INTERNATIONAL JOURNAL OF HEALTH & MEDICAL RESEARCH

ISSN(print): 2833-213X, ISSN(online): 2833-2148

Volume 04 Issue 04 April 2025

DOI : 10.58806/ijhmr.2025.v4i4n01

Page No. 206-211

Replacement of a Congenital Missing Lateral Incisor Using a Flapless Implant: A Case Report

Maher m. Jwaid[1], Mohammed J. Alwan[2]

[1,2] Al-Hadi University College, Baghdad-10011, Iraq

ABSTRACT: Implant insertion generally leads to marginal bone loss and soft tissue recession surrounding the implant when a full-thickness periosteal flap is elevated. This occurs because the reduced blood supply to the underlying bone affects its health. In order to maintain the blood supply to the bone beneath, implants might be inserted using a surgical approach that does not need the creation of a flap. This method also offers several other advantages, including reduced trauma, accelerated healing time, diminished pain, lower risk of infection, and enhanced patient adherence. This article details a case in which flapless implant implantation was performed in the maxillary anterior area, resulting in optimal outcomes and minimal patient pain. The benefits and constraints of this method are also examined.

KEYWORDS: Dental implants, minimally invasive surgery, and flapless surgery,

INTRODUCTION

The combined use of medical imaging and software planning has resulted in significant enhancements in treatment planning.(1) Surgical guides now play an important role in transferring this premapped plan to placing the implants at their designated positions (angulation and depth).(2)

The surgical guide is not only used for placing implants in challenging anatomical situations, but also for placing implants in optimal placements in the bone, which enhances the aesthetic and functional benefits of prosthodontic-driven implants. (3) Glossary of prosthodontic terms-9 defines surgical template as a guide used to assist in proper surgical placement and angulation of dental implants. (4) Surgical guide is the link

between what"s in mind (treatment planned) and what will be executed (treatment). In the last three decades,

there have been changes made to the designs of flaps used in implant surgery. More recently, a new approach has been established where implants are placed without lifting the flap and exposing the bone tissues.

Flapless methods have been employed for a considerable duration in tooth extractions and site preservation, and these treatments have demonstrated reduced morbidity. (5) The flapless technique is employed to place immediate implants, aiming to maintain the vascular supply and the current soft tissue shapes. (6) Surgeons utilise rotary devices or a tissue punch to create perforations in the gingival tissues in order to gain entry to the underlying bone. The technique of flapless implant implantation offers numerous benefits for both the patient and the surgeon. Preserving the periosteum on the outer and inner sides of the ridge helps maintain a sufficient blood flow to the area, hence decreasing the chances of bone loss. (7) Furthermore, it leads to decreased patient-level consequences, such as oedema and discomfort, while also reducing intraoperative haemorrhaging, surgical duration, and the necessity for suturing. (8) Nevertheless, the flapless technique has certain drawbacks. The surgeon is unable to visually perceive anatomical landmarks and vital structures, or manipulate the surrounding soft tissues to achieve the desired dimensions of keratinized mucosa around the implant. Additionally, there is limited access to the bony contours for alveoloplasty.(9)

Although it may appear to be a straight forward procedure, it nonetheless necessitates the expertise of a skilled dental surgeon due to the need to insert the implant into the bone without direct visible confirmation of its placement.The effectiveness of this blind operation relies heavily on preoperative planning and careful identification of suitable cases. This case report describes a surgical procedure for implant implantation using a flapless approach with assessed surgical guide which resulted in minimum patient discomfort.

CASE REPORT

A 22-year-old woman presented to our department with a complaint of a missing tooth, specifically tooth 12 (right upper lateral incisor). The tooth was congenitally absent, and she desired to replace it with a fixed prosthesis. Following an initial examination

inside the mouth, the patient was presented with the choices of a fixed partial denture or an implant-supported prosthesis. After considering the options, the patient consented to the implant supported prosthesis as this was more predictable and conservative to teeth.The patient was a non-smoker in excellent overall condition, with no notable medical history.

The intraoral examination (Figure 1) revealed that the individual had satisfactory gingival and periodontal health.

The residual ridge had insufficient width mesiodistally; therefore, the patient was referred to the orthodontist to make space for the implant. Sufficient bone was achieved after one year of radiographic examination (Figure 2). After measuring the bone clinically and radiographically, it was decided to place a standard-sized diameter root form implant (diameter =3, length =13 mm, OXY Implant System Colico, Italy) by flapless surgical procedure.

The surgical guide was designed by ODS GUIDE Software (figure 5, figure 5a and Figure 5b) By matching CBCT data (figure 4 and Figure 4a) and STL files (figure 3 and Figure 3a) to simulate implant and prosthetic placement and printed by SprintRay Pro S 3D printer Los Angeles, USA (figure 6).

The surgery was conducted using local anaesthesia. Subsequently, the surgical guide was positioned within the patient's mouth to guarantee accurate placement and support from the remaining teeth.

A tissue punch was utilised to create perforations in the gingival tissue, allowing direct access to the underlying bone without the need for flap elevation. The osteotomy procedure began with a pilot drill at the punch site, while ensuring there was plenty of irrigation. The final osteotomy was then produced by employing a series of consecutive drilling.

Following the completion of the final osteotomy preparation, the implant was inserted using a torque measuring wrench, achieving a final torque of 50 N/cm2. The implant was put in a parallel position with the surrounding teeth roots, as shown in (Figure 7). The implant exhibited satisfactory primary stability. An abutment for healing purposes was positioned onto the implant.To promote the growth of a healthy gum tissue.(Figure 7a)

The patient was given detailed instructions on how to manage pain after surgery. They were prescribed amoxicillin 500 mg three times a day as an antibiotic for potential infections, and ibuprofen 400 mg three times a day as a pain reliever. The prescription was to be taken for a duration of three days. The patient was summoned for a normal follow-up after 2 days. There were no signs of swelling outside the mouth, and he experienced only little discomfort in the affected area.

After two days, the patient was brought back for a follow-up appointment; he had minimal local pain and no swelling outside his mouth. After 12 weeks of placement healing abutment a smooth, healthy gingival cuff had developed around the gingival abutment (Figure 8) . Upon removal, three months later, It was determined to make an impression as the patient reported no pain or sensitivity from the implant.

The scan body was placed and a digital impression was taken with scanner Media i600 Seoul, Republic of Korea (Figure 9). The prosthesis designed by EXOCAD software Darmstadt, Germany. (Figure 10) .The final prosthesis provided 18 weeks after implant placement. Since the patient intends to achieve a full smile with veneers with shade 0M1 (VITA Bleached Shades Guide,Bad Säckingen, Germany) after orthodontic treatment, the shade of the final prosthesis is negligible; therefore, this prosthesis may be altered in the future. (Figure 10)

DISCUSSION

Flapless implant surgery has been reported as a reliable method with excellent success rates, provided that patients are carefully chosen and there is sufficient bone breadth for implant placement.6,7 Additionally, an animal study revealed that osseointegration and bone height around implants were substantially greater when they were placed without flap elevation than when flap elevation was performed.8 It is straight forward to execute flapless implant surgery, which has been proposed as a potential treatment option for improving the aesthetics of implants. (10) Assessing the hard and soft tissues during the process of planning treatment is of greatest importance for the placement of implants without the need for incisions. A suitable location necessitates a minimum of 5 mm of width from the front to the back of the bone and 7 mm of length from one side to the other. These measurements enable the placement of a root form screw type or press fit implant with a standard-sized diameter (3-4.2 mm), ensuring sufficient bone housing and spacing for the implant in the dental structure. (11,12)

The utilisation of digital technology has shown to be an indispensable instrument in the process of diagnosing medical conditions and devising treatment plans. However, even the most well-designed plans appear to have no value if they are not performed correctly. (13) When doing oral implant placement, the surgeon must direct the drill (including its position, depth, and angulation) based on the desired shape of the prosthesis. Optimal positioning enables the advantageous application of forces on the implants and the prosthetic component. Surgical guides have demonstrated enhanced accuracy in implant placement, resulting in improved prosthetic outcomes. (14) In this case report the surgical guide made from acrylic resin that fits right over adjacent teeth, with a hole where the implant is to be placed.

It is crucial to evaluate the soft tissue, including measuring the thickness and height of the fibrous keratinized tissue, examining the quality of the fibromucosal attachment, and determining the position of the mucogingival line. It is important to take into account the relationship between the soft tissues, the underlying bone, the placements of the implants, and the anticipated emergence profile. The attached gingiva should have a minimum distance of 4 mm from the intended free gingival border to the mucogingival

junction.15,16,17

Placement of implants without raising a flap guiding with surgical guide not requires a high level of experience.Surgical guidance reduces the likelihood of bone perforation and late complications and doubles the benefit of reducing bone loss with flapless implants, but this procedure must be performed with great care and appropriate preoperative planning.

CONCLUSION

The development of transmitting virtual planning to the patient's mouth is a relatively new technique, despite the potential benefits of this current approach. To support this unique method to implant rehabilitation, more study is needed.

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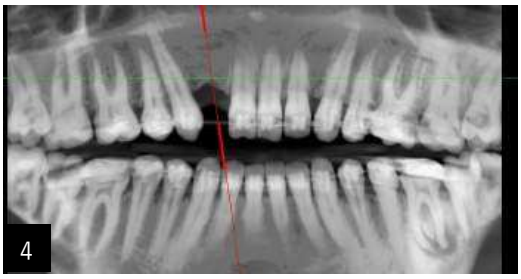

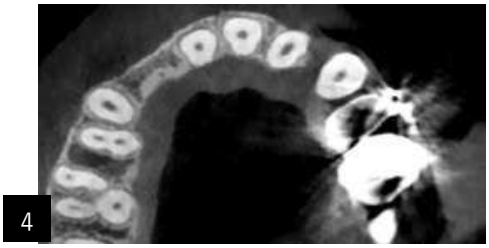

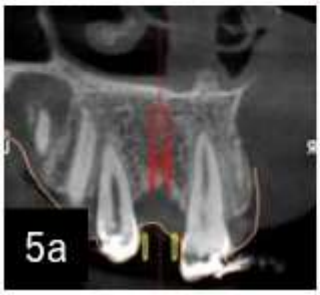

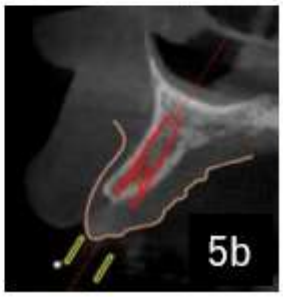

FIGURES 1–7. FIGURE 1. Preoperative intraoral photograph. FIGURE 2. Preoperative orthodontic treatment photograph. FIGURE 3. Preoperative intraoral scanner (IOS). FIGURE 4. Cone-beam computed tomography (panoramic view) showing available vertical bone. FIGURE 4a. Cone-beam computed tomography (axial view) showing available bone width. FIGURE 5. Planning scheme for the position of the implant (panoramic view). FIGURE 5a. Planning scheme for the future position of the implant (sagittal view). FIGURE 5a. Planning scheme for the position of the implant (coronal view). FIGURE 6. Surgical guide (type: tooth support).FIGURE 7. IOPA radiograph taken after the

FIGURE 8: Gingival cuff formed after 12 week of healing abutment placement.

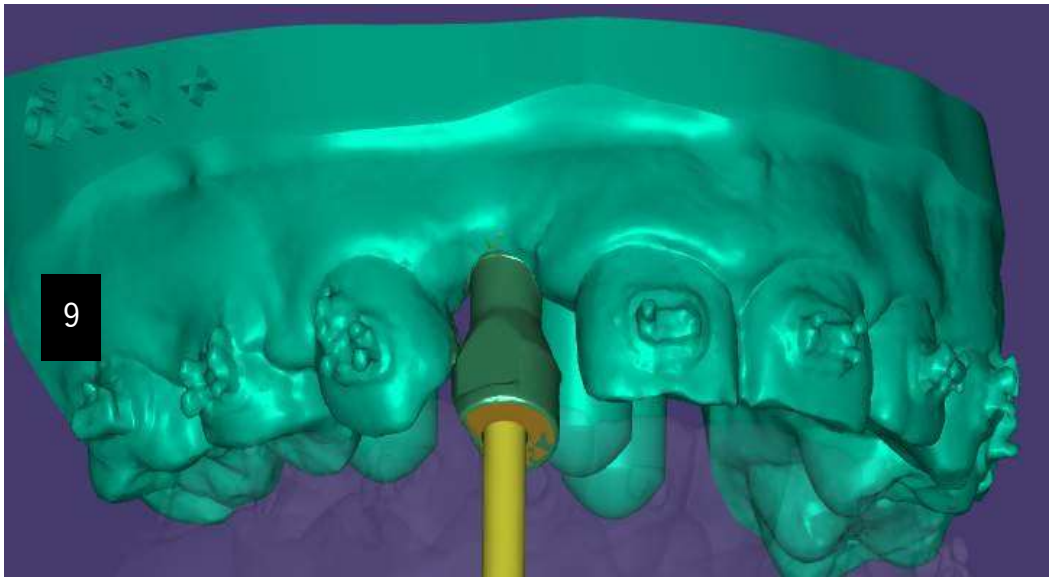

FIGURE 9: Intraoral scanner with scan body

FIGURE 10: Photograph showing final digital design of prosthesis.

FIGURE 11: Photograph showing final prosthesis.