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Restoration of Maxillary Anterior Teeth with Immediate Implant Placement Into Extraction Sites: A Case Report

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Abstract: *Immediate implants are positioned in the course of surgical extraction of the tooth to be replaced. The percentage success of such procedures varies among authors from 92.7-98.0%. The main indication of immediate implantation is the replacement of teeth with pathologies not amenable to treatment. Its advantages with respect to delayed implantation include reduced post-extraction alveolar bone resorption, a shortening of the rehabilitation treatment time, and the avoidance of a second surgical intervention. Recently, implants are placed at the time of extraction of the tooth, or soon after, before significant bone resorption occurs, known as immediate implants. This case report describes a case of immediate implant placed in a maxillary central incisor followed by evaluation of soft and hard tissue changes occurring during post-operative period followed by discussion of advantages and disadvantages of immediate implant.*

Keywords: *Immediate implant placement, atraumatic extraction, fresh extraction sockets, primary stability, osseointegration,*

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I. Introduction

Immediate implants are defined as the placement of implants in the course of surgical extraction of the teeth to be replaced (1). The insertion of implants immediately after extraction is not new, and in the eighties the University of Tübingen advocated the procedure as the technique of choice for Tübingen and München ceramic implants (2). As a result of the success of the protocol designed by Brånemark and his team for their dental implant system, other procedures were largely relegated for many years. Initially, a healing period of 9-12 months was advised between tooth extraction and implant placement (3). Nevertheless, as a result of continued research, a number of the concepts contained in the Brånemark protocol and previously regarded as axiomatic - such as the submerged technique concept, delayed loading, machined titanium surface, etc. - have since been revised and improved upon even by the actual creators of the procedure. Based on the time elapsed between extraction and implantation, the following classification has been established relating the receptor zone to the required therapeutic approach (1,4):

(a) **Immediate implantation**, when the remnant bone suffices to ensure primary stability of the implant, which is inserted in the course of surgical extraction of the tooth to be replaced (primary immediate implants). (b**) Recent implantation**, when approximately 6-8 weeks have elapsed from extraction to implantation - a time during which the soft tissues heal, allowing adequate mucogingival covering of the alveolus (secondary immediate implants).

(c**) Delayed implantation**, when the receptor zone is not optimum for either immediate or recent implantation. Bone promotion is first carried out with bone grafts and/or barrier membranes, followed approximately 6 months later by implant positioning (delayed implants).

(d) **Mature implantation**, when over 9 months have elapsed from extraction to implantation. Mature bone is found in such situations.

Studies in dogs and primates have shown that implants positioned immediately after extraction can undergo osseointegration, with good surface bone adaptation and without clinically apparent mobility (5). Karabuda et al. (6), in a histological and morphometric study in canine mandibles, recorded 62.4% bone contact in hydroxyapatite-coated implants, versus 51.3% contact in titanium plasma-sprayed (TPS)-surface implants, after 8 weeks. Wilson et al. (7), in a histological study of a deceased patient, noted good osseointegration of immediate implants, as determined 6 months after implantation. Cornelini et al. (8) in turn carried out a clinical and histological study of a non-submerged immediate implant which 8 months after placement was found to cause discomfort requiring explantation. The corresponding histological evaluation revealed an important percentage of bone-implant contact. Block and Kent (9) confirmed good clinical results with immediate implants - posterior studies reflecting percentage successes of between 92.7% (10) and 98.0% (11). Grunder et

al. (12) observed no significant differences in long-term success between immediate (92.4%) and delayed implants (94.7%). Mean bone resorption in immediate upper maxillary implants was found to be 0.8 mm yearly, versus 0.5 mm in the lower jaw. According to these authors, an increased failure rate was only obtained when immediate implantation was carried out after extracting teeth due to periodontal disease.

In contrast, according to Tolman and Keller (13), immediate implantation affords a lesser success rate when compared with implants positioned in mature bone. Nevertheless, in a study published by Schwart-Arad et al. (14) involving 380 implants, of which 31% were immediate, the cumulative survival rate after 5 years was seen to be 96% and 89.4% for immediate and non-immediate implantation, respectively. Four important factors are to be considered for closure over immediate implants (1) Position and width of attached gingiva, (2) Configuration and level of the gingival margin, (3) Buccal contour/volume of alveolar process,, and (4) Shape and size of the interdental papilla. The following techniques have been reported in the literature to achieve closure over immediate implants are coronally repositioned flap, free gingival graft, subepithelial connective tissue graft, pedicle island flap, pedicle palatal flap, and membranes.Immediate implantation has provided implant dentistry the opportunity to achieve better and faster functional results and a predictable treatment strategy with a very high-rate of success followed by reduction of treatment time, prevention of bone resorption, and preservation of alveolar ridge in terms of height and width. In order to, provide these benefits to the patient, immediate implant were placed.

Indications Of Immediate Implantation

Primary implantation is fundamentally indicated for replacing teeth with pathologies not amenable to treatment, such as caries or fractures. Immediate implants are also indicated simultaneous to the removal of impacted canines and temporal teeth (15,16). Immediate implantation can be carried out on extracting teeth with chronic apical lesions which are not likely to improve with endodontic treatment and apical surgery (17). Novaes et al. (18), in a study in dogs, inserted immediate implants in locations with chronic periapical infection. These authors reported good results and pointed out that despite evident signs of periapical disease, implant placement is not contraindicated if pre- and postoperative antibiotic coverage is provided and adequate cleaning of the alveolar bed is ensured prior to implantation. While immediate implantation can be indicated in parallel to the extraction of teeth with serious periodontal problems (17), Ibbott et al. reported a case involving an acute periodontal abscess associated with immediate implant placement, in a patient in the maintenance phase (19).

Contraindications

The existence of an acute periapical inflammatory process constitutes an absolute contraindication to immediate implantation (16,18,19,20,21).

Advantages

One of the advantages of immediate implantation is that post-extraction alveolar process resorption is reduced (22-24), thus affording improved functional and esthetic results (25,26).

Figure1: atraumatic extraction of 11 using periotomes

Figure2: showing the 19 mm length of socket.

Another advantage is represented by a shortening in treatment time, since with immediate placement it is not necessary to wait 6-9 months for healing and bone neoformation of the socket bed to take place. Patient acceptance of this advantage is good (22,23), and psychological stress is avoided by suppressing the need for repeat surgery for implantation (24,25,26). Preservation of the vestibular cortical component allows precise implant placement, improves the prosthetic emergence profile, and moreover preserves the morphology of the peri-implant soft tissues (27) - thereby affording improved esthetic-prosthetic performance One inconvenience of immediate implant placement is the more frequent need for tissue regeneration and bone promoting techniques. The application of bone grafts and/or barrier membranes to the defect created by the socket-implant discrepancy contributes to increase the complexity and cost of treatment (28). In general terms, the placement of membranes requires the raising of flaps to cover the latter - a circumstance that may lead to problems such as disappearance of the interdental papillae and the development of peri-implant mucositis over these non-keratinized displaced tissues. The possibility of membrane exposure and subjacent infection produces antiesthetic sequelae, and places implant viability at risk (29).

Disadvantages

The disadvantages are the ideal modality for the treatment of marginal voids is subject to considerable controversy, the additional cost of associated grafting and use of barrier membrane offsets the perceived advantage that the cost is lower due to a lesser number of surgeries, more extensive soft tissue manipulation is required if the submerged healing protocol for immediate implants is to be used and also the procedure may be technically more demanding.

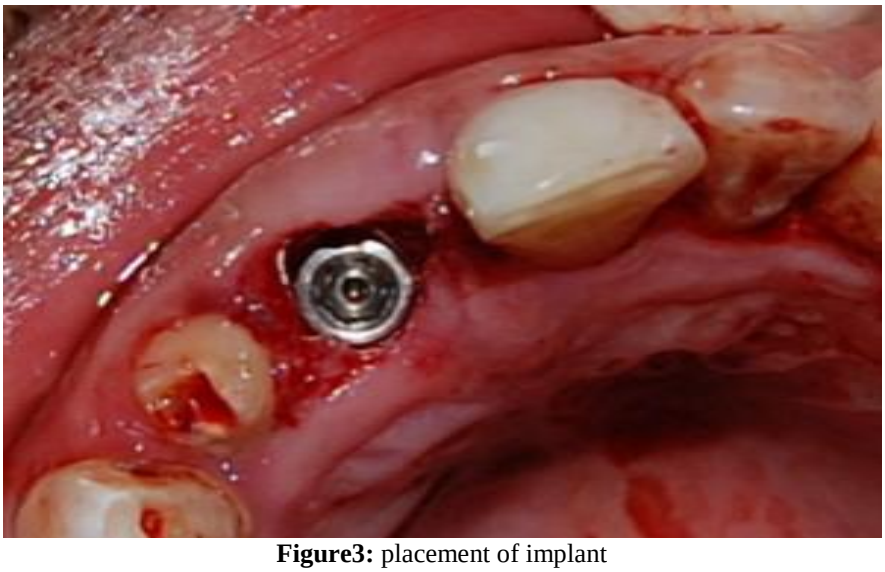

Figure3: placement of implant

This case report describes a case of immediate implant placed in a maxillary central incisor followed by evaluation of soft and hard tissue changes occurring during post-operative period followed by discussion of advantages and disadvantages of immediate implant.

II. Case Report

A 42 years old female patient in good health, reported to my private clinic . The patient's complaint was broken tooth in the upper front tooth region since 3 years and wanted replacement of the tooth. On probing the dental history, patient revealed that she met with an accident and her broke. No relevant medical history was obtained. Pre-operative IOPA was taken to assess the bone levels irt 11.Informed consent was obtained. The patient was scheduled for surgery and prescribed Amoxycillin 500 mg T.I.D 1 day preoperatively. The extraction was performed under local anesthesia using periotomes with appropriate precautions to ensure that the labial plate of bone was not traumatized (Figure 1).

Figure2 shows the extracted root stump of 11 with intact root following which the extraction socket was carefully examined for dehiscences and fenestrations and measurement of extraction socket was done which were 6 mm in width and 19 mm in height as shown . After careful inspection of the extraction socket, the walls are thoroughly debrided. The extraction socket was assessed using the Socket Seal classification developed by Krauser and Hahn (2004) who describes the extent to which an implant fills the extraction socket.**[6]** The extraction socket was classified as Grade II where particulate grafts are to be used to fill the void between socket and implant and using Extraction Defect Sounding classification by Caplanis et al (2004), it was assessed to be EDS-1 where ideal soft tissue was predictable and gingival biotype was thick and was ready for immediate implantation into the socket. **Figure3[**

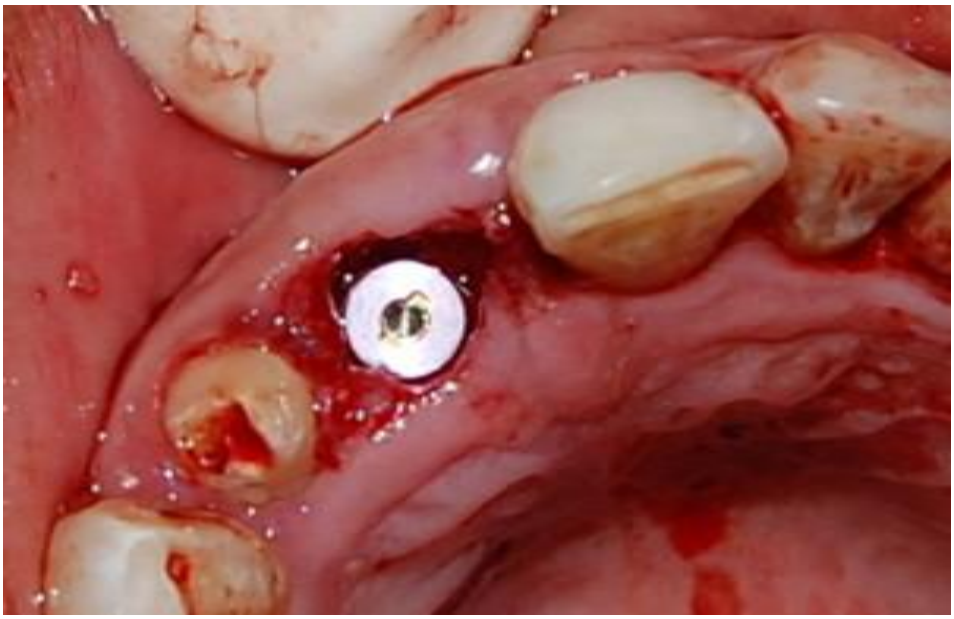

Figure4: placement of bone graft

A tapered self-thread implant of 4.3 mm diameter and 15 mm length (Uniti implants from Equinox, Holland) was placed after drilling an osteotomy along the palatal wall of the socket and and the drill should be extended 3 mm beyond the apex of the socket to ensure palatal orientation of the implant .There should not be any contact between the implant and the labial bone plate. **Figure4**The implant must be stable within the osteotomy with no mobility. A study done by Kohal et al have shown that the pressure of the implant on the bony walls of the alveolus can result in microfractures and early crestal bone loss.**[8]** Torque resistance of 40 Newton centimeters is indicative of initial implant stability. Excessive torque should not be applied to the implant because this may strip the implant threads or exert excessive compression on the adjacent bone, potentially leading to compression necrosis and implant failure.**[9]** The ideal situation would be for the implant to be in contact with the socket without putting undue pressure on the socket walls unless the alveolus is very thick, leaving no gap between the head or neck of the implant and surrounding socket walls. In other words, the radiographic appearance of an ideal immediate implant placement should look identical to a standard implant placement **Figure5**.

Studies have shown that close adaptation of the implant to the socket wall promotes greater osseointegration.**[10,11]** When a gap exists between the socket wall and the implant fixture, a bone graft and/or

membrane can be used to prevent epithelial migration into the space and aid in healing. As there was a gap of about 2 mm between the implant crest and the labial plate as shown (Figure 5 and 6), it was decided to use Sybograft-Plus (Eucare pharmaceuticals , India) to fill the gap. Primary closure was achieved by interrupted 4/0 silk sutures and the patient was asked to continue amoxicillin 500 mg TDS for 1 week and to use chlorhexidine mouthwash for the next 3 weeks. Sutures were removed after 2 weeks.

Figure5:the occlusal view of the implant placed.

The immediate postoperative period was uneventful and the patient returned after 4 months for the definitive implant restoration. Stage II surgery was done to uncover the implant. The implant was found to be stable to hand tightening of the healing abutment. A Platform switch was performed using a standard abutment of the 3.5 mm platform as shown (Figure 7) and the occlusal view of the abutment is also shown (Figure 6) to assess the proximity to adjacent tooth.

Using a closed tray impression technique, the impression was made and sent it to laboratory for making final restoration. A week later, final crown was seated and checked by taking IOPA to evaluate the exact fit between implant and abutment so as to avoid micro-gap as shown (Figure 9 and 10). Recall appointments were made 3 months after insertion of final restoration and the necessary clinical and radiological findings were assessed at regular intervals so as to monitor the implant **Figure7**

Discussion

The correct implant position is crucial for long-term success, and is both a surgical and a prosthetic parameter. No matter how well implants are inserted, grafted or osseointegrated, if the angulation and position are not beneficial for the prosthesis, the outcome will be neither aesthetic nor durable.[16 ,16,17,18,19] The clinician must first decide where to place the abutment and decide upon the emergence profile before he performs the surgical part. As implantology becomes an increasingly important treatment option, osseointegration and a firm bite, as well as functional stability, aesthetic and long-lasting results, are more frequently demanded by the patients.[16,17,18,19]

Figure6: the final prosthesis

A crucial question has to be asked: now that aesthetics is becoming increasingly important, how much sense do conservative treatments make in cases such as the one described here? Is it better to extract a tooth causing ongoing problems at the right time, rather than trying to preserve it and losing bone and soft tissue? When we wait for too long, we lose bone and soft-tissue aesthetics and limit our implantological treatment options. In this case, extracting the tooth was the correct choice, as was placing the implant immediately. Seeking to influence bone remodelling by augmentation was also a good decision. Using an all-in-one abutment as a cover screw and scaffold for the soft tissue was also the only way to achieve an aesthetic outcome.[4,20,21,22,23,24]

All these aspects, as well as correct positioning, prosthesis and recall, are factors that must be planned before surgery. Reverse planning is very important. If the planning is correctly structured, the surgical part entails only a drill sequence, especially when using computer guidance. Patients do not only want to eat with their teeth, but they want them to look good for a long time. This can only be achieved if we choose the right system for each patient, customise our operating protocol according to each individual situation, decide first where we want to place the abutment for perfect prosthetics and then manipulate the soft tissue without a scalpel. We can preserve the crestal bone by both adequate surgical bone treatments and soft tissue.[25,26,27,28,29] In preceding case report, the concerned teeth was extracted atraumatically using periotomes so as to avoid the fracture of labial plate of alveolar bone .Clinical research

Figure7: OPA of implant to evaluate the fit between abutment and implant.

Support these suggestions; the immediate placement of implants into fresh extraction sockets has proven as successful as the original protocol as to implant survival. **[15,16,17,18]** Furthermore, clinical radiographic and histologic data has shown no significant difference between immediate and delayed implant placement Frequently, when implants were placed into extraction socket, a partial incongruency between the outer surface of the implant and the bony walls of the socket is often seen. This space is known as jumping distance or critical space. **[19]** There is strong evidence to suggest that bone augmentation procedures are effective in promoting bone fill and defect resolution in peri-implant defects with both surgical approaches—immediate (type 1) and early (type 2) placement.**[20]** A human histologic study confirmed that spontaneous bone regeneration occurred in experimental peri-implant defects that were less than 2 mm in width, and that the newly regenerated bone became integrated with the previously exposed implant surface.**[30,31]** There is evidence to show that peri-implant defects with gaps of less than 2 mm following type 1 and type 2 implant placement may heal with spontaneous bone regeneration and defect resolution. However, gaps of 2 mm or more in the orofacial dimension show clearly reduced predictability for spontaneous bone regeneration. [30] Schwartz and Chausa discussed the protocol of immediate implants as shown below. 1. Immediate implants have a high-rate of survival, ranging from 93.9 to 100%. 2. Implants must be placed 3 to 5 mm beyond the apex to achieve maximum initial stability. 3. Implants must be placed as close to the alveolar crest as possible (0 to 3 mm). 4. The use of a membrane does not imply better results 5. There is no consensus regarding gap filling or the best grafting material. 6. The absolute need for primary closure is to be established. **[32]**

Each technique works well within its specific range of indication. The correct decision with regard to which technique to use, when and for which patient is the key to success. In addition, collaboration between surgeon, prosthetic specialist and technician is necessary to achieve the desired result.

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