

Post Extraction Implant Placement with Immediate Provisionalization and Finalization Using a Simplified Technique: a Case Report

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Abstract

Immediate implant placement following tooth extraction in appropriately selected cases has been considered the optimal procedure for the following reasons: the natural healing process are mobilized to the maximum, no bone resorption has taken place yet, drilling is reduced, a number of surgical stages are eliminated, design and construction of prosthesis is simplified, and positive psychological effect on the patient. In this case report a satisfied aesthetic outcome was achieved with immediate implant placement.

Keywords: Anterior, atraumatic extraction, fresh extraction sockets, immediate placement, implant

Date of Submission: 25-09-2021

Date of Acceptance: 08-10-2021

I. Introduction

Dental implants have become a standard treatment option for replacement of missing teeth. Originally, it was standard protocol to wait for a period of 6 to 8 months after tooth extraction, to place the dental implant. This was to allow for the healing of the alveolar bone.[1] However this waiting period was a major disadvantage of this treatment modality. Subsequently, attempts were made to shorten this duration of waiting period. Techniques such as early placement, immediate delayed placement and immediate placement were developed.[2] Moreover, the aesthetic requirement of the patient has to be taken into consideration for shortening the treatment time wherever anterior teeth were to be replaced. [3]The immediate implant placement in an extraction socket was first described by Schulte and Heimke in 1976.[3] Not only are the time period and number of operations reduced, several other advantages have been put forth including improved implant survival rates, better aesthetics, higher patient satisfaction as compared to delayed implants and prevention of undue resorption bound to happen post extraction.[4] It also allows for maintenance of gingival form and promotes periimplant gingival tissue esthetics by maintaining the interdental papillae. Small osseous defects, which are frequently found adjacent to implants placed at the time of tooth extraction, can be grafted with autogenous or synthetic bone grafts. However, because of the nature of this treatment method, a higher risk of complications and failures may be expected.[5]

In 1989, Lazzara [6] first reported immediate implant placement in an extraction socket in humans.[6] Since then, this treatment modality has received much attention in the literature [7 Fugazzotto [8] conducted the only study comparing implants immediately placed into sites with periapical pathology with those immediately placed into sites without periapical pathology in the same patient, thus helping to control a number of interpatient variables and render the results more directly clinically applicable.[9] It was observed that both treatments yielded comparable results with no statistically significant difference in survival rates[10].

The risk of microbial interference with the healing process [11]. Some studies on immediate implants suggest that periapical or periodontal pathosis should not be performed [12]. In addition, there are clinical reports suggesting that the history of periodontal or endodontic infections is a predictive marker for implant infection and failure [9]. The presence of chronic periodontal disease has also been correlated with an increased risk of implant failure [1,3,5]. Therefore, infected sites are considered as a contraindication for immediate implantation by many clinicians [1,4]. Maxillary alveolar process is dependent on the existence of teeth. This area will undergo significant structural changes when teeth are lost. [11]The dynamics and magnitude of these changes can be very significant if there is infection present.[12] The biological process occurring after the tooth extraction produces a physiological resorption of the alveolar process and, consequently, a reduction in volume of the maxillary bone, which usually affects the vestibular side of the bone crest. In the first three months

following an extraction, there will be a horizontal volume reduction of 30% of the alveolar process, which could reach up to 50% in 12 months.[13,14]

Following tooth extraction, the periodontal ligament (PDL) loses its functionality and disappears. However, the remnants of PDL cells differentiate into a variety of cell types, including fibroblasts, osteoblasts, and osteoclasts [15]. There are a few studies that suggest that PDL fibroblasts have osteoblast-like properties [4,5]. Lin, et al. found that PDL fibroblasts actively proliferate after the tooth extraction, migrate into the coagulum, form dense connective tissue, and differentiate into the osteoblasts that form new bone during socket healing. [16]Therefore, the state of the PDL and the remaining socket wall would be the main influential factors for the osseous regeneration. Diseased sockets will often present with vital and some non-vital.[1-6]

Placement of a dental implant in the esthetic zone is a technique- sensitive procedure with little room for error. A subtle mistake in the positioning of the implant or the mishandling of soft or hard tissue can lead to esthetic failure and patient dissatisfaction.[17,18] The advantages of immediate implant placement include a reduction in treatment time, a reduction of surgical procedures and a reduction of aesthetic rehabilitation time .[19]

In this case report a satisfied aesthetic outcome was achieved with immediate implant placement.

Case report



Figure 1 .a, b. ;The preoperative condition

A 20 years old patient was referred to to Aesthetics Dental Clinic,Athens, Greece, after having a traumatic accident with . Then she developed external resorption of her upper right central incisor. She saw an endodontist who told her that it wasn't restorable and she then found her way to me. A little rotated, a little crooked - but not by much .She was presented in the clinic 12 hours after the accident (Figure 1a,b). The patient expressed his desire to have a rehabilitation that could offer a functional and aesthetic outcome. Clinical, radiographic panoramic and 3D imaging examination showed proper conditions of hard and soft tissue for immediate intervention (Figure 2).



Figure 2; Pre-Operative IOPA

Immediate implant placement restoration was suggested and the patient gave his written informed consent. Before starting the surgical procedure the patient received 2 g of Amoxicillin 1 hour before surgery and rinsed for 2 minutes with 0.12% chlorhexidine digluconate solution to reduce the risk of infections. Local anesthetic was injected buccally and palatally . (Figure 3). First the socket of the avulsed left incisor was irrigated with sterile saline and debrided carefully with a manual instrument. To achieve a good primer stability we did an under preparation implant site. An Ankylos implant, 3.5 x 11mm mm implant was placed in the prepared socket with a torque of 50 Ncm (Figure 4). The implant was placed 1mm under the buccal margin bone, and the residual gap between the implant surface and the buccal margin bone wall was ≥ 2 mm. The implant was inserted 3 mm apical to the free gingival margin. Titanium abutment is screwed on the implant. To obtain a bone regeneration and bone integration in the circumferential area the residual gap was filled with bone graft, (collagen matrix Osteobiol by Tecnos), and compressed with a manual instrument . The 11 was extracted atraumatically to preserve the integrity of the interproximal papillae and remaining buccal and palatally bone plates .



Figure 3: Probing of the extraction socket showed intact bony walls, especially the buccal walls.



Figure 4; A healing cap was placed after extraction

For a natural aesthetic outcome and to save time the crowns of the lost 11 tooth were cut and were used as provisional restoration (Figure 5). The crowns are prepared over the abutment, with 37% phosphoric acid gel for 20 seconds, rewashed and dried, after lubricating the surface with bond adhesive and polymerization we unite the crown with the abutment (Figure 5). The single structures were fixed filling the gap between the provisional crown and the abutment with flowable composite resin and were subsequently removed from the implants to eliminate the occlusal stops and refine and contour the surface profile so as to achieve proper adaptation of the gingival soft tissue. The occlusion was adjusted, the occlusal contacts in centric relation and in protrusive/ lateral movements were removed and in the end the screw access holes were filled with flowable composite resin. The patient was placed on amoxicillin 500 mg 3/day for 5 days, and was instructed to rinse twice daily with 0.2% chlorhexidine digluconate for 2 weeks. After the surgery the patient did not report any specific symptoms and did not

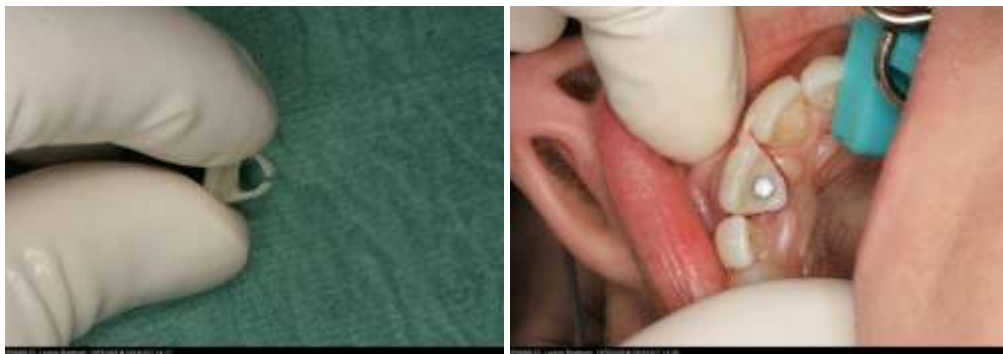


Figure 5 a,b; The hollowed-out tooth. The tooth was etched for 15 to 20 seconds. The tooth was tried on the abutment

show any adverse clinical signs, his desire for aesthetic and functional outcomes were achieved . The patient came after 3 months and a definitive impression was taken for the permanent prosthetic restoration in zircon-ceramic. Symmetry of gingival margin was achieved with complete fill of the mesial interdental space between 2 central incisors (Figure 6a,b).



Figure 6 a,b; The restoration on the day of surgery

After 6, 8 and 12months the clinical and radiographic parameters were really optimal: the gingival margin levels and the interproximal papilla remained stable, over this period of time even the interproximal bone level also did not show any change (Figure7a,b). Another appointment was schedule after 24 months after surgery and no changes in the soft and hard tissue had occurred, patient's conditions were very good.

II. Discussions

Replacing a single tooth in the esthetic zone with an implant restoration is one of the most demanding tasks in implantology. Therefore, the anterior region represents the most critical area from an esthetic standpoint and the most complex one with regard to the osseous and gingival architecture. The anterior sector always becomes even more esthetically challenging during the replacement of a central incisor, because of the presence of the contralateral tooth and the adjacent teeth; thus the gingival tissues will serve as references for the volume, position, color, texture, marginal contour and interdental papillae, and so on at the end of the treatment .[20,21]



Figure 7a,b; The preoperative smile.

Implant placement subsequent to tooth extraction in conjunction with the use of provisional restorations in the anterior maxillary region is certainly challenging for the dental practitioner. [21] However, this treatment modality offers several advantages, including reduced clinical time, a single local anesthetic injection, a flapless procedure and immediate placement of the implants. From the patient's point of view, the immediate incorporation of a fixed implant supported provisional restoration is very acceptable and even requested. With the clinical procedure described here, both dentist and patient can evaluate the aesthetics of the restoration. Soft-tissue support is enhanced and achievement of the desired result is facilitated. With initial implant stability, proper tissue management and correct use of the available implant components, a predictable aesthetic result can be produced. On the other hand, occlusal control, oral hygiene and a regular recall program should be considered prerequisites for maintaining a long-lasting restoration. Single-tooth implants have shown high success rates in both the anterior and the posterior regions of the maxilla and the mandible. [22] Immediate post-extraction implant placement has been done since the early years of the clinical application of implants with very good clinical outcomes. [23] Decisive factors for immediate implant placement are lack of infection in the periodontal tissues and an intact tooth socket. Immediate incorporation of a temporary restoration has been presented in the literature with encouraging results. [24-28] Although clinical experiences have advocated this clinical technique for many years, more extended long term clinical studies are necessary to prove the efficacy of the method and establish a stable clinical protocol. [29,30]

In the area of the smile, immediate implantation after an extraction, or delayed implantation in a healed site with a thin biotype, generally also represents a great clinical challenge. [31] When a single central incisor is to be replaced by an implant crown without accompanying restoration of the adjacent teeth, the esthetic risk is even greater, as no compromises are acceptable with regard to the restoration and the surrounding gingiva. [31,32]

The esthetic difficulties involved in implant dentistry are managing the soft tissue, and mimicking the natural appearance of the patient's teeth and gingiva. Indeed, achieving the ultimate esthetic results in the anterior zone with implant restoration should be similar to achieving esthetic results with conventional restorative dentistry.

In esthetic gingival contour includes a harmoniously scalloped gingival line, the avoidance of abrupt vertical differences in clinical crown lengths between adjacent teeth, a convex buccal mucosa of sufficient thickness, and distinct papillae. [33] Esthetic success can really be predictable only through the development of a comprehensive treatment approach and a proper understanding of the biological parameters that can influence the esthetic outcome at the dental/implant restoration interface. [1-5] For all of the surgical and/or prosthetic steps to culminate in a predictable esthetic result, there is an optimal treatment time, which is necessarily proportionate to the complexity of the case and the chosen treatment modality. [34]

Soft tissue recession is minimized by enhancing the volume of the labial margins and the interproximal papillae, and this technique enhances the clinician's ability to design and sculpt the soft tissue contour around the soft tissue graft [35]. This could be done in a different way, as follows:

- By combining, after extraction and immediate implant placement, a bone graft over the implant with a regenerative membrane. The membrane will be then covered with a connective tissue graft
- By using a rolled pedicle connective graft in conjunction with implant placement and a healing abutment
- By placing implants in fresh extraction sites, an immediate subepithelial connective tissue graft, sutured in the buccal pouch, was shown to be a valid treatment procedure that produces esthetically predictable results for the treatment of nonsalvageable teeth. [36]

Immediately after implant placement in a mature edentulous site, a connective tissue graft placed on top of the cover screw will increase the thickness, and the vertical and buccal contours, and also prevent the implant from leaving a grayish shadow. [37] Whatever is done, tissue contraction will occur after implant exposition and restoration in the first 3–6 months. At its highest point, the gingival margin will lose 0.61 mm, and the interdental papillae will retract by an average of 0.37 mm. [38] The technique of immediate loading of implants following tooth extraction, associated with grafting of a connective-bone sliver harvested from the maxillary tuberosity, promotes acceleration of bone repair for the implant and graft, and minimizes the number of surgical procedures. The connectivebone sliver not only restores the lost vestibular bone plate but also impedes cell competition between the hard and soft tissues, thereby promoting effective bone and gingival healing. [37,38]

The provisionalization phase should be done meticulously to build harmony between the teeth/ implant restoration and the soft tissue. [1,2] A more recent provisionalization strategy in the esthetic zone is to place a final abutment at the time of surgery. Newly available, prefabricated abutments allow the surgeon or restoring dentist to complete any modifications chairside and allow the clinician to place, and torque to 35 N cm, a final abutment at the time of surgery or following a period of integration). [3,6] Placement of a final abutment at the

temporary crown phase encourages the earlier onset of soft tissue maturation and renders any major detachment of the abutment/implant/tissue seal unnecessary when the final restoration phase is undertaken. [1-6]

In general, in the early postsurgical period, the provisional restoration margin is kept in a supragingival position, with subsequent apical positioning following soft tissue integration, maturation, and stability. The crown form or prefabricated shell is relined with acrylic and indexed intra-orally over a prefabricated zirconium abutment, but finished extraorally. The temporary crown is then cemented onto the abutment at the time of surgery. [39]

Provisionalization is definitely the most important step in promoting an optimal tissue form around implants. The provisional implant restoration plays an essential role in the anterior sector in the preservation or the shaping and formation of peri-implant tissues and in its biological dynamism. [1] Developing the tissue form using interim restorations provides distinct advantages for the restorative dentist, technician, and patient. Whether it is started prior to implant placement (ridge preservation), in immediate implant placement and restoration, or in delayed implant placement with or without loading protocols, provisionalization ultimately defines the final peri-implant soft tissue contour. [3] The esthetics of maxillary anterior crowns on single natural teeth is one of the most difficult challenges in restorative dentistry. The challenge of fabricating a crown on an implant abutment is even greater. [4] The implant diameter and cross-section rarely match the anatomy of the root of an anterior tooth. Consequently, the esthetics of a single implant crown in the cervical zone needs to accommodate an implant with a circular cross-section, while balancing the biological and esthetic parameters. [5] A dilemma is faced when developing the restoration form from the circular shape normally found at the platform of an implant to the full contours to replicate the shape of a natural tooth crown around the cemento-enamel junction level. To a certain extent, the diameter of the placed implants is influenced by the available volume of labial bone and the interproximal distance. [40]

Long-term esthetic results are the main objective of the more demanding and better-informed patients. [9,10] The purpose of esthetic implant treatment is to obtain a pleasant aspect of the restoration and correct alignment of the soft tissue: the gingival margin and the papillae. [11,12] The esthetics of the implant should be biological: osseous and gingival remodeling can be reduced if the biological rules are respected. [13]

III. Conclusion

This case report describes a technique to preserve and augment anterior aesthetics by combining atraumatic teeth extraction, hard and soft tissue augmentation, immediate provisionalization and using the platform switching concept to preserve the buccal plate. The gingival tissue surrounding the implants has remained stable with no recession two years following final crowns placement (fig. 7a,b). 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.

Conflict of Interests

The author confirms that this article content has no conflicts of interest

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