

Immediate Implant Placement And Restoration With Natural Tooth In The Maxillary Central Incisor: A Clinical Report

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Abstract: Anterior tooth loss and restoration in the esthetic zone is a common challenge in dentistry today. The prominent visibility of the area can be especially distressing to the patient and requires a timely and esthetically pleasing solution. Immediate single-tooth implantation followed by immediate provisionalization is becoming an increasingly desirable treatment that offers numerous benefits over conventional delayed loading. Provisionalization for immediately-placed implants using the patient's existing tooth can enhance the final aesthetic outcome if certain steps are followed. If the natural tooth is intact and can be used as a provisional, the emergence profile can be very similar to the preoperative condition. This article outlines a technique to use the patient's natural tooth after extraction to provisionalize an implant.

Keywords: Dental implant, immediate, natural tooth, immediate restoration

I. Introduction

The loss of a tooth in the anterior aesthetic region as a result of periodontal disease, trauma, endodontic failure, or root resorption can be a traumatic experience for a patient. Traditional implant therapy often required 2 to 3 months of alveolar ridge remodeling after tooth extraction and an additional 6 months of non-loaded healing for implant osseointegration to be successful.[1] Aesthetic single-tooth implant placement using a traditional two-stage surgery has been well-documented in the literature. Many complications can occur during the healing phase, such as loss of papilla as a result of flap elevation or blunting of the papilla caused by provisionalization with a removable appliance that is not stable. Bone and gingival tissue loss after maxillary anterior tooth extraction and implant surgery may present additional aesthetic challenges.[2] Clinical and histologic studies have demonstrated that non-submerged implants osseointegrate as well as submerged implants and function comparably under load over extended periods.

Osseointegrated dental implants have traditionally been placed in accordance with the Bränemark's two stage protocol. Implants were submerged and left to heal for a period of 3 to 4 months in mandible and 6 to 8 months in maxilla.[1] This meant that patients had to wait a significant time before prosthesis placement and often had to wear suboptimal provisional prostheses. Initial attempts to load the implant earlier were associated with increased failure rates.[2,3] But with the many advances being made in the field of implantology, implants can now be successfully loaded early or immediately in selected cases.[4]



Figure 1. The preoperative condition.

Immediate replacement of single tooth by provisional restoration of dental implants is a procedure of growing interest among clinicians worldwide. Single tooth loss is probably the most common indication for implant placement.[5] The loss of a single tooth is a traumatic experience for many patients and early/immediate implant loading is therefore an attractive treatment option. However, single teeth replaced by

implants in the aesthetic zone are one of the most challenging situations facing a clinician, even when using a two-stage implant protocol.[6] Careful assessment thus must be made of mucosal and bone volumes for optimum implant aesthetics.[6,7] Immediate implant placement allow advantages over conventional approach such as reduction in the number of surgical procedures and hence the treatment time required,[1] ideal axial orientation of the implant,[2-4] preservation of the bone at the extraction site and optimal soft-tissue aesthetics,[2,4] significantly reduced period of wearing of an interim prosthesis.[4] Studies showing high success rates of immediately placed implants have made this protocol more favorable for implantologists.[5,7]



Figure 2. The preoperative view

However, this protocol has been associated with shortcomings like ideal modality for the treatment of marginal voids. These are the gap present between the implant body and the wall of the bony socket. The procedure is also technically more demanding. Although, implant placement in fresh extraction socket has been described previously, it is only recently that such clinical approach has gained popularity.[8]



Figure 3;Pre-Operative IOPA

The form of the periodontium plays an important part in the final aesthetics of the implant restoration. [9] The three categories of gingival scallop are high, normal, and flat. Based on a clinical survey of 100 patients, the average or normal gingival scallop is positioned 4 mm to 5 mm more incisally than the free gingival margin. [10] The high or long gingival scallop will have a much higher risk for gingival loss or flattened papilla after extraction vs the normal or flat scallop. The flat scallop has less volume of papilla in the interproximal area; therefore, it is much more predictable and maintainable after extraction. One of the principal advantages of the immediate technique is the prevention of post-extraction bone resorption. Bone loss may affect approximately 23% of the anterior alveolar crests during the 6 months after extraction. [11] Infection affecting the tooth being extracted may be a contraindication to the immediate technique, as it is most often accompanied by apical or lateral bone loss that can impair primary stability. Primary stability after implant placement is important when provisionalizing immediately. Drilling 3 mm to 5 mm beyond the apical limit (in a palatal direction) can ensure sufficient stability.[12]

Not all extraction sites lend themselves to immediate implantation. Careful evaluation based on clinical guidelines must direct the clinician as to the suitability of the socket and the appropriate surgical procedures. Various pertinent classification systems have been formulated in the last few years that may serve as useful diagnostic tools.

Salama and Salama's[13] pre-operative classification of extraction sites is based on the classical definition of periodontal intrabony defects. They divided the extraction sites into three types, each possessing distinctive characteristics:

Type 1. Ideal for immediate implantation because of 4- or 3-wall sockets with minimal bone resorption, sufficient bone available beyond the apex, acceptable discrepancy between the fixture head and the necks of the adjacent teeth, and manageable gingival recession or esthetics is not essential.

Type 2. Requiring orthodontic extrusive augmentation in view of dehiscence >5 mm, substantial discrepancy between the fixture head and the necks of the adjacent teeth, and significant recession or esthetics is essential.

Type 3. Not suitable for immediate implantation owing to inadequate vertical and buccolingual bone dimension, recession and severe loss of the labial bone plate, and severe circumferential and angular defects. This article outlines a technique to use the patient's natural tooth after extraction to provisionalize an implant.

Case presentation

An 23-year old female patient presented with root resorption of the maxillary right central incisor (Figure 1,2,3). Available restorative options were presented to the patient and included a removable partial denture, a fixed bridge or an implant-supported restoration. The adjacent teeth had not been previously restored, so the patient chose to have an implant-supported restoration to avoid preparation of the adjacent teeth. The patient also did not want to wear a removable appliance during the implant healing phase. There was no active infection present and no apical pathology was seen radiographically. Periodontal evaluation revealed a thick, normal-scalloped periodontal biotype. Approximately 85% of the population present with thick, flat periodontal forms, whereas the periodontal architecture of the remaining population is thin and scalloped. [14] Though the amount of postoperative soft tissue modifications is generally minimal for patients with thick and flat gingiva, significant changes have been observed in those with thin and scalloped biotypes.²⁶ The projected interproximal tissue height depends on the interproximal bone height of the adjacent teeth. Bone sounding of the teeth adjacent to the failing tooth can ascertain predictable interproximal tissue height. In this patient, a normal osseous crest was revealed after bone sounding. Gingival tissue was approximately 3 mm from the osseous crest facially and 5 mm interproximally.

The risks and benefits of treatment were presented to the patient and an implant was selected for immediate placement and fixed provisionalization using the patient's natural tooth on the abutment. Using the natural tooth as a provisional will allow tissue support and create an emergence profile similar to the pre-extraction condition. Before extraction of the tooth, stone models were made and a putty index was formed over the teeth. This would act as a guide to placing the tooth in the proper orientation after surgery. Local anaesthetic was administered and periostomes were used to loosen the periodontal ligament. The tooth was extracted atraumatically, without flap reflection. A periodontal probe was used to verify the integrity of the facial plate, and the socket was thoroughly debrided. Figure4



Figure 4: Probing of the extraction socket showed intact bony walls, especially the buccal walls.

Primary stability was achieved by engaging the palatal wall and bone approximately 4 mm beyond the apex to the extraction socket with a An Ankylos implant, 3.5 x 11mm. The top of the implant was placed approximately 3 mm from the final proposed free gingival margin in the mid-facial area. Ideally, the 1-mm polished collar should be above the bone level. With a flapless surgical approach, this is sometimes difficult to visualize. The implant diameter was within the confines of the tooth socket, without engaging the facial plate to prevent possible perforation. A minimal distance of approximately 1.5 mm to 2 mm between the implant and adjacent teeth is recommended to minimize marginal bone loss resulting from encroachment. Although not necessary with a horizontal distance less than 2 mm from the implant to the facial bone, synsynthetic bone was placed around the implant and a healing cap (Figure 5) was lightly tightened. Immediate provisionalization was

then begun; the healing cap was removed and a solid abutment was placed on the implant and hand tightened . No preparation was necessary as this is a stock component and the occlusion did not interfere. The coronal portion of the patient's tooth was to be used as the provisional restoration.



Figure 5; A healing cap was placed after extraction

The extraction was necessary because of the resorption of the root .The root of the tooth was sectioned horizontally with a diamond bur approximately 3 mm from the cemento-enamel junction . The tooth was then hollowed out so that it would fit over the abutment Figure.6 Before relining the tooth, it was placed on the solid abutment to make sure it would fit and that there would be no occlusal contact on the final provisional (Figure 7). After confirming an accurate fit, the tooth was etched for 30 seconds (Figure 8), then rinsed and air-dried. A bonding agent was applied and light-cured for 20 seconds A bis-acryl material was injected into the tooth (Figure 8) and then placed intraorally onto the abutment and allowed to self-cure for 2 minutes.



Figure 6; Ankylos implant, 3.5 x 11mm.

It is very important when relining the restoration extraorally that an analog is used that is exactly the same as intraorally. Do not use a laboratory implant abutment analog for this purpose. It is important to get an accurate fit of the restoration. The final provisional should be refined and contoured flat or slightly under-contoured (Figure 9) on the facial so as not to put too much pressure on the free gingival margin, which can cause apical migration of the tissue. This is done with finishing disks and polishing points to create a smooth surface. The interproximal tissue should be supported by the natural emergence profile of the tooth. It is impossible to create too much interproximal pressure, as it is the exact emergence profile that existed before the extraction.[15] One of the possible complications from immediate placement and provisionalization using a cement-retained restoration is the possibility of leaving excess cement subgingivally. If the implant is placed too deeply and it is impossible to remove all of the cement, it is better to use a screw-retained provisional.



Figure 7; Root resorption of the tooth

A technique first described by Higginbottom [16] allows the majority of the provisional cement to be removed extraorally using the same analog as that used for the fabrication of the temporary. A temporary cement is placed in the crown and then placed on the abutment extraorally (Figure.9). The excess cement is then removed before placing the temporary intraorally. This allows minimal clean-up intraorally and prevents possible gingival irritation. Do not be fooled into placing more cement into the restoration after cleaning. There is adequate cement to hold the restoration on. Place the restoration on the abutment and allow the cement to fully set. Clean off any excess cement. Figure .10 shows the restoration on the day of surgery. The tooth was taken out of occlusion and the patient was advised against using the surgical site and instructed not to have any contact on that tooth while eating. It is very important for the patient to understand the importance of their part in the success of the restoration. If the patient is not willing to accept some responsibility in the final success, then an immediate restoration may be contraindicated.[17]

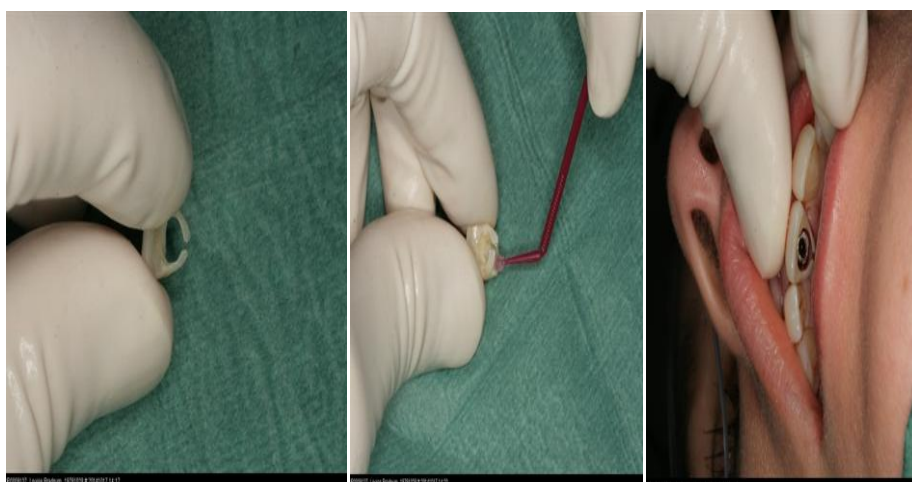


Figure 8; The hollowed-out tooth. The tooth was etched for 15 to 20 seconds. The tooth was tried on the abutment

Patients with deep bites, bruxers, or who have active infection present are not good candidates for this type of treatment. The patient presented 2 weeks postsurgery for clinical evaluation. The area was healing without any complications (Figure 11). After 3 months of healing, the patient returned for a final impression of the implant. A fixture-level impression was made for a custom abutment . This is a UCLA-type abutment that is waxed cast, and then porcelain is added to it. The custom abutment was placed and torqued to 35 Ncm (Figure.11). The final restoration was cemented with resin-reinforced glass-ionomer cement. The final restoration is shown in Figure 11. The preoperative smile is shown in Figure 1 and the postoperative smile is shown in Figure 11.

II. Discussion

The clinical, anatomic, and radiologic characteristics of the socket immediately after tooth extraction are distinctly different from the socket environment after 1 year of healing.[18]

Implants placed immediately in fresh extraction sites engage precisely prepared bony walls only in their apex, while the coronal space is filled by at end of the healing phase.[19]



Figure 9 The polished provisional.

Therefore, the main difference occurs during the initial stage of osseointegration, most of the studies focus on this interval to define survival rates.[18] The level of implant insertion into the alveolar crest is crucial, since its placement below the crest prevents bone preservation, one of the main advantages of immediate implantation. Crestal placement without radical alveoplasty is preferable, because it does constitute an impediment to desirable outcome.[18,19]



Figure 10; The restoration on the day of surgery

The studies of single implant placement and prostheses have described good treatment prognosis. Nevertheless, an accurate diagnosis and treatment planning is important for the immediate implant placement and restoration. Immediate implant placement would be a sensitive technique because of the placement of implants in fresh extraction sites is difficult.[20] The reasons for tooth extraction included retained root, trauma, and nonrestorable crowns.

Immediate implant placement should be avoided in case of ongoing inflammatory processes, such as active periodontal and periapical infection.[20,21,22] In addition, it should be avoided when bone around root apex area is insufficient after extraction of the tooth. Several studies have reported low success rates when the prostheses were in light occlusal contact or in full functional loading. [22,23]

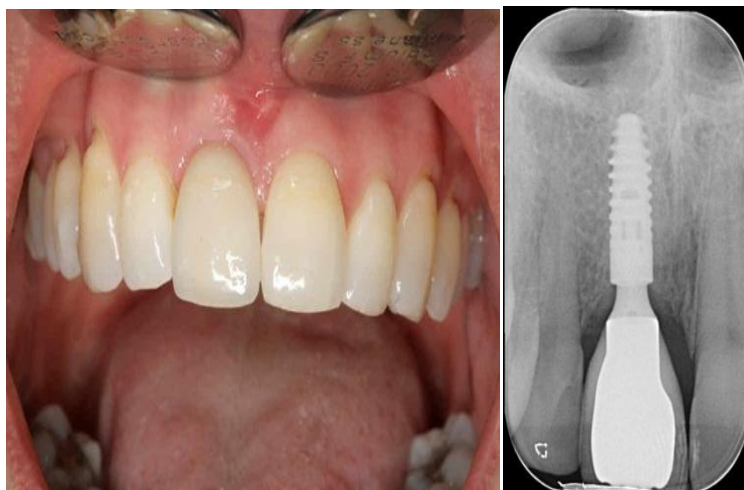


Figure 11; The preoperative smile.

Patients with parafunctional occlusal habits must use a habit appliance or occlusal guard. [24] This report presented the immediate implant placement and temporization on the upper right central incisor. The soft tissue reaction was favorable because of the existence of a temporary crown during the healing period. The temporary crown maintained the interdental papilla and gingiva, occurring highly esthetic results.[25] The clinician should instruct the patient to perform adequate oral hygiene during the healing phase. Moreover, the temporary crown or fixed partial denture should not be taken out during the healing period of approximately 6 weeks. Several studies have reported that the marginal bone dimension was similar with immediate and conventional approach in the short term period of 5 years. However, more long-term research is required to support these conclusions.[25,26]

Studies on extraction socket preservation have shown that atraumatic tooth extraction is a prerequisite in socket preservation. Various socket preservation techniques have been employed and it can be prudent to decipher from numerous studies, that socket preservation is a validation for management of extraction site and future prosthetic rehabilitation. Studies have claimed gain in alveolar crestal width and height after socket preservation procedures, and also lesser resorption not only in horizontal but also in vertical dimension.[1,2,3,22,26] Most grafting materials have been used as filling materials in fresh extraction sockets and to avoid collapse of the membrane. Increased mineralization was seen in socket preservation sites especially in the apical area of the socket. This proved that bone formation initiated from the old bone of the lateral and apical socket walls toward the centre of the wound.[27]

Early publications and clinical experience seem to indicate that PRF improves early wound closure, maturation of bone grafts, and the final esthetic result of the peri-implant and periodontal soft tissues. It also provides a significant postoperative protection of the surgical site and seems to accelerate the integration and remodeling of the grafted biomaterial. [1,3] Practitioners are often faced with the dilemma of restoring patients as quickly as possible.(3) However, it often takes time to provide optimal treatment. By incorporating new techniques and materials, we as practitioners are able to treat our patients with the most optimal treatment without making sacrifices due to the length of time it has previously taken to accomplish this treatment. By using immediate placement and immediate function we can bring our patients through treatment in a stable, natural manner while better supporting the biological complex.[28] The final restoration can take advantage of newer biologically compatible materials and provide a longer-lasting, more esthetic end result.[28,29]

Many clinical reports and experimental studies in the animal model demonstrated the favourable outcome of dental implants immediately inserted in freshly extraction socket, without the use of any regenerative materials. [30] The outcome is always better when regenerative materials like Bio-Oss & PRF are used. Our data shows a survival rate of immediate implantation carried out on this patient at three year after immediate implantation and does not differ from the cases in which implant was placed in healed sites. [31] These data agree with those from other authors who evaluated the clinical success rate of immediate implantation without use of any membrane or graft material in both humans and animals.

It must be kept in mind that the present study is related to immediate implant not subjected to functional loading and therefore not fully comparable with the results from loaded implants. However, it has been demonstrated that functional loading does not impair, but rather enhances, bone maturation.[31,32]

The primary disadvantage of immediate loading is the risk of implant failure or greater crestal loss around the healing implants. Overloading of the implant could be a factor for implant failure in immediate loading.[20] Hence, we considered immediate temporization and not immediate functional loading.[19] Temporary crowns had a positive impact on the soft tissue with respect to the preservation of the papillae.[22] Placement of implant at correct angulation is again very important.[18] The one-piece implant design enables undisturbed healing of the peri-implant soft tissue and avoids disruption of the soft tissue seal when placing the definitive prosthetic restoration.[18,19,20,21]

The natural tooth with implant offer a unique simple treatment modality, and have been specially designed for immediate loading of fixed restorations. They are considered an alternative to the conventional implant placement regimen and are ideal for immediate loading in varying bone qualities and quantities. They allow minimally invasive transmucosal flapless placement and limit the requirement for hard tissue grafting procedures

III. Conclusion

This clinical report demonstrates esthetic treatment of fractured upper right central incisor using immediate implant placement and temporization with natural tooth. The clinical outcome showed black triangles not only of prosthesis but also adjacent teeth, however the patient was satisfied with the prosthesis and lack of anterior edentulous period.

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