

Replacement Of Maxillary Anterior Tooth With Immediate Implant Placement Along With Graft Material: A Case Report

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Abstract:

Background: The replacement of a maxillary anterior tooth poses a unique challenge due to its aesthetic and functional importance. Immediate implant placement, combined with graft material, has emerged as an effective approach to restore the missing tooth promptly. This case report outlines the successful replacement of a maxillary anterior tooth using immediate implant placement with graft material, focusing on the background, case presentation, discussion, and concluding remarks.

Case Report: A 32-year-old male patient presented with a missing maxillary left central incisor due to a traumatic injury. The patient had a healthy medical history and was evaluated for dental implant placement. After a thorough clinical and radiographic assessment, immediate implant placement was deemed suitable. The surgical procedure involved atraumatic tooth extraction and immediate implant placement, followed by the application of graft material, (osseograft DMBM), to augment the alveolar ridge. The procedure was performed under local anesthesia, and a flapless approach was utilized to minimize tissue trauma. After implant placement and grafting, a temporary restoration (essix retainer) was fabricated to ensure proper healing without pressure and optimal esthetics during the healing phase.

Discussion: Immediate implant placement in the maxillary anterior region requires meticulous planning and execution to achieve favorable outcomes. Graft materials play a critical role in preserving the ridge dimensions and providing adequate support for the implant. In this case, the use of xenograft demonstrated its efficacy in enhancing bone volume and quality.

The flapless surgical technique reduced postoperative discomfort and accelerated the healing process. Moreover, the use of a temporary restoration contributed to maintaining the patient's esthetic appearance while ensuring the implant remained undisturbed during osseointegration.

Conclusion: The replacement of a maxillary anterior tooth with immediate implant placement along with graft material can yield successful results when performed with careful patient selection, precise surgical technique, and appropriate graft materials. This case report highlights the feasibility of this approach in achieving optimal functional and esthetic outcomes. However, long-term follow-up is essential to assess the stability and success of the implant and graft materials, emphasizing the importance of continued research and clinical evaluation in implant dentistry.

Key Word: Immediate implant, Anterior implant replacement, Graft, Missing anterior, Esthetics

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I. Introduction

Dental implants have emerged as a feasible therapy option for people who are entirely or partially missing teeth. Since 1968, when Dr. Branemark first established the notion of osseointegration, a large quantity of clinical research with long-term follow-up has been undertaken on the effectiveness and predictability of implant-supported restorations.

The term osseointegration is defined as the direct structural and functional connection between organized living bone and the surface of a load-bearing implant. Because of its excellent predictability, osseointegrated dental implants can be used to replace lost anterior teeth.

For years, endosseous implants have been the choice of treatment for restoring missing teeth successfully. In 1965, Branemark placed the first endosteal titanium implant successfully. Original protocols required the placement of implants into healed edentulous ridges and implant placement signifies the placement

of the implant in the healed extracted socket after a minimum of 5–6 months. In 1989, Lazzara placed implants at the time of tooth extraction. Over the past few years, numerous studies have confirmed the reliability of implants placed at the time of tooth extraction.

Immediate implant placement, defined as the placement of dental implant immediately into fresh extraction socket site after tooth extraction, has been considered a predictable and acceptable procedure (Schwartz *et al.*, 2000). The advantage of immediate implant placement into the extraction sockets over the delayed placement of implants are there is no need to wait for 4–6 months after extraction for the bone to form and crestal bone loss is found to be less in immediately placed implants rather than delayed placed implants.

Hansson *et al.* in 1983 and Ericsson in 2000 have found out that the decreased surgical trauma of immediate placement type will decrease the risk of bone necrosis and permit bone remodeling process to occur, that is, the healing period is rapid and allows the woven bone to be transformed into lamellar bone. The natural socket being rich in periodontal cells and matrix makes the healing faster and more predictable. Small osseous defects, which are frequently found adjacent to implants placed at the time of tooth extraction, can be grafted with autogenous bone obtained from edentulous ridges or other intraoral sites. Clinicians have also used other materials and methods to augment edentulous ridges and small bony defects adjacent to dental implants.

A systematic review by Esposito *et al.* looked at 5 randomized controlled trials of adults with a minimum follow-up of 6 months after loading. They found no significant differences in measured outcomes between one- and two-stage implant placement techniques. Moreover, the development of implant surface characteristics has increased bone-to-implant contact and implant stability at earlier stages in the healing process. Ultimately, the conventional protocol of including a healing period of 6 months for the maxilla and 4 to 6 months for the mandible has been reduced significantly. Some specific implant surface characteristics allowed functional loading 6 weeks after implant placement, which is a major breakthrough in surface technology.

Block and Kent, 1991 summarized the indications as (1) traumatic loss of teeth with a small amount of bone loss, (2) tooth lost because of gross decay without purulent exudates or cellulites, (3) inability to complete endodontic therapy, (4) presence of severe periodontal bone loss without purulent exudates (5) adequate soft tissue health to obtain primary wound closure.

The contraindications are: (1) presence of purulent exudates at the time of extraction, (2) adjacent soft tissue cellulites and granulation tissue, (3) lack of an adequate bone apical to the socket, (4) adverse location of the mandibular neurovascular bundle, maxillary sinus and nasal cavity, (5) poor anatomical configuration of remaining bone.

Immediate implant insertion and repair of a single implant in the esthetic zone has several potential advantages, including shorter overall treatment duration, fewer surgical procedures, less traumatic surgery, and higher patient satisfaction. However, this treatment regimen has few limitations, including difficulty in obtaining implant stability, an increased risk of implant failure, variable soft and hard tissue levels, and the necessity for bone transplants. A temporary restoration on a single implant in the esthetic zone has been recommended for achieving a favorable soft tissue contour, when combined with immediate implant placement. Immediate implant placement and provisionalization can be a reliable treatment technique to replace a hopeless tooth in the esthetic zone if primary implant stability

For a successful treatment outcome, the following criteria should be fulfilled in case of immediate implant placement: (1) the patient should not have any contraindications to treatment, such as systemic diseases (e.g. diabetes), and he should not be consuming any prescription medications or recreational drugs; (2) the buccal and lingual plate of the extraction socket must be present; (3) the teeth adjacent to the extraction socket must be free of overhanging or insufficient restoration margins; (4) the patient most preferably should not use nicotine; and (5) the interradicular septum should be wide and intact following the tooth extraction. Also include implant primary stability, osseointegration, correct prosthetic placement, and esthetics. To obtain initial implant stability, the 3-5- mm-wide implant must be placed into the host bone.

The esthetic zone is very important during treatment planning. The important things to be taken into consideration are: Scallop of periodontium, crestal bone level, smile line, morphology of gingival tissues, proposed inter implant distance, existing occlusal contact relation, and interproximal bone level

II. Case Report

A 32 year old male patient, reported to department of prosthodontic, crown and bridge with chief complaint of missing tooth in upper front tooth region. On further examination, the missing tooth was fractured with root piece intact.

Following a comprehensive medical history, we discovered that the patient was in good physical condition and denied any systematic or allergy disorders that were relevant to dental treatment. He also had no mucosal lesions, no bleeding condition, no tobacco usage, and no substance addiction.

Clinical Examination

Extra-oral: No gross facial asymmetry or swelling was detected. No clicking of TMJ or limitation and no deviation while opening and closing of jaw.

Intra-oral: Hard tissue examination reveal that teeth 21 was missing. Evaluation of edentulous space shows adequate interalveolar space for abutment tooth. There was slight bone defect and labial ridge concavity.

Soft tissue examination shows adequate thickness thick biotype and normal color and texture of oral mucosa. No mucosal lesions, fibrous connective tissue displacement and other abnormalities.

A comprehensive periodontal exam revealed no probing depths greater than 3 mm, and the embrasure spaces between the maxillary incisors were completely filled with interdental papilla. Neither tooth mobility nor percussion/palpation pain was detected in teeth 12 to 22.

Occlusion: The overbite and over-jet were normal. The occlusion was stable.



Figure 1: Pre-operative labial view

Treatment Options

After clinical and radiographic preoperative analysis to assess the patient risk profile for immediate implant placement, four treatment options (immediate implant placement, early implant placement with soft tissue healing, early implant placement with partial bone healing, and late implant placement) were reviewed with the patient. Immediate implant placement followed by tooth supported clear retainer(essix) after tooth extraction was recommended, and the patient accepted the treatment plan.

Treatment

Step 1. Preoperative Examination

Blood pressure and routine blood analysis were evaluated to assess the systemic health condition prior to treatment planning. A proper patient’s history was taken and preoperative CBCT taken.

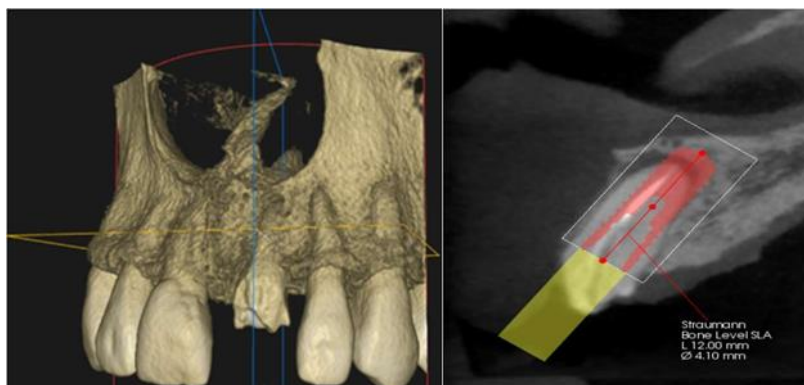


Figure2 Pre-operative CBCT examination

Step 2: Instruction On Oral Hygiene And Scaling

The patient's comprehension of the financial, time, and maintenance requirements was critical, and these commitments had to be made clear to the patient at the outset as well as throughout subsequent appointments. All supragingival and subgingival calculus had to be removed prior to surgery, and a blood screening test was conducted.

Step 2: Surgical Implant Planning

After evaluation of CBCT report, treatment options proposed are immediate implant placement, socket

shield and delayed implant placement. Excluding socket shield technique due to periapical lesion and to obtain quick result delayed implant placement was excluded too.

After detailed analysis and discussion immediate implant placement of dimension 4.2 × 13 mm with bone graft and submerged placement plus delayed loading was planned.

Guidelines as mentioned for immediate implant placement According to Kois, there are five diagnostic keys exist for predictable single-tooth periimplant esthetics when an immediate extraction and implant insertion is contemplated: (1) the tooth position (2) the form of the periodontium, (3) the biotype of the periodontium, (4) the tooth shape, and (5) the position of the osseous crest before extraction.

In this particular case as stated by Buser et.al ,the tooth position was ideal with adequate space for maxillary central incisor, periodontium was healthy although slight periapical radiolucency was observed with buccal and palatal plate completely intacted, thick biotype of periodontium ,tooth shape ideal and the osseous crest was 0.5-1mm below the CEJ level of adjacent right maxillary central incisor, pointed with well defined cortex.

Esthetic parameters that have been defined for conventional dental restorations can also be used for implant patients during preoperative planning. These parameters can help define potential risk factors for esthetic shortcomings. The main esthetic objectives of implant therapy from a surgical point of view are the achievement of a harmonious gingival margin without abrupt changes in tissue height, maintaining intact papillae, and obtaining or preserving a convex contour of the alveolar crest

Step 3: Surgical Procedure

One hour before the surgery, the patient was given 625 mg of Augmentin for surgical prophylaxis to enhance the success rate of the implant . Under local anesthesia, an intrasulcular incision was placed 360° around tooth 21 using a 15C . An anterior periosteal elevator was used to sever the periodontal ligament to facilitate the atraumatic extraction of

21. The tooth was then removed using extraction forceps with controlled rotational force without flap elevation. Extreme care was taken to avoid fracturing the socket walls, especially the buccal plate, so the gingival and bone architecture would be preserved. The external root resorption was also confirmed on the tooth removed . The extraction socket was thoroughly debrided using a serrated excavator to remove any granulation tissue and then irrigated with sterile saline before osteotomy. A periodontal probe was used to confirm the integrity of the socket walls and to verify that the distance from the alveolar crest to the gingival margin was less than 3 to 4 mm as recommended for immediate implant placement. A sharp precision drill (Noris) was used to penetrate the palatal wall of the extraction socket that guided the initial preparation of an osteotomy. The osteotomy was extended about 3 to 5 mm beyond the root apex to ascertain implant primary stability . A periapical radiograph was taken with a twist drill to verify the angulation. A Noris implant of 4*13mm was placed immediately into the fresh extraction socket, and the implant shoulder was positioned at least 3 mm apical to an imaginary line connecting the cemento-enamel junctions of the adjacent teeth.

The primary stability of the implant was confirmed by achieving a torque resistance of 40 Ncm. Osseograft DMBM sterile bioresorbable demineralized bone matrix graft Xenograft- Advanced biotect product limited, Chennai and Periocol-GTR- collagen periodontal membrane (25-30mm) Eucare Pharmaceuticals limited, Chennai was placed in the jumping space between the labial bony wall and the implant and flap closure done by simple interrupted suturing technique using 3-0 non resorbable silk sutures.



Fig3 Extraction of 21

Fig 4 : Extracted tooth

Fig 5: Extracted socket

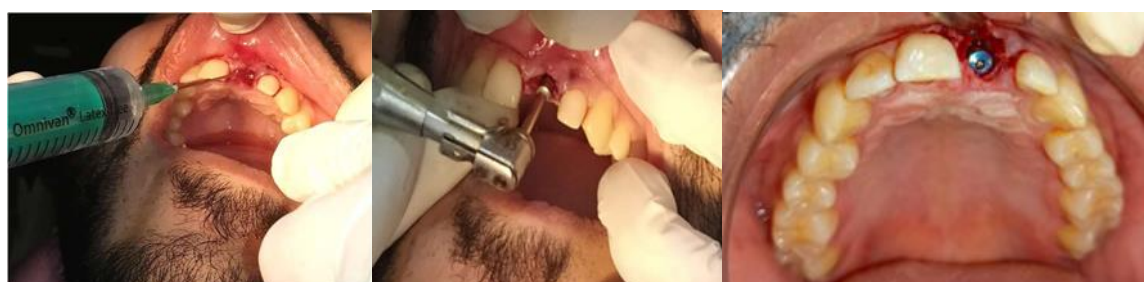


Fig 6: Irrigation of socket fixture

Fig 7: Implant fixture drilling

Fig 8: Placement of implant



Fig 9: Grafting the surgical site Fig10: Flap closur Fig 11: Periapical X-ray After surgery



Fig 12: Healed site

Fig 13: essix retainer

After 10 days suture removal was done and essix appliance was given to patient for esthetic rehabilitation.

Step 4 Stage II Surgical Process

After four months , CBCT evaluation was done and stage II surgery was performed. providing 10 days of transmucosal healing support.

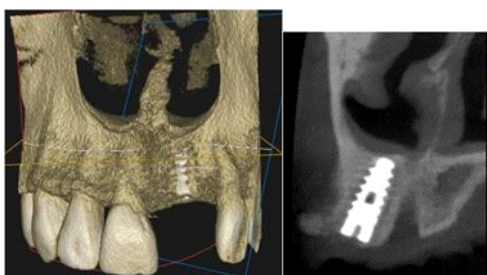


Fig 15: Radiographic evaluation (osseointegrated implant)

Step 5. Impression For The Master Cast

The two-stage impression technique was carried out with the open tray impression technique on rubber-based impression material with a custom tray. After disinfecting the impression, lab analogs were then connected to the impression copings and the master cast was poured with type IV dental stone. In impression, it is necessary to ensure proper fit. A screw retained DMLS print anterior crown with proper shade matching was given to lab for fabrication.



Fig 16: placement of coping



Fig 17: space for impression



Fig 18: Final impression impression

Step 6. Try-In And Cementation

The fabricated crown was tried in the patient's mouth, and the screw retained prosthesis is seated in patient mouth. The patient was prompted to make lateral and protrusive movements with articulating paper, and excursive contacts were removed. The occlusion was checked. The patient was given implant maintenance

instructions, and a week later, a follow-up was performed. Then a radiograph was taken to verify seating of the restoration



Fig 19 Dmls pfm crown ; **Fig 20** Periapical radiograph of implant and abutment connection **Fig 21** final prosthesis intraoral view ; **Fig 22** implant prosthesis restored in patient)

III. Discussion

Immediate implant placement refers to the placement of an implant on the day of tooth extraction and within the same surgical procedure. Wohrle was the first to report the protocol for immediate implant placement and provisionalization in the esthetic zone, which subsequently has been adopted in numerous studies and found to be an excellent treatment modality with high success/survival rate and stable gingival architecture. A systematic review on immediate implant placement indicated that most studies evaluated the success/survival rate and radiographic marginal bone levels around immediate implant placement and provisionalization. However, few studies assessed soft tissue parameters such as proximal papilla levels and facial gingival levels. Lang et al. reported that the estimated 2-year survival rate of implants placed immediately in fresh extraction sockets was 98.4%. Another systemic review conducted by Slagter et al. specifically investigated immediately placed single-tooth implants in the esthetic zone and also found a similar survival rate of 97.1%.

An extraction socket classification system for the maxillary anterior teeth, based on the soft and hard tissue components, was introduced in 2008. According to this classification system, the extraction socket in the present case was graded type I, which was suitable for immediate implant placement. Immediate implant placement and provisionalization in a fresh extraction socket is challenging and requires careful case selection. In general, the soft tissue contour of the extraction socket should closely mimic that of adjacent natural teeth without vertical soft tissue deficiency. Furthermore, the keratinized gingival width on the midbuccal aspect of the socket should be ≥ 2 mm, with a thick gingival biotype (≥ 2 mm). The apical bone beyond the extraction socket should be ≥ 4 mm to achieve primary stability of the implant. The tip of the mesial and distal papillae should lie between the interdental contact and the most coronal extent of interproximal CEJ. In other words, the papilla appearance should be categorized as Class I based on the classification system described by Nordland and Tarnow. Regarding the hard tissue in the fresh extraction socket, the distance between the osseous crest and the gingival margin should be ≤ 3 mm on the midfacial and ≤ 4.5 mm on the proximal aspects. In addition, the distance from the facial bone of the extraction socket to the implant should be ≥ 2 mm to maintain the implant soft tissue profile for ideal esthetics.

In the present case, the implant was positioned at the center of the final restoration with a clearance of ≥ 1.5 mm between the implant fixture and the adjacent teeth to minimize the risk of damaging adjacent natural teeth. Furthermore, the implant was also placed in the cingulum position with ≥ 2 mm between the facial bone and the implant fixture. A recent animal study on dogs suggested a critical buccal bone wall thickness of at least 1.5 mm to compensate for the dimensional changes occurring after implant placement and the progression of peri-implantitis. To obtain a better emergence profile, the implant platform should be located apicocoronally at least 3 mm from the cemento-enamel junction of the adjacent tooth. According to the classification system described by Kan et al. on sagittal root position in relation to the anterior maxillary osseous housing, the sagittal root position in the present case was classified as Class I, where a considerable amount of bone was present on the palatal aspect, indicating a favorable setting for immediate implant placement. About 81% of teeth were classified as Class I in Kan et al.'s study.

Placing the implant in the cingulum position often results in a gap between the implant and the labial cortical plate. Dramatic changes in ridge dimension following tooth extraction have been demonstrated in clinical and histological studies, and bone augmentation has been effective in promoting bone fill and defect resolution at immediate implant sites. Clinical and histologic studies have shown that an esthetic hard tissue contour can be maintained both vertically and horizontally when the implant-socket gap is filled with bone grafting materials. Therefore, the implant-socket gap was filled with freeze-dried bone allograft and the

marginal bone level changes were negligible.

Chu et al. proposed the dual-zone concept where bone grafts were placed in the bone and tissue zones to serve as a scaffold to maintain hard and soft tissue volume and the blood clot to facilitate initial healing . Xenografts were placed in the gap between the implant and buccal bone until the gap was filled to the most coronal aspect of the free gingival margin. The authors suggested that xenograft particles incorporated into the soft tissue when placing the provisional restoration can minimize ridge collapse and increase peri-implant soft tissue thickness . These studies were followed for 6 months to 4 years after delivery of the definitive tooth restoration, and further long-term studies are still needed. In our case, the concept was not utilized at the time of surgery. We placed bone grafts in the gap between the implant fixture and buccal plate but did not fill it all the way up to the soft tissue .

The most challenging goal for implant therapy in the esthetic region is achieving soft and hard tissue stability over time. Midfacial mucosal recession has been one of the most commonly reported complications following immediate implant placement . It has been documented in the literature that anatomic factors associated with midfacial recession following immediate implant placement are the gingival biotype and the width of the keratinized mucosa . More recession has been observed on implants placed in patients with a thin gingival biotype and narrow keratinized mucosa with a width less than 2 mm. A damaged facial bone wall also represents a significant risk factor for midfacial recession. Kan et al. reported that midfacial recessions greater than 1.5 mm were observed one year after immediate implant placement and provisionalization in 8.3% of tooth sockets with a narrow V-shaped facial bony defect exceeding 3 mm despite simultaneous guided bone regeneration and soft tissue grafting . Furthermore, midfacial recession increased to 42.8% and 100% when the bony defect extended wider onto the mesial or distal aspect of the failing tooth (U-shaped) or adjacent teeth (UU-shaped), respectively. Staged reconstruction of unfavorable U- and UU-shaped facial bony defects followed by delayed implant placement was strongly recommended. Additionally, the position of the implant has consistently played an important role in the midfacial mucosal level . Placing implants too buccally has been associated with more recession of the midbuccal mucosa. Immediate implant placement using a flapless approach also demonstrated an average of 0.89 mm less midfacial mucosal recession at 1 year after implant placement compared to open-flap implant placement. Instant provisionalization of immediate single-tooth implants has also been shown to have 0.75 mm less midfacial recession in comparison with delayed restoration after 1 year .

IV. Conclusion

The goal of this case study was to go over the surgical stages involved in rapid implant implantation followed by tooth supported clear essix retainer after tooth extraction. Careful planning and case selection are required to assure implant success with acceptable esthetic outcomes.

Immediate implant placement and provisionalization appear to provide considerable benefits for the cosmetic replacement of anterior teeth. This method preserves physiologic soft and hard tissue architecture, which consistently results in great esthetic outcomes and patient satisfaction. The long-term effectiveness of this method is dependent on achieving primary stability. Extraction with a flapless technique, followed with rapid implant implant placement and provisionalization without functional loading, provides a predictable results.

Details Of Products Used

- Noris implant system with implant dimension as
- Osseograft DMBM sterile bioresorbable demineralized bone matrix graft Xenograft- Advanced biotect product limited, chennai
- Periocol-GTR- collagen periodontal membrane (25-30mm) Eucare Pharmacueticals limited,Chennai

Patient Consent

The patient has given his consent for his images and clinical information. The procedure was carried out with a proper consent from the patient by explaining the treatment.

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