

Minimally Invasive Extraction and Immediate Implant Placement with Single-Stage Surgical Procedure: Technical Notes and a Case Report

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Abstract: This case report describes extraction of a fractured left maxillary lateral incisor tooth, followed by immediate placement of a dental implant in the prepared socket and temporization by a bonded restoration.

Materials And Methods: The tooth was extracted with minimal hard and soft tissue trauma and without flap reflection. The socket was prepared to the required depth and a Implant was inserted. An impression was made 4 months after implant insertion, and a definitive restoration was placed.

Results: The atraumatic operating technique and the immediate insertion of the Implant resulted in the preservation of the hard and soft tissues at the extraction site. The patient exhibited no clinical or radiologic complications through 12 months of clinical monitoring after loading.

Conclusion: The dental implant and provisional restoration provided the patient with immediate esthetics, function, comfort and most importantly preservation of tissues.

Keywords: Implant, Immediate placement, Temporization

I. Introduction

Endosseous dental implant therapy is rapidly becoming the prosthetic standard of care for a vast array of clinical applications, however, despite the high success rate of endosseous implant therapy, it has yet to achieve wide public acceptance and utilization [1]. Endosseous implant therapy in the mandible has repeatedly been reported at a success rate of 95% or better, yet public utilization of endosseous implant therapy has not exceeded 5% [2]. The most frequently cited reasons for underutilization of endosseous implant therapy are that treatment cost is perceived to be too high and treatment takes too long (Branemark's original treatment protocols required up to a year or more to complete treatment). An obvious area of focus has been to decrease the amount of time necessary to complete implant therapy [1,2,3,4]. In implant dentistry the concept of osseointegration was first introduced by Brånemark in 1964, and the guidelines for obtaining a direct connection between bone and titanium were described in 1977 by the same author [1]. A stress-free healing period is generally recommended to achieve osseointegration of dental implants without interposition of fibrous scar tissue [1]. In addition, the traditional guidelines recommend a six- to twelve-month healing period for the alveolar bone following tooth extraction [2].



Fig.1; radiography

Approaches to achieve this goal have dominated clinical research and practice: delayed/immediate implant loading, improving implant surface technology (promotion of quicker healing and better osseointegration), and immediate placement of an endosseous implant after extraction of a natural tooth. [5,6] The definition for an immediate endosseous implant is extraction of a natural tooth followed by immediate placement (within the same surgical procedure) of an endosseous dental implant. Immediate implants have become widely accepted despite controversial beginnings and the available literature consistently cites high levels of success (ranging from 94-100% on average), immediate implants provide clinically recognizable benefits. Broadly speaking, these benefits include reduction of morbidity, reduction of alveolar bone resorption. Controlled clinical studies have demonstrated an average of 4.4mm of horizontal and 1.2mm of vertical bone resorption six months after tooth extraction [1, 2], preservation of gingival tissues, preservation of the papilla in

the esthetic zone, and reduction of treatment cost and time (the healing phase is shorter in general and there is a reduction in the number of procedures).[1,2,3,4,5]With the extraction socket as a guide, the surgeon can also more easily determine the appropriate parallelism and alignment relative to the adjacent and opposing residual dentition.[4] To maximize the advantage of these benefits and to minimize implant failure, case selection must be based on sound clinical and research criteria. Immediate placement and provisionalisation for single tooth replacement allows for minimal disruption of the marginal soft tissues, providing immediate prosthetic support for the peri-implant tissues through the use of a carefully crafted provisional restoration. Primary implantation is fundamentally



Fig.2 Frontal view

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 5,6. 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 7 . The surgical requirements for immediate implantation include extraction with the least trauma possible, preservation of the extraction socket walls and thorough alveolar curettage to eliminate all pathological material. Primary stability is an essential requirement, and is achieved with an implant exceeding the alveolar apex by 3-5 mm, or by placing an implant of greater diameter than the remnant alveolus. Esthetic emergence in the anterior zone is achieved by 1-3 mm sub-crest implantation.[6,7,8,9,10]



Fig .3 Depithelization of the contour

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 . Novaes et al. , 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.[11]



Fig.4;Suture membrane

When an implant is planned for an area currently occupied by a tooth that must be removed, it may be advantageous to immediately place the implant when the tooth is extracted. Immediate placement offers several advantages compared to extracting a tooth, allowing the bone to heal and then subsequently placing the implant.[12,13] The advantages are the bone that originally surrounded the tooth is more likely to be preserved. Thin bone such as the facial bone of maxillary teeth and interproximal bone can rapidly disappear after tooth extraction. Placing an implant at the time the tooth is extracted helps preserve the remaining bone and decrease the need for subsequent ridge augmentation procedures, more ideal implant positioning is possible.[13,14] For single rooted teeth, the implant is positioned where the root of the tooth was located which is advantageous unless the position of the tooth prior to extraction was undesirable. When implants are centered beneath the crown, there is more favorable loading. Also, screw access holes are more likely to be centrally located, within the peripheral crown dimensions which facilitates the fabrication process, there is a shorter time period when the patient is subjected to the challenges of being edentulous /wearing a provisional removable prosthetics, treatment time and number of surgical procedures are reduced, soft tissue contours and height are better preserved in esthetic zones and prevention of the bone loss in both vertical and horizontal directions.[4,6,7,9,14,15]

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.[15] Soft Tissue Closure after Immediate Implants: [5] Four important factors are to be considered for closure over immediate implants ;



Fig.5 Implant placement

(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.



Fig.6;Suturing connective tissue graft

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 implants were placed.[4,13,14,15]

The existence of an acute periapical inflammatory process constitutes an absolute contraindication to immediate implantation [8,9] In the case of socket-implant diameter discrepancies in excess of 5 mm, which would leave most of the implant without bone contact, prior bone regeneration and delayed implantation may be considered [10]. Avoid teeth with large or acute periapical infection; Teeth with labial bony dehiscence or fenestration defects; Insufficient bone apically to ensure primary stability of the implant; Systemic factors that

may impair healing (e.g. smoking); Large bulbous root morphology, Interproximal bone loss (aesthetic zone), active periodontitis.[4,15]



Fig.7; 15 days after the surgery

This case report describes extraction of a fractured left maxillary lateral incisor tooth, followed by immediate placement of a dental implant in the prepared socket and temporization by a bonded restoration.

Case report:

A 32-year-old male patient presented with a history of trauma and crown fracture at the cervical area of tooth 21 and requested an immediate solution. Clinical and radiological evaluation revealed adequate alveolar bone, absence of periapical pathology but fracture line was below the crest of alveolar bone and was limited to the tooth. Fig.1 Fig.2So, it was decided to extract and place endosseous implant immediately and place a provisional restoration to avail the benefits like preservation of bone and emergence profile. After administering appropriate antibiotic and analgesic, induction of local anaesthesia was carried out using lignocaine with adrenaline. As preservation of alveolar bone is key to success of immediate implants, extraction of tooth has to be atraumatic, Fig.3so using periostomes and small periosteal elevators the fragment was luxated without excessive enlargement of the socket, and using an innovative method where endodontic file was used to engage the canal wall and tooth fragment was slowly luxated and pulled out of the socket using Fig.4 Fig.5 . The sockets were debrided with curettes and a dental implant was planned (3.7 x 13 mm). The drilling sequence was carried out without reflecting the flap to preserve the bone. After checking for primary stability, which was achieved by wrenching the implant into the bone beyond the apex of the socket, alloplast – BIO-OSS was packed between the implant and labial socket wall. The cover screw was placed and interrupted sutures were placed. Fig.5 IOPA was taken to see the implant placement . It was found to be satisfactory. Post operative instructions were given to the patient, and was asked to report after 1 week. The sutures were removed after 7 days and the patient received temporary acrylic crown bonded to the adjacent teeth with fibre-reinforced composite on the same day . Fig.6 Fig.7 Fig.8The patient was recalled after four months for the prosthetic procedures and was given porcelain fused to metal crown over the implant. He was recalled for prophylaxis and follow up every three months. The clinical and radiographic appearances at six months and after one year show good aesthetic result and acceptable osseo-integration of the implant Fig.9 Fig.10.



Fig. 8; Second stag



Fig.9;Provisional restoration



Fig.10. Post abutment for digital impressions

Recall appointments for clinical and radiological control took place at one week, as well as six, 12 and 18 months. At each appointment, stable conditions in the crestal bone and in the soft tissue were exhibited. At the 24-month follow-up, no recessions or clinical or radiological crestal bone resorption was apparent. Fig.11, Fig.12



Fig.11; Zirconia customized CAD/CAM abutmen

II. Discussion

Nowadays, we know that osseointegration works and we know how it works. We can also achieve predictable and repeatable results. 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.[1,2,6,7,14,16,17] 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]

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]



Fig.12; final frontal view

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.[25,26,27,28,29,30]

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.[4,15, 31,32,33,34]

III. Conclusion

The implant therapy must fulfill both functional and esthetic requirements to be considered a primary treatment modality. Aiming to reduce the process of alveolar bone resorption and treatment time, the immediate placement of endosseous implants into extraction sockets achieved high success rate of between 94-100%, compared to the delayed placement.

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