique are not yet defined. Obviously, a minimal overall bone thickness of 2.5-3.0 mm is needed, and it is essential to have a minimal amount of spongy bone between the oral and buccal cortical, in order to enable splitting. More detailed research might be needed to validate this option and evaluate the limitations.

Successful osseointegration itself, with the correct angulations of the implant might not end up with sufficient esthetics. Prosthetic

rehabilitation, with detailed soft-tissue contouring has led to the positive outcome of the treatment. As literature describes no significant difference between cemented and screw retained implant crowns in the clinical behaviour of the peri-implant marginal bone or of the peri-implant soft tissues [28], but screw retained crowns give the opportunity to be modified several times after placed in situ [29], the usage of screw retained temporary crown was an excellent tool to achieve optimal emergence profile. The same background also explains the final restoration design. Having the opportunity to re-contour or modify the final restoration, together with the option to control oral hygiene and gingival health at the implant-abutment junction, recommends the use of screw-retained restorations even in the esthetic zone. However in some cases, due to the wrong angulations of the dental implant this solution might not be a preferable option.

The use of press-ceramic crowns on dental implants is a well documented solution in the literature [30,31]. Processing ceramic abutments on titanium implants is described in details by the manufacturer.

Conclusions

Within the limitations of a case report, the use of screw-retained temporary composite crowns for soft-tissue contouring can be affirmed. One year after rehabilitation the screw-retained press-ceramic crown is still in function without any esthetic compromise.

The surgical method described and used in this case report still needs long-term evidence-based evaluation and verification.

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