

Immediate Extraction and Implant Placement in Compromised Situation: A Case Report

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Abstract: Dental implants are used to replace missing teeth in mandible or maxilla by anchoring to prosthesis which can be used to replace either single tooth or entire dentition and its success primarily depends on the principle of osseointegration. Earlier in 1980's, implant placement and loading was delayed up to 6-12 months for implants to get osseointegrated. But in 1990's, the protocols for implant placement have been modified including its placement in fresh extraction sockets or partially healed alveolar ridges in aesthetics zone.

Immediate implant placement is a treatment option well adopted currently as it has better treatment outcome in terms of being time saving and achieving predictable aesthetics therefore increasing patient satisfaction.

This report presents a case of immediate implant placement in compromised alveolar ridge in terms of loss of edentulous space mesiodistally in right maxillary posterior region which was assessed with various diagnostic modalities available such as radiovisiography (RVG), orthopantomograph (OPG) and cone beam computed tomography (CBCT), that achieved predictable function, aesthetics and caused minimal discomfort to the patient as the number of procedures were reduced and was performed using flapless technique. The advantages and limitations of this technique are also discussed here.

Keywords: Dental implant, immediate implant placement, orthopantomograph, cone beam computed tomography, flapless.

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I. Introduction

The ultimate aim of restorative dentistry is to fabricate a restoration which will help patient to return to its normal function, speech, aesthetics, contour, comfort and health. The ability of dental implant in achieving these goals regardless of disease, atrophy or injury to stomatognathic system makes it a unique treatment modality[1]. Around 40 years ago, the introduction of implant in the field of dentistry changed the idea of treating patient with tooth replacement therapy. Branemark was first to discover that edentulous patient being partial or complete can be treated using machined screws made of commercially pure titanium which osseointegrated with bone to get fix prosthesis[2].

Since then endosseous implants of various size, shape and surface texture are available with success rate of 96.7 percent over 8 years[3]. Earlier it was thought to delay the implant placement and loading up to 6-12 months to allow healing of any pathology involving soft and hard tissue at recipient site and also implant will show better osseointegration[4]. But now, due to advancement in surface technology of implant, understanding of the healing around extraction socket and implant and increased patient expectations with treatment outcome and to decrease time between extraction and final implant supported prosthesis, there is increase in the trend of placing implants immediately[5].

According to the systematic review by Lang et al(2012)[6], based on clinical studies, demonstrated that on an average alveolar ridge undergoes mean reduction of 3.8 mm in horizontal direction and 1.24 mm in vertical direction within six months after tooth extraction. Studying these post extraction resorptive changes could negatively affect bone availability for implant placement, lead to advent of immediate implant placement. First case report of immediate implant placement was described by Schulte and Heimke in 1976 using step threaded tapered polycrystalline aluminium surface coated implant design and later reintroduced by Lazzara 1989[7].

To properly evaluate patients receiving immediate implant, various classification systems have been evolved with time depending on timing of implant placement after tooth extraction as given by Hammerle et al 2004 and Esposito et al 2006[8]. According to him: Type I represents implant placement in fresh extraction sockets, Type II after soft tissue coverage, within 4-8 weeks, Type III within 12-16 weeks and Type IV in healed sockets that is after more than 16 weeks. Wilson and Weber's classification describing soft tissue healing and predictability of guided bone regeneration, Mayfield's classification concerning intervals expressed as time

before placement of implant, currently Chen and colleagues presented a classification system based on morphological, dimensional and histological changes occurring following tooth loss[9].

The primary rationale of immediate implant placement according to studies performed by Sennerby and Becker 2005[10], has shown that it achieves and maintains high degree of primary stability of average 62 ISQ which increases to 64 ISQ within 4-6 months of healing interval. The increase in stability occurs because of bone to implant healing begins immediately with extraction site healing there fore increase in stiffness at bone-implant interface and also by engaging either to pristine bone of length 3-5 mm beyond apex of affected tooth or by engaging lateral socket walls[11].

Other benefits include reduced morbidity, decreased alveolar bone resorption, preservation of hard and soft tissue and papilla in aesthetics zone, reduced treatment time and cost, shorter healing phase, decrease in number of procedures, also with socket as guide one can more accurately determine parallelism and correct alignment relative to adjacent and opposing residual dentition[12]. The potential disadvantages include increased risk of infection and associated failures if socket becomes infected, horizontal defect depth or jumping distance that is mismatch between socket wall and implant surface since tooth roots do not have regular circular shape[13].

The indications for immediate placement include retained deciduous tooth or its root, fractured tooth, teeth with deep dental caries, endodontic failure tooth, poor aesthetics, pre molars represent sites with favorable indication due to their anatomical position and low aesthetic demands, also preferred for single rooted tooth or in multi rooted tooth with good width of interradicular bone or else it will compromise the positioning of final prosthesis[14].

The contraindications include acute/chronic periapical inflammation (presents as absolute contraindication), socket- implant discrepancy of more than 5 mm (bone regeneration or delayed implant placement should be chosen in such cases), labial bone dehiscence or fenestration, insufficient periapical bone to attain initial stability, systemic factors such as smoking and large bulbous roots[16].

With advent of cone beam computed tomography allowing 3D view of implant site, assessment of availability of the bone in terms of quantity and quality. Flapless surgery can be a predictable option involving tissue punch to gain access to alveolar ridge for its placement and also to evaluate correct alignment of implant without jeopardizing the periodontium.

II. Case Discussion

A 19 year old female reported to our department with the chief complaint of missing tooth 14 (right upper first premolar). According to the patient, tooth was lost as a result of fracture following decay. After patient evaluation which included oral examinations, radiographic assessment and articulated diagnostic model, treatment options of fixed partial denture and implant supported prosthesis were discussed with patient. She agreed for implant supported prosthesis as it is a conservative approach.

The following things were taken into consideration like age, medical status and concurrent drug therapy. Patient was non smoker. Intraoral examination showed that she had good gingival and periodontal health (Fig. 1a and b). Radiographic assessment including RVG and OPG showed submerged root stump in the region of 14 (Fig. 2 a, b and c). The residual ridge was covered with healthy keratinized mucosa, was sufficient buccopalatally but compromised mesiodistally. Therefore, decided to undergo for CBCT examination as well. Following data were found: height of alveolar bone from crest to nasal floor was 16.2 mm, depth of mucosa over bone was 2.5 mm, buccopalatal width at crest for 7.4 mm, mesiodistal was 6.8 mm and the bone quality was Type 3 (thinner cortical layer with fine trabeculea) according to Lekholm and Zarb. Length of root stump was 7.6 mm; mesiodistal width of the root at crest level was 4.7 mm (Fig. 3 a and b). After evaluating these data it was decided to place standard size diameter root form implant 3.75 into 11 mm, Genesis Dental Implant System by flapless surgical procedure.

The position and angulation provided by surgical stent was checked using RVG (Fig. 4).

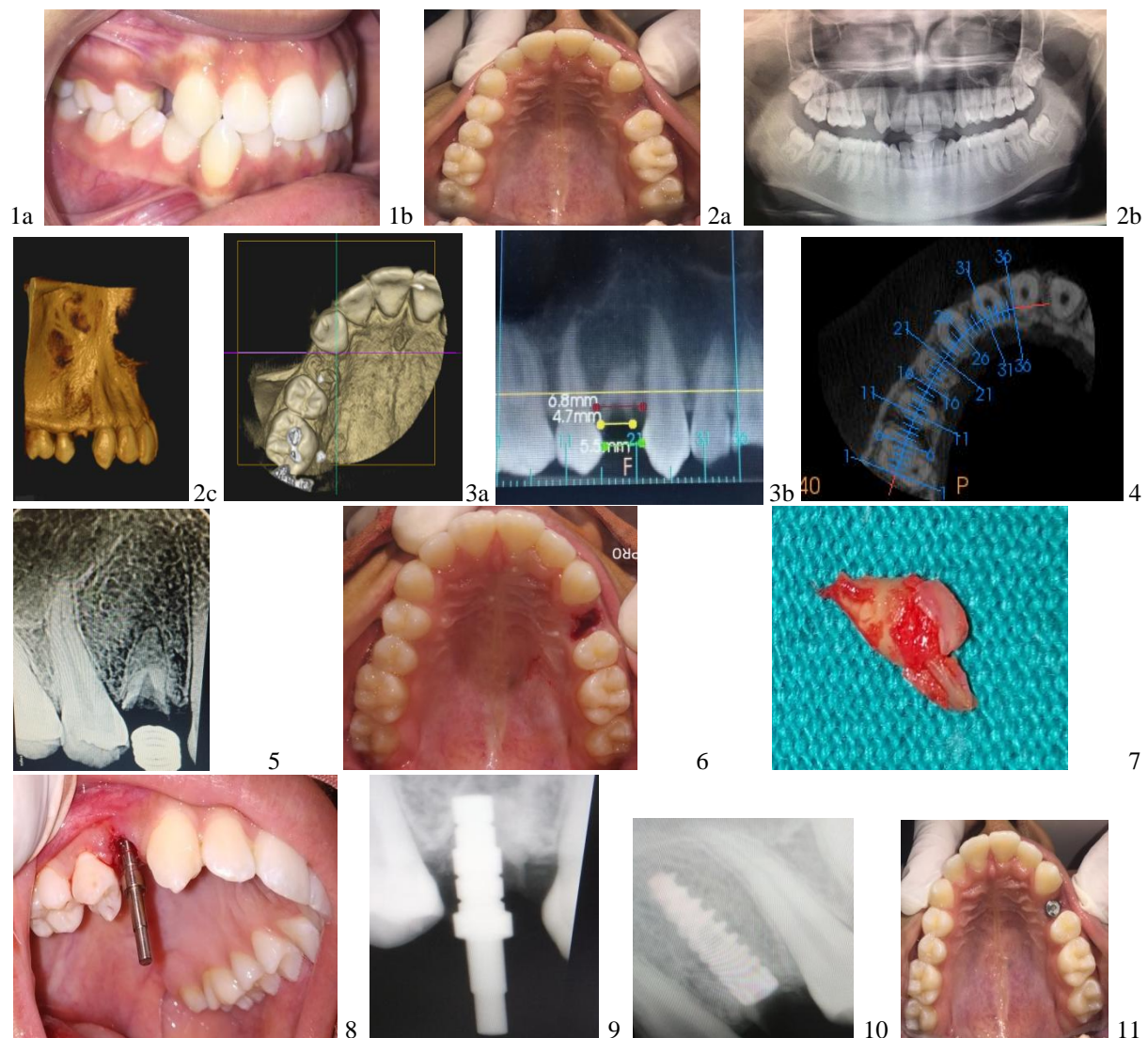
Following administration of local anesthesia, the tooth in question was extracted carefully and atraumatically with periosteal elevator along proximal surface of tooth root causing minimal trauma to bone to prevent fracture of buccal cortical plate and surrounding soft tissue. After luxation of root stump, force of anatomical design was used to rotate tooth to retrieve root from socket

(Fig. 5, 6).Surgical stent was placed and pilot drill was used along palatal wall directed towards exact apex under copious irrigation to get the decided orientation and angulation of implant. This direction avoided implant to rest against thin buccal plate leading to resorption. The horizontal defect depth here was less than 2 mm therefore there was no need for bone graft.

Final osteotomy site was prepared following standard protocols of sequential drilling. The proper angulation and depth of osteotomy was evaluated with depth gauge and RVG (Fig. 7, 8). Implant was placed with final torque of 45N/cm² using torque measuring wrench. Primary stability was checked by having no mobility on palpation. Cover screw was placed to achieve marginal level of implant flushing with buccal bone crest (Fig. 9). Post surgical instructions were given to control postoperative pain and infection (amoxicillin 500mg TDS/ Ibuprofen 400mg TDS were prescribed for 3 days). The patient was recalled after 2 days for checkup.

2nd stage surgery was performed after 3 months to remove cover screw and gingival former having 3mm gingival collar height was placed. After 1 week, gingival former was removed; smooth healthy gingival cuff was formed around implant (Fig. 10). There were no signs of pain or tenderness. Definitive impression was made using rubber base impression material (President: The Original, polyvinylsiloxane elastomeric) after placement of impression post using close tray technique (Fig. 11, 12). Final prosthesis was provided with good esthetics and functional results to satisfy patient's need (Fig. 13, 14 and 15).

III. Figures



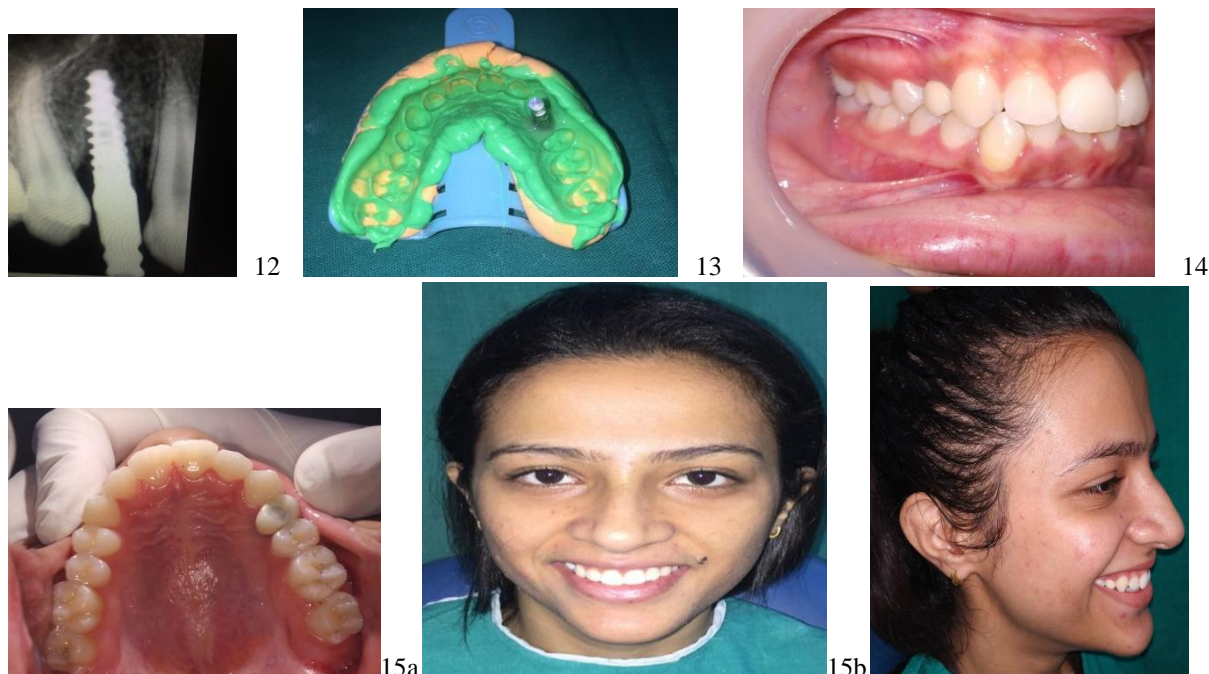


FIGURE 1- Intraoral (a) right lateral and (b) occlusal view. FIGURE 2 (a) Preoperative orthopantomogram and (b,c)- CBCT showing root stump in the region of 14. FIGURE 3 (a, b)- showing measurements done using CBCT. FIGURE 4 -showing RVG of stent placed intraoperatively. FIGURE 5 -showing punch incision for atraumatic extraction of root stump removal. FIGURE 6- root stump of 14. FIGURE 7 and 8-verification and RVG of osteotomy clinically and radiographically to verify position and angulation of osteotomy site. FIGURE 9- RVG of implant after placement. FIGURE 10-showing gingival cuff formed around implant after 1 week of placement of healing. FIGURE 11 and 12- showing RVG impression coping and retrieval of impression. FIGURE 13 and 14- intraoral view of final prosthesis. FIGURE 15 a and b- showing before and after pictures of patient.

IV. Discussion

Traditionally implant placement timing has varied time to time after extraction of tooth. Immediate implant placement is an alternative treatment option of single sitting extraction of teeth and allowing implant placement, it serves the purpose of being safe, predictable, cost and time effective option to patient.

In the recent study of Paolantonio[16], has suggested placement of implant as early as possible to preserve the alveolar anatomy and maintain bone crest structure.

In Meta analysis done by Ignacio Sanz et al, showed that there is bone gain and decrease bone loss in immediate placement compared to implant placed in healed bone. Immediate implant placement not only preserves height and width of bone but also provides enough keratinized mucosa for successful bone augmentation procedure while implant placement. Several studies have also shown that bone augmentation using bone grafts might enhance bone remodeling process around immediate implant placement, therefore increasing its survival rate[17].

The factors which determine good prognosis of immediate implant placement is primary stability, crestal bone changes around it, platform switching which decreases bone loss around implant, loading time, one or two stage placement, number of remaining bony walls after extraction gap between socket walls and implant[18].

Various studies have provided evidence that if horizontal defect depth is less than 2 mm, a graft is not required for implant osseointegration (Paolantonio and Chen 2004), therefore it could heal without any graft or barrier in nonsubmerged approach (Botticelli and Chen 2007) therefore tapered implants are chosen in order to decrease distance between implant and socket wall to increase primary stability. Also nonsubmerged implant show less changes in keratinized tissue height then submerged implant[19]. In this case also, horizontal defect depth was less than 2 mm therefore there was no need of bone graft.

Surgeons must also determine whether an adequate volume of good quality of soft tissue should remain surrounding implant to gain better function and aesthetics therefore preoperative try in of surgical template can facilitate evaluation of quality, quantity and position of existing keratinized tissue related to planned implant emergence by determining whether thickness of keratinized tissue will remain to get stable periimplant region after tissue punch[20].

Correct 3D positioning of an implant is very crucial or else it may lead to incorrect restoration implant alignment, if placed too far buccally, chances of recession of mucosal margin increases, or if placed too far palatally, it may lead to poor emergence profile. Also incorrect mesiodistal position can affect papilla shape and size leading to poor embrasure form, coronal malposition can also lead to biological complications[21].

In this case, position of implant was verified using surgical template and all rules of soft tissue were followed such as implant was placed 3mm below facial gingival margin in apicocoronal direction to allow formation of biologic width, 1-2 mm palatally in buccopalatal direction and minimum of 1.5 mm gap was present between implant and adjacent tooth[22].

The selected implant was 4 mm greater in length than tooth socket, threaded, roughened surface providing predictable osseointegration and initial stability was achieved by engaging lateral walls and bone apical to original socket dimensions, in either of these situations, at least 1-3 threads of implants should come in contact with bone.

Analysis has also shown that decreased crestal bone loss around immediate implant placement compared to implant placed in healed socket. Crestal bone loss can increase the chances of midfacial recession and papillary loss with display of grey hue beneath implant. Flapless techniques should be employed specially in cases of immediate implant placement in aesthetic zone where there is favorable attached gingiva and site has been assessed well with radiographs. According to Comeleni, soft tissue recession around immediate implant placement is 0.75 mm with flap and 0.55 mm in flapless (Kan et al). To reduce risk of midfacial soft tissue recession in immediate implant placement, only cases with intact facial bone and medium to thick soft tissue biotype be chosen[23].

The flapless technique preserves vascular supply of underlying bone to prevent marginal bone loss of tissue recession, therefore leaving intact periosteum on buccal and palatal aspect of alveolar ridge, leading to fewer postoperative complications such as swelling and pain, decreased intra operative bleeding, avoid need for suturing, improve patient comfort, allowing patient to resume normal oral hygiene procedures immediately. But it has its own limitations by not allowing surgeon to visualize anatomical landmarks, vital structures and bony contour[24].

Immediate implant placement is technically challenging and should be undertaken after careful evaluation and planning both surgically and prosthodontically.

V. Conclusion

Immediate implant placement provides various advantages such as decreased treatment time, hastens healing phase, number of visits are reduced, improved patient compliance, preservation of soft & hard tissue architecture providing optimum esthetics and function, also flapless technique can be used which has its own benefits of reduced bone loss due to improved vascularity. This procedure also has its own limitations but when carefully executed at proper and planned situation, this protocol provides predictable and better treatment outcome and patient satisfaction.

Abbreviations

RVG: RadioVisioGraphy, OPG: Orthopantomograph, CBCT: Cone Beam Computed Tomography

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