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Implant Placement with Guided Bone Regeneration in Maxillary Anterior Esthetic Zone - A Case Report

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Abstract

The replacement of missing maxillary incisors is one of the challenging steps while planning a treatment in a precise manner for individual especially in terms of aesthetic goal. Aesthetically achieving a harmonious gingival contour, maintaining and preserving the intact interdental papillae as well as the preservation of convex contour of alveolar crest is the major objective of implant supported prosthesis. Placement of implant without prosthesis resulting in compromised functional and aesthetic outcome. Guided bone regeneration is one of the most common approaches for enhancement of bone volume GBR is the surgical procedure where bone graft and barrier membrane have been utilized for the reconstruction of the defects around dental implant. The osseous regeneration by GBR depends on migration of osteogenic cells to the bone defect site and elimination of the cells which hinder the osteoblastic activity. This technique is highly successful for the localized augmentation of atrophic jaw or during simultaneous implant placement. The case report presents the surgical aspect of guided bone regeneration and implant placement in maxillary anterior aesthetic zone to augment the deficient buccal bone.

Keywords: Dental Implant, Aesthetic Zone, Guided Bone Regeneration, Augmentation, Bone Graft, Bone Defect.

Introduction

Dental implant devices are placed into edentulous ridges where an appropriate bone width is available to support removable or fixed type dental restorations. The major challenge in implant dentistry is alveolar atrophy which may occurs subsequently to tooth extraction which limits the use of endosseous implants to restore oral function.[1] Clinical and radiographic studies have shown significant alterations to the height and width of the alveolar ridge following tooth

extraction in the maxilla and mandible. Ridge healing patterns following tooth removal result in more rapid bone resorption on the buccal than on the lingual/palatal aspects of the ridge. Horizontal and vertical bone resorption after the tooth loss is usually caused by local injuries such as trauma, poorly fitting restorations, persistent infection and thin bony structure particularly on the buccal plate. The maxillary and mandibular bone resorption patterns after tooth extraction may jeopardize correct implant placement with respect to position and angulation. Clinicians usually encounter with bony deficiencies associated with either anatomic or pathologic conditions resulting in structural, functional, and aesthetic outcomes of implant treatment.[2] Malpositioned implants may affect the emergence profile of the final implant restoration and generate functional and aesthetic problems that would have a negative effect on implant long-term success rate.[3]

Various surgical techniques have been proposed in the literature to correct the bone defect at the facial aspects of specific implant site. Bone augmentation procedures such as guided bone regeneration uses a staged approach to regenerate the enough volume of bone in case of narrow ridges which is the first and foremost prerequisite for implant placement.[4] Guided bone regeneration involved with the application of resorbable or non-resorbable membrane having a primary function of physical barrier and promote the local homeostasis.[5,6] Guided bone regenerative membrane along with bone filler grafting materials act as a scaffold for bone in growth and protection of the augmented bone volume from the resorption. The technique has a benefit effect while placing the dental implant with grafting and barrier membrane in localized bone augmentation, bone volume deficiency, socket preservation cases and in peri-implant defects. Therefore, the present report describes a case of rehabilitation of missing anterior teeth in the maxillary aesthetic zone by means of dental implants using GBR to aid in augmenting the deficient buccal bone.

Case Description

Case 1: A 35 years old female patient presented her maxillary anterior teeth with a history of trauma due to fall nearly10 years back. The patient had a dental history of root canal treatment along with crown restoration w.r.t. maxillary anterior teeth (11,21). The patient was unhappy and wants a replacement with immediate teeth for aesthetic concern. The patient demonstrated good overall periodontal health with good oral hygiene status. Medical history revealed that she was systemically healthy and not under any medications. Patients detailed intraoral and extra oral examination was done. Diagnostic impressions and casts were prepared and patient was motivated for implant prosthesis. In order to plan an immediate implant, a preliminary cone beam computed tomography (CBCT) was prescribed to better evaluate the bone volume of maxillary anterior region. CBCT findings revealed that there was a damage to one or more bone walls and require simultaneous bone augmentation followed by implant placement and surgery was planned after obtaining the written consent from the patient.

Surgical procedure was carried out with atraumatic extraction of 11 and 21 under local anaesthesia and the freshly extracted socket was evaluated for any remnants. Mucogingival flap surgery was performed after the controlled bleeding from the freshly extracted socket by reflecting full thickness mucoperiosteal flap using crestal incision for immediate placement of implant. Osteotomy was performed using sequential drilling (2.2mm, 2.6mm and 3.6mm) following which two implants (Dentium) 3.6 X 12 mm were placed considering buccolingual, mesiodistal and apicocoronal position with proper torque of 40Ncm to gain the primary stability. There was thin facial bone buccal to the implant that might undergo resorption in future Therefore, contour augmentation was done to achieve long term treatment outcome. Apicoectomy and

Corticotomy was performed to improve bone healing by enhancing blood supply to the graft as in the decertification concept.

Bio-Oss Xenogenic graft was placed (combination of 90% bio-Oss granules composed of bovine bone minerals and 10% Porcine collagen) and stabilised by using the guided bone regeneration (GBR) membrane (Creos™ Xenoprotect). Cover screw was placed and primary closure was performed using 5-0 silk sutures. Postoperative medication and instructions were given. Postoperative digital RVG was taken to evaluate the implant placement with respect to 11 and 21. After 10 days implant site was assessed for healing of wound and for suture removal. Patient was recalled for replacing the cover screw with straight abutment with temporary crown. After 16 weeks of healing since implant placement, the temporary crown was removed and abutment level impression was recorded using poly vinyl siloxane for final restoration. Final restoration was cemented using resin modified glass ionomer cement after 20 weeks of implant placement by removing the temporary crown and cleaning the abutment with copious amount of water. The patient was very happy with final aesthetic and functional outcome. Oral hygiene instruction was given to patient and recalled after 3 months for regular checkup.

Case 2: A 62 years old female patient presented her left maxillary anterior teeth (21 and 23) with a history of implant failure thrice a year. The patient had a dental history of multiple restorations, root canal treatment along with crown restoration w.r.t. left maxillary teeth. The patient was unhappy and wants a replacement of missing teeth for aesthetic concern. The patient demonstrated history of periodontitis or genetic predisposition with sufficient oral hygiene status. Medical history revealed that she was systemically healthy and not under any medications. Patients detailed intraoral and extra oral examination was done. Diagnostic impressions and casts were prepared and patient was motivated for implant prosthesis. In order to plan for implant placement, a preliminary cone beam computed tomography (CBCT) was prescribed to better evaluate the bone volume of left maxillary 21 and 23 region. CBCT findings revealed that there was a deficient bone volume in horizontal direction and require simultaneous horizontal bone augmentation followed by implant placement and surgery was planned after obtaining the written consent from the patient.

Surgical procedure was carried out under local anaesthesia and full thickness mucoperiosteal flap was raised using crestal incision for the placement of implant. Osteotomy was performed using sequential drilling (2mm, 2.2mm and 3.5mm) following which two implants (Cowellmedi implant) 3.5 X 12 mm were placed considering buccolingual, mesiodistal and apicocoronal position with proper torque of 40Ncm to gain the primary stability. There was thin facial bone buccal to the implant that might undergo resorption in future Therefore, contour augmentation was done to achieve long term treatment outcome. Bio-Oss Xenogenic graft was placed (combination of 90% bio-Oss granules composed of bovine bone minerals and 10% Porcine collagen) and stabilised by using the guided bone regeneration (GBR) membrane (Creos™ Xenoprotect). Cover screw was placed and primary closure was performed using 5-0 silk sutures. Postoperative medication and instructions were given. Postoperative digital RVG was taken to evaluate the implant placement with respect to 21 and 23. After 10 days implant site was assessed for healing of wound and for suture removal. Patient was recalled for replacing the cover screw with straight abutment with temporary crown. After 16 weeks of healing since implant placement, the temporary crown was removed and abutment level impression was recorded using poly vinyl siloxane for final restoration. Final restoration was cemented using resin modified glass ionomer cement after 20 weeks of implant

placement by removing the temporary crown. The patient was very happy with final aesthetic and functional outcome. Oral hygiene instruction was given to patient and recalled after 3 months for regular checkup.

Discussion

The maxillary anterior zone is considered as the most aesthetic zone both psychological and functional point of view. The rehabilitation with the prosthesis may improve the social as well as quality life of the patient.[7] For the clinician the placement of an implant is one of the major challenges in day-to-day procedure. However, to reach at the goal in terms of aesthetics it can be extremely satisfactory for implantologist. In modern dentistry placement of dental implant and for aesthetic results a through knowledge and precise technique is required. The present case report was carried out to replace the missing tooth in maxillary anterior region to achieve aesthetic success based on important concept of immediate implant placement.

Lazzara in 1989 firstly placed an immediate implant in an extraction socket.[8] The survival rate is high ranging between 93.9% and 100% on immediate loading according to Schwartz-Arad[9] after reviewing the relevant literature. Schropp et al. demonstrated the formation of new bone occurs in extraction socket with immediate placed implants.[10] Immediate placement of an implant decreases the treatment time, enhanced the healing of the soft tissue with more positive outcome for the bone regeneration when used in combination with bone grafts. GBR technique involves the use of membranes as a barrier to epithelial proliferation and as a stimulating environment for osteogenesis allowing tissues to regenerate the bone defect by blocking invasion with unwanted cells. The success of guided bone regeneration techniques is ensured by compliance with the following operatory conditions during surgical procedures (Ehrenfest et al., 2015): sterile operating field; flaps with uniform thickness and adequate vascularization; -minimal salivary contamination of the membrane; -exceeding by 2 - 3 mm of the edges of the defect by the membrane; -the insertion of grafting materials under the space provided by the membrane, within the guided bone regeneration techniques; -adapting the edges of the membrane to the implant site; -primary closure and the absence of tension at the level of the flap.

The present case report revealed preservation and an augmentation in the anterior maxillary region by combining with atraumatic extraction placing a barrier membrane along with apicoectomy and Corticotomy concept to enhance the healing of soft tissue. The gingival area around the dental implant revealed no pathological changes and remained stable without any clinical sign of gingival recession. The demands of the patients were fulfilled based on the aesthetic and function point of view. Therefore, implant placement offered a superior aesthetic result while preserving the adjacent dentition integrity.

Conclusion

To maximize functional and aesthetic results, implants should be placed according to prosthetic needs and design. Due to bone resorption after extraction, ideal placement of implants would be often impossible without bone augmentation technique. Deep knowledge of these techniques will allow the surgeon to properly select the right combination for prosthetic needs and especially for the aesthetic and function of patients. Immediate implant placement after the extraction can be a treatment choice in terms of bone resorption and less working time.

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