

Implant with Simultaneous Bone Grafting for Replacement of Maxillary Anterior Tooth - A Case Report

Roshna T.

Department of Periodontics, Peoples Dental Academy, People's Campus Bhanpur, Bhopal-462037.

Abstract:

Successful replacement of the lost teeth by means of tissue-integrated implants represents a major advance in dentistry. The bone quality and amount of bone available in anterior maxilla is often variable and commonly there is a deficiency of bone volume. Currently, however, implants are also being placed in sites with ridge defects of various dimensions. The various reconstruction techniques using bone graft, guided bone regeneration, orthognathic surgery or bone distraction provides the surgical specialist with a wide range of treatment options for placing implants in compromised ridges. Appropriate use of these methods will enable the successful treatment of almost any complicated case with bone deficient jaws. This case reports the step-by-step procedures in a case where the missing maxillary left central incisor was restored by placement of implant simultaneous with the use of bone grafting using Hydroxyapatite for the correction of minor dehiscence in the alveolar ridge.

Key Words: Single tooth implant, ridge augmentation, HAP bone grafts, anterior tooth implant.

Introduction:

The rehabilitation of partial or total edentulism with dental implants has long become an accepted treatment in dentistry. The present surge in the use of implants was initiated in 1952 by Branemark who demonstrated that commercially pure titanium implants can be anchored to the jaw bone and used successfully for tooth replacement in edentulous arches. Since then osseointegrated implants have been used widely in dentistry to restore missing teeth. Osseointegration is defined as the direct structural and functional connection between ordered living bone and the surface of a load-carrying implant (Listgarten et al, 1991). Recently, there has been a paradigm shift in periodontics from the philosophy of saving teeth at all costs to one of extracting compromised teeth and replacing them with dental implants for a better and more predictable long-term outcome (Klokkevold, 2006).

The characteristics of the alveolar ridge play an important decisive factor in the success of implant placement. Currently, however, implants are also being placed in sites with ridge defects of various dimensions utilizing the various reconstruction techniques using bone graft, guided bone regeneration (Yeh & Hsu, 2003) orthognathic surgery or bone distraction (Block & Baughman, 2005). Here is the presentation of the step-by-step procedure in a case where the missing maxillary left central incisor was restored by placement

of implant simultaneous with the use of bone grafting for correction of minor dehiscence in the alveolar ridge. A two-stage implant surgery was done wherein the first surgery was for implant insertion and the second surgery, several months later was done for uncovering the implant and attaching a prosthetic abutment (Maiorana & Santoro, 2002).

Case report:

A 19 year old male patient reported to the Department of Periodontics, Government Dental College, Trivandrum, expressing the desire to replace his missing anterior tooth. The tooth 21 was lost following a traumatic injury 9 months before (Fig.I-A). The patient was systemically healthy with good periodontal condition and oral hygiene. Clinical examination revealed the mucosa was firm and resilient with normal thickness. Thickness of the soft tissue was assessed at different points around the planned recipient site using transgingival probing.

Radiographic evaluation showed excellent periodontal condition of the remaining teeth, and there was adequate bone height and mesiodistal width for the placement of the implant. (Fig.I-B) The remaining bone was of good quality with sufficient bone density. The alveolar ridge was of type IV vide classification given by Hammerle et al (2004). The alveolar ridge has undergone substantial bone resorption labially since tooth extraction several months ago. These type of ridges can present with buccal dehiscence defect during placement of implants, which used to be augmented using grafting (Hammerle & Jung, 2008; Kahnberg, 2005).

Corresponding Author: Dr. Roshna T, Reader, Department of Periodontics, Peoples Dental Academy, People's Campus Bhanpur, Bhopal-462037.

Phone No.: 9993587880

E-mail : roshna_t@yahoo.com



(A) Frontal View
 (B) Intraoral periapical radiograph
 Fig.I: (A-B) Pre-operative Photograph.

A two - stage implant surgical procedure (using Frialit-2 implant system) was planned with simultaneous use of bone grafting to cover any dehiscence in the labial aspect that may appear during the placement procedure. After evaluating the clinical and radiographic findings, a stepped-screw implant of 13 mm length and 4.5 mm diameter was considered ideal for the site taking into consideration the fact that the tooth-implant distance should be greater than or equal to 3mm at the site (Quirynen & Lekholm, 2008).

Non-surgical periodontal treatment including scaling and polishing was performed 2 weeks prior to the implant placement surgery. Study models were prepared. Occlusal guiding stents were prepared with clear acrylic.(Fig.II-A). The prefabricated surgical stent was to be used to direct the implant placement in the correct angulation.

Surgical Procedures:

The surgical procedure was performed according to established guidelines for implant placement. (Adell et al, 1985; Lekholm & Jemt, 1989).

a) First surgical stage: After anesthetizing the surgical site using infiltration anesthesia, a full thickness (mucoperiosteal flap) was elevated following a horizontal incision on the palatal aspect of the alveolar ridge.

The flap was reflected to the labial surface to expose the underlying bone. Occusal opening in the prefabricated surgical stent allowed the surgical burs to be placed and angled correctly in the implant recipient site (Fig.II-A). The point of insertion on the bone was marked with the help of a round bur inserted through the occlusal opening of the stent.

This was followed by a the use of a 2mm spiral drill at a bur speed of 800rpm to 1000 rpm with copious irrigation with normal saline. The depth stop of all instruments was placed at 13 mm corresponding to the selected implant length. The 2mm spiral drill was taken

to the predetermined depth followed by a 3 mm spiral drill which enlarged the opening along the angulations determined by the previous spiral drill. The recipient site was prepared to the final diameter (4.5mm) by using sequential drills of successive increase in diameters (Palmer et al, 2002).

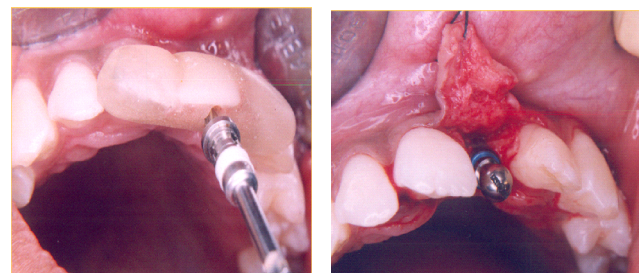
The implant was removed from the sterile packaging and placed in the prepared cavity with finger pressure & a mallet was used to gently tap the inserting instrument and the placement head until the implant fitted snugly and could be rotated into place (Fig.II-B). The placement head was removed and the placement instrument for the implant was inserted into the interhexagon of the implant and the ratchet was placed into position. The implant was established into its final position by three full turns of the ratchet.

After implant insertion, the corresponding color coded covering/healing screw was threaded into position and placement was verified with the surgical stent (Fig.II-C). Cover screws are used to protect the inner aspect of the implant during the healing period and they were placed in level with the surrounding crestal bone.

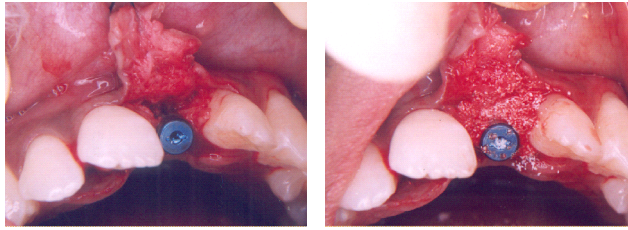
Bone Grafting: A buccal dehiscence defect at the most coronal aspect of the implant exposing a few threads of the implant was noted (Fig.II-C). After decorticating the labial bone with hand instruments, the graft (particulate hydroxyapatite bone graft/ HAP) mixed with blood from the recipient site was placed covering the dehiscence (Fig.II-D). The flap was closed over the graft and implant sutured using interrupted sutures. An immediate pos-toporative radiograph of the surgical site showed correct angulation and bone support around the implant. A temporary restoration was fabricated and used during the transitional period i.e. period of healing.

b) Second surgical stage:

After a healing period of 5 months as advised in the classical Branemark 2 stage submerged protocol (Branemark et al,1969), a tissue punch was used to uncover the implant.

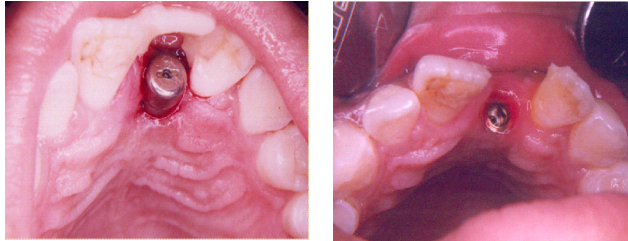


A. Occlusal guiding stent in place B. Placement head in position

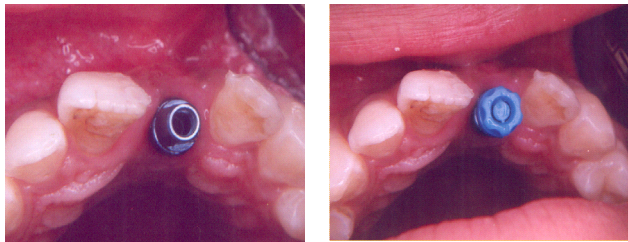


C. Dehiscence defect at the labial bone exposing a few coronal threads. D. Bone graft placed to cover the defect.

Fig. II A-D: First Surgical stage.



A. Gingiva former placed after punching B. Normal healthy marginal tissue contour on removal of the gingiva former



C. Impression coping attached to the implant D. color-coded transfer cap

Fig. III A-D: Second surgical stage.

The titanium covering screw was removed and replaced with a gingiva former which would enable the gingival margin to form properly during the healing period and ensure an ideal emergence profile around the future crown abutment (Fig.III, A-B).

The gingiva former was removed after healing of the gingiva (after 2 weeks) and replaced with a transfer coping, placed with a coping screw used for transferring the position of the implant exactly and reliably to the master model (Fig.III-C). Corresponding color coded transfer cap was placed over the coping (Fig.III-D). This allowed for the better transfer of the impression coping back into the impression.

Making of the impression: Impression was obtained with syringe material around the transfer coping and a heavy body material was placed in the tray for the rest of the dentition. The gingiva former was threaded back into the implant till the seating of the fabricated crown was

to be done. The implant analog was united with the implant coping and secured with fastening screw. A good fit was verified by lining up the flats of the impression coping with the corresponding flats in the impression, the assembly was rotated and snapped into position in the impression and the master cast was poured and sent to the lab for crown fabrication.

The abutment screws were threaded into position in the implant after removing the gingiva former and the final restoration was cemented to the abutment (Fig.IV, A-B). The patient was kept on regular maintenance appointments during which the esthetics & functioning of the restoration was found satisfactory. A one-year postoperative radiograph showed maintenance of adequate bone level and density around the implant (Fig.IV-C).



A. Abutment screwed into position B. Final restoration in place

C. 1 yr post-operative radiograph showing good bone support around the implant



Fig. IV- A-C: Post-operative photographs

Discussion and Conclusion:

Dehiscence defects may range from a very small lack of marginal bone to large areas of denuded implant surfaces. During implant installation surgery, minor fenestration or marginal dehiscence sometimes occurs. Hence some threads of the implants may be exposed (not covered by bone). In most cases, such uncovered threads may be left unattended since no adverse reactions have been observed in the mucosa of such locations (Lekholm et al, 1996). On the other hand, if the jaws contain defects of such a magnitude that the implants cannot be placed in proper position without having major parts of the bone exposed, a ridge

augmentation is often done using guided bone regeneration (GBR) or bone grafting. Here a grafting with particulate hydroxyapatite bone graft/ HAP (Allegrini et al, 2006), was performed to cover the defect and to level the minor deformity in the labial bone. Evaluation of porous HAP as grafting materials in implant sites have shown that porous hydroxyapatite bone graft enhanced bone formation and osseointegration in the augmented sites (Quinones et al, 1997).

As long as the implant can be securely anchored in the existing bone, concomitant implantation and bone regeneration may be performed. Various technique including distraction osteogenesis, guided bone regeneration (Hermann & Buser, 1995) and bone grafting are being employed to assist implantation at the dehiscence sites. The available literature does not provide clear cut guidelines for a situation requiring bone augmentation and a situation without this requirement (Hammerle & Jung, 2008). Simultaneous placement of bone grafts and implants shortens the treatment time without increasing complications or reducing the success rate (Boronat et al, 2010). This case presents the successful restoration of the missing maxillary central incisor in a ridge with dehiscence, performed with two-stage implant surgery and simultaneous bone replacement graft.

Bibliography:

1. Adell R., Lekholm U & Branemark P-I: Surgical Procedures. In: Tissue integrated prosthesis. Osseointegration in clinical dentistry. P-I Branemark, GA Zarb, T Albrektsson, Eds.; 1st Edn.; Quintessence Publication, Chicago, 1985; pp: 211-232.
2. Allegrini SJr, Rumpel E, Kauschke E, Fanghänel J, König B Jr: Hydroxyapatite grafting promotes new bone formation and osseointegration of smooth titanium implants. *Annals of Anatomy*, 2006;188(2):143-151.
3. Block MS, Baughman DG: Reconstruction of severe anterior maxillary defects using distraction osteogenesis, bone grafts and implants. *Journal of Oral and Maxillofacial Surgery*, 2005;63(3):291-297.
4. Boronat A, Carrillo C, Penarrocha M, Penarrocha M: Dental implants placed simultaneously with bone grafts in horizontal defects: a clinical retrospective study with 37 patients. *International Journal of Oral and Maxillofacial Implants*, 2010;25(1):189-196.
5. Branemark P-I, Breine U, Adell R, Hansson BO, Lindstrom J, Ohlsson A. Intra-osseous anchorage of dental prostheses. *Scandinavian Journal of Plastic and Reconstructive Surgery*. 1969; 3:81-100.
6. Hammerle CH, Chen ST, Wilson TG Jr: Consensus statement and recommended clinical procedures regarding the placement of implants in extraction sockets. *International Journal of Oral and Maxillofacial Implants*, 2004;19(Suppl.):26:28.
7. Hammerle CH, Jung RE: Ridge augmentation procedures. In: Clinical Periodontology and Implant Dentistry (Vol.2). J Lindhe, NP Lang, T Karring, Eds.; 5th Edn.; Blackwell Publication Munksgaard, 2008;pp:1090-1092.
8. Hermann JS, Buser D: Guided bone regeneration for dental implants. *Current Opinion in Periodontology*, 1996;3:168-177.
9. Kahnberg K-E: Grafting Procedures. In: Bone Grafting Techniques for Maxillary Implants. K-E Kahnberg, L Rasmusson & G Zellin, Eds.; 1st Edn.; Blackwell Publishing Co., Munksgaard, 2005; pp: 14-23.
10. Klokkevold PR: Oral Implantology. In: Clinical Periodontology. G Newman, H Takei, PR Klokkevold, A Carranza, Eds.; 10th Edn.; W. B. Saunders, Philadelphia, 2006;pp:1071.
11. Lekholm U, Jemt T: Principles for single tooth replacement. In: The Branemark Osseointegrated Implant. T Albrektsson T, GA Zarb, Eds.; 1st Edn.; Quintessence Publishing Co., Chicago, pp:117-126.
12. Lekholm U Sennerby L, Roos J, Becker W: Soft tissue and marginal bone conditions at osseointegrated implants that have exposed threads- A 5 year retrospective study. *International Journal of Oral and Maxillofacial Implants*, 1996;11(5):599-604.
13. Listgarten MA, Lang NP, Schoeder HE, Schroeder A: Periodontal tissues and thier counterpart around endosseous implants. *Clinical Oral Implants Research*, 1991;2(1):1-19.
14. Maiorana C, Santoro F: Maxillary and mandibular bone reconstruction with hip grafts and implants using Frialit-2 implants. *International Journal of Periodontics and Restorative Dentistry*. 2002 ; 22(3):221-229.
15. Palmer RM, Smith BJ, Howe LE, Palmer PJ: Basic factors in implant surgery. In: Implants in Clinical Dentistry. 1st Edn.; Martin Dunitz Ltd, London, 2002;pp: 87-90.
16. Quinones CR, Hurzeler MB, Schüpbachs P, Kirsch A, Blum P, Caffesse RG, Strub JR: Maxillary sinus augmentation using different grafting materials and osseointegrated dental implants in monkeys. Part II. Evaluation of porous hydroxyapatite as a grafting material. *Clinical Oral Implants Research*, 1997; 8(6): 487-496.
17. Quirynen M, Lekholm U: The Surgical Site. In: Clinical Periodontology and Implant Dentistry (Vol. 2). J Lindhe, NP Lang, T karring, Eds.; 5th Edn.; Blackwell Publication, Munksgaard, 2008;pp:1068-1069.
18. Yeh HC, Hsu KW. Guided bone regeneration for fenestration defects in dental implants. *Chang Gung Medical Journal*, 2003 ;26(9):684-9.