

Immediate Implant Placement: Clinical Decisions, Advantages, and Disadvantages

Monish Bhola, DDS, MSD,¹ Anthony L. Neely, DDS, PhD,² & Shilpa Kolhatkar, DDS, MDS²

¹ Program Director of Graduate Periodontics, Department of Periodontology, University of Detroit Mercy, MI

² Associate Professor, Department of Periodontology, University of Detroit Mercy, MI

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Correspondence

Anthony Neely, Periodontology and Dental Hygiene, University of Detroit Mercy, 2700 Martin Luther King Jr. Blvd. Detroit, MI 48208-2576. E-mail: neelya@udmercy.edu

Abstract

Implant placement in fresh extraction sockets in conjunction with appropriate guided bone regeneration is well documented. The decision to extract teeth and replace them with immediate implants is determined by many factors, which ultimately affect the total treatment plan. The goal of this article is to review some of the important clinical considerations when selecting patients for immediate implant placement, and to discuss the advantages and disadvantages of this mode of therapy.

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Implant placement in fresh extraction sockets in conjunction with appropriate guided bone regeneration is well documented.¹⁻⁴ Animal and human studies have demonstrated attainment of osseointegration of implants following such therapy at a light microscopic level.⁵⁻⁷ Immediate implant placement techniques report survival rates of 94 to 100% over a varying healing period of 3 months to 7 years.^{4,8-13}

The decision to extract teeth and replace them with immediate implants is determined by many factors. This decision becomes critical when teeth are planned as abutments for fixed partial dentures. Advanced periodontal attachment loss, teeth restored with crowns, loosened endodontic posts, advanced caries, unfavorable crown-to-root ratios, and various combinations of these factors contribute to a final decision to remove teeth. These factors ultimately affect the total treatment plan.

The goal of this article is to review some of the important clinical considerations when selecting patients for immediate implant placement, and to discuss the advantages and disadvantages of this mode of therapy.

Background

According to the traditional Branemark protocols, a 12-month healing period after tooth extraction is recommended before implant placement.¹⁴ In addition, a subsequent healing period of 3 to 6 months is indicated after implant fixture placement. In most instances, this translates to 1-2 years from the start of treatment to completion of the restoration. This often leaves the patient with a missing tooth or teeth for an extended period of

time. Attempts to shorten the overall length of treatment have focused on three approaches:

- shortened or immediate loading subsequent to implant placement;
- alteration of the surface of the implant fixture to promote faster healing; and
- immediate placement of the implant after extraction of the natural tooth.

Data and reports on the first two approaches have been favorable, but with limitations, especially in terms of duration of the time period. Immediate implant placement postextraction has resulted in the initiation of prosthetic treatment in as little as 3 to 6 months, with the additional benefit of reducing alveolar bone resorption.¹⁵

Patient evaluation

The first step in determining whether immediate implant placement is a reasonable clinical choice is the evaluation of the potential implant site. Residual extraction socket morphology may complicate ideal implant positioning in fresh extraction sockets. The slope of the axial walls, the root curvature of the extracted tooth, and the final position of the apex of the extracted tooth in the alveolar housing pose challenges to the precise, atraumatic placement of an implant in the most desirable restorative position.¹⁶

Several classification systems have been proposed.^{2,15,17} All the systems provide criteria for evaluating the bony

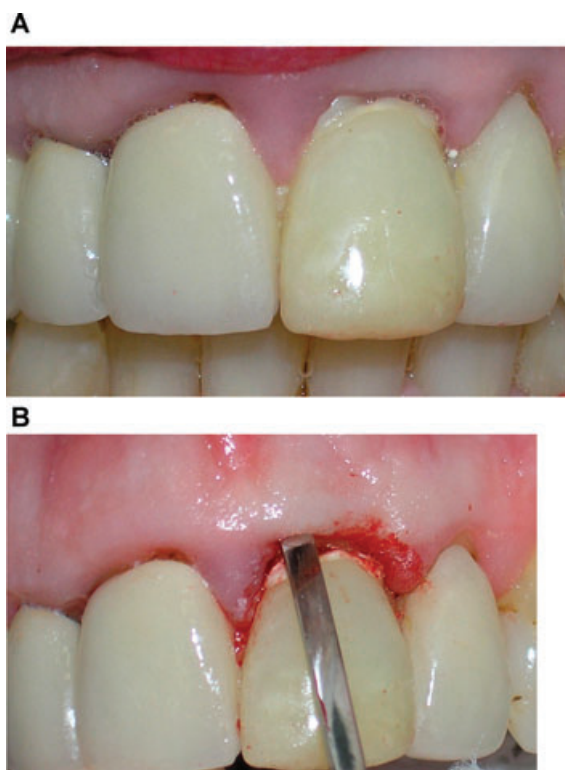


Figure 1 (A) Maxillary left central incisor prior to extraction. (B) Tooth removal was accomplished with a periosteal elevator that severed the periodontal ligament and facilitated flapless, atraumatic extraction (Photos courtesy of Dr. Holly Halliday).

morphology for immediate implant placement. The ideal extraction site for immediate implant placement is one with little or no periodontal bone loss on the tooth that is to be extracted, such as a tooth being extracted due to endodontic involvement, root fracture, root resorption, periapical pathology, root perforation, or unfavorable crown-to-root ratio. Most researchers

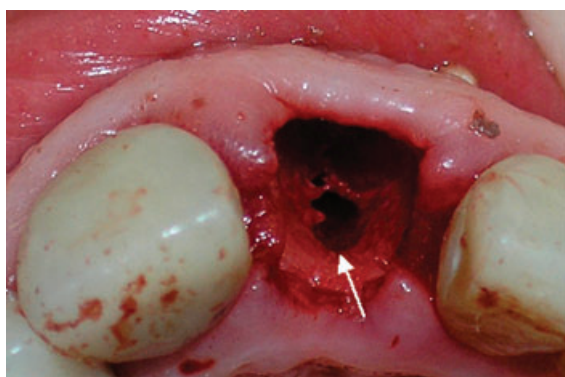


Figure 2 View of the initial stage of osteotomy preparation secondary to atraumatic extraction. Notice that the osteotomy (arrow) was started on the palatal wall of the extraction site to engage intact bone and to improve implant stability. Subsequent drills widened the site by removing bone from the palatal wall (Photo courtesy of Dr. Holly Halliday).

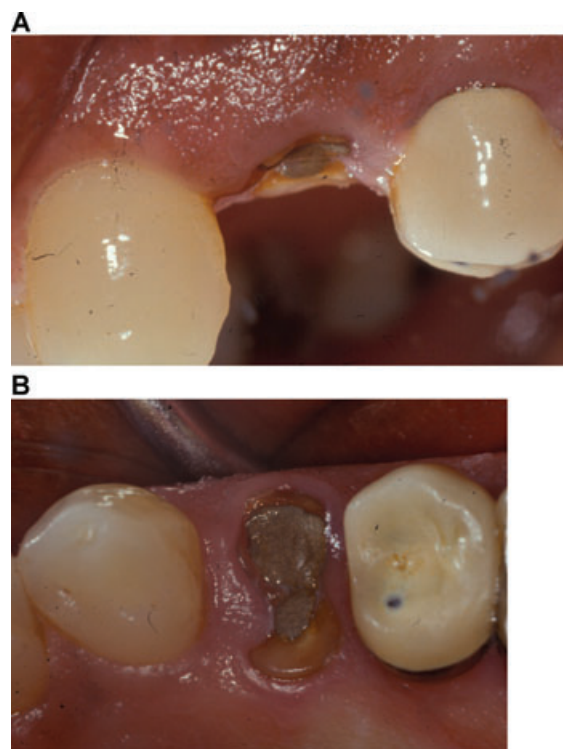


Figure 3 (A) Facial view of the maxillary left first premolar prior to extraction. (B) Occlusal view of the maxillary left first premolar prior to extraction.

recommend at least 3 to 5 mm of bone beyond the apex and a bony length of 10 mm or greater for stability when placing immediate implants. There is general consensus that suitable sites for immediate implant placement do not include those with severe labial and circumferential bone defects or bony defects with two or three missing walls. Wilson *et al* showed that the horizontal or circumferential component of the peri-implant defect was a critical factor relating to the final amount of histologic bone to implant contact, and that the horizontal defects of less than 1.5 mm do not need membranes to obtain histologic osseointegration.¹⁸

Therefore, immediate implant placement should be limited to those defects that have three or four walled sockets, sufficient bone to stabilize the implant, and minimal circumferential defects. Initial implant stability is the most critical factor in implant osseointegration. Thus, an ideal site is one that has significant alveolar bone around the socket enabling the implant to fill the socket space. Ivanoff *et al* showed that early mobility of implants greatly reduces their integration and clinical success.¹⁹

Clinical procedure

Tooth extraction

The first step in immediate implant placement after case selection is atraumatic extraction (Fig 1A). Every attempt should be made to minimize trauma to the alveolus during the

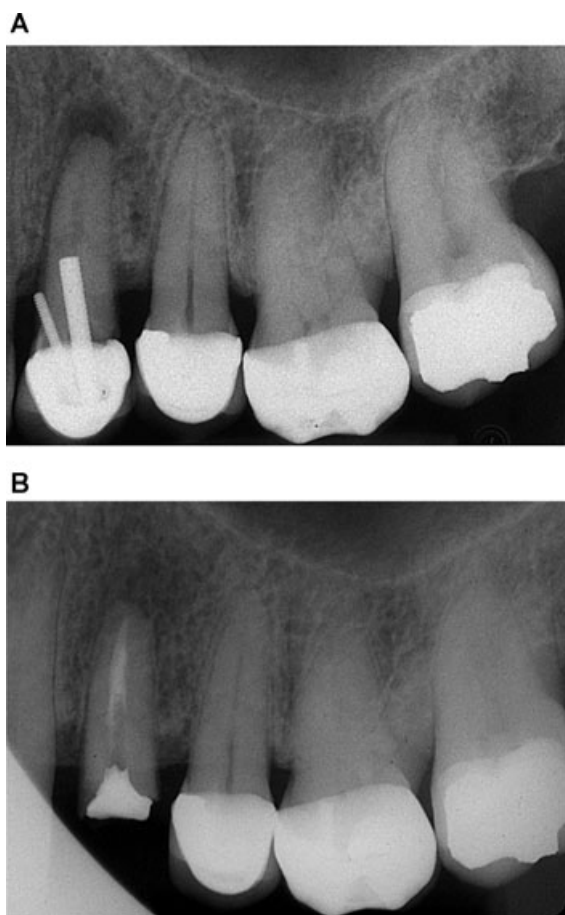


Figure 4 (A) Preoperative radiograph of the maxillary left first premolar showing a mesial pin perforation and a periapical lesion. (B) Postoperative radiograph showing periapical bone healing after root canal therapy prior to tooth extraction.

extraction. The use of specially designed instruments, such as a mini surgical blade or a periosteal elevator (Fig 1B) is extremely critical to maintain most of the alveolar housing of the tooth to be extracted. The periosteal elevator helps in separating the periodontal ligament fibers from the tooth, thereby preventing the fracture of the alveolus. After careful inspection of the extraction socket, the walls are thoroughly curetted to remove all remnants of the periodontal ligament. Hand instruments, burs, or piezo instruments can be used to accomplish the debridement.

If all four walls are intact after tooth extraction and the circumferential defect is less than 1.5 mm, an implant may be placed without the need for bone grafting or augmentation. Presence of three or more walls or a circumferential defect greater than 1.5 mm can support an immediate implant, but bone grafting and protection of the socket with a membrane is recommended.

Implant osteotomy

The next step is the preparation of the extraction area and the apical bone for the placement of the implant. If the site is a maxillary anterior tooth, the osteotomy must be kept on

the palatal aspect of the alveolus to prevent perforation of the buccal plate (Fig 2).

Once the osteotomy is prepared to the desired depth with at least 3 to 5 mm of intimate implant-to-bone contact, an implant is placed. The implant must be stable within the osteotomy with no mobility. 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.²⁰ 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 would look the same as a standard implant placement.

The implant-to-socket wall space

Studies have shown that close adaptation of the implant to the socket wall promotes greater osseointegration.^{18,21} 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.²²⁻²⁵

Bone healing in an implant osteotomy proceeds apical to coronal, much like that of an extraction socket;²⁶ therefore, the coronal aspect becomes the most critical in the healing. Current research favors the use of an occlusive barrier membrane to protect the healing socket area.²⁷

Postoperative management

A temporary prosthesis, either removable or fixed, can be placed over the implants. Removable prostheses should not put excessive pressure on the implant since this may result in overloading of the implant. While immediate implant loading has been shown to be as successful as delayed loading,²⁸⁻³² excessive loading can cause fibrous encapsulation around implants³³ and subsequent failure. New implant surfaces have been approved by the FDA for implant loading as early as 8 weeks, significantly shortening the time from implant placement to a provisional crown, but the greater size of bone-to-implant gap around some immediate implants may require longer healing times.

Soft tissue management

One of the most critical factors in implant restorative esthetics is the gingival form. The gingival tissues can be shaped and managed by the provisional prosthesis and by the provisional crown placed on the implant prior to placement of the definitive crown. In restoration of dental implants in the esthetic zone of the maxillary anterior teeth, it is recommended that a temporary crown be considered as part of the restorative treatment plan to help shape and form the peri-implant tissues prior to placement of the definitive crown. The use of anatomic gingival formers or single stage implants and the placement of implants without elevating a flap have significantly improved the clinician's ability to readily achieve excellent peri-implant gingival form.



Figure 5 Extraction site showing atraumatic tooth removal. Note the intact septal bone.

Advantages and disadvantages

The primary advantages of placing immediate implants are the reduction in time of therapy, reduction in surgical episodes, and preservation of the bone and gingival tissues. Greater rate of bone resorption occurs during the first 6 months following tooth extraction, unless an implant is placed or a socket augmentation procedure performed.²⁷ The early maintenance of the gingival

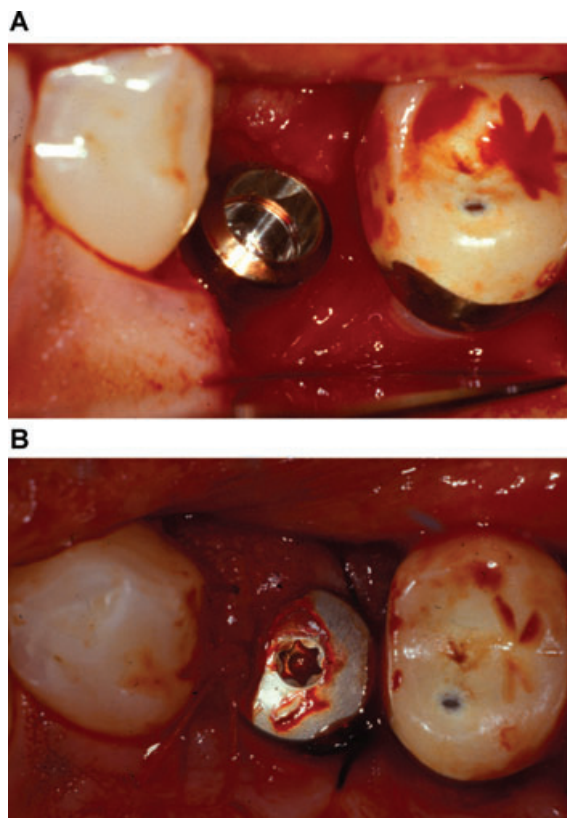


Figure 6 (A) Lingual view of implant site prior to bone grafting and placement of a resorbable collagen membrane. (B) Primary closure of flap with a combination of resorbable and silk sutures.

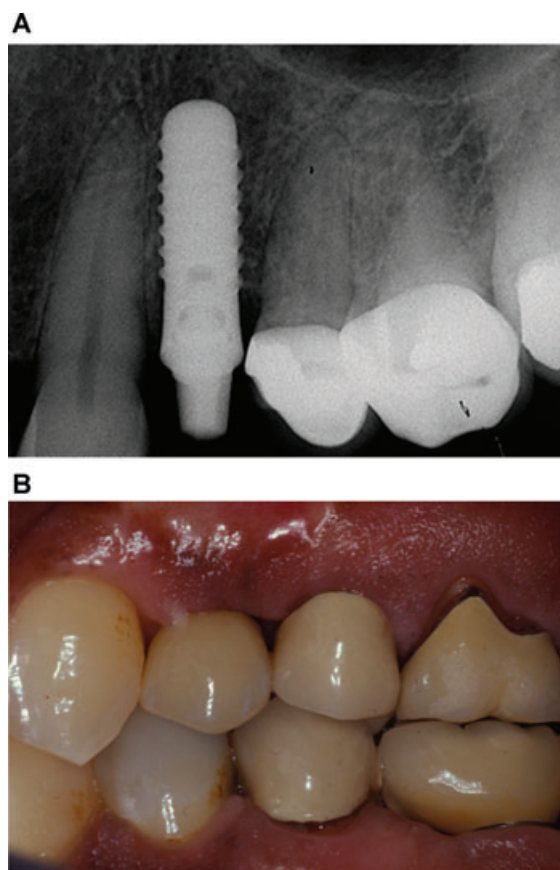


Figure 7 (A) Radiograph of implant and abutment 6 months after fixture insertion. (B) Buccal view after the case was completed. New crowns were placed on the maxillary first molar and mandibular molar implants (Restorations courtesy of Dr. Mary Parise).

form greatly facilitates the peri-implant gingival tissue esthetics by maintaining support for the interdental papillae.

Aside from the biological advantages of immediate implant placement, there are also psychological advantages. Although many patients readily accept delayed implant placement, some find it difficult to face the prospect of waiting up to 6 months for an extraction site to heal followed by an additional 3 to 6 months for the implant to osseointegrate.

In clinical practice, there often arises a situation when one is not able to place an immediate implant, even though it was planned. Hence, patients must always be informed that although immediate placement will be attempted, successful placement cannot be guaranteed. Factors such as tooth ankylosis, fracture of the buccal plate, socket expansion during extraction, or extensive infection might make immediate implant placement impossible or less predictable.

Potential disadvantages of immediate implant placement include, but are not limited to the following: (i) lack of control of the final implant position; (ii) difficulty obtaining primary stability; (iii) inadequate soft tissue coverage; (iv) inability to inspect all aspects of the extraction site for defects or infection; (v) difficulty in preparing the osteotomy due to bur movement (chatter) on the walls of the extraction site; and (vi) the added

cost of bone grafting. While all the disadvantages listed are not present in every situation, any can result in a compromised case.

Clinical case presentation

Figure 3 shows the clinical condition of tooth #12 in a patient who presented for immediate implant placement.

The tooth was originally treated with root canal therapy to be followed by crown lengthening, dowel core, and crown; however, clinical (Fig 3) and radiographic (Fig 4) evaluation revealed an unfavorable crown-to-root ratio and potential exposure of the furcation with crown lengthening.

Figure 5 shows that the anatomical concerns were justified upon examination of the septa in the extraction site. This figure shows that crown lengthening would have exposed the furcation and compromised the final result.

After careful inspection of the extraction site and removal of residual granulation tissue, an osteotomy site was prepared for an immediate implant using the principles outlined previously. The site was prepared through the septum of bone remaining after the extraction.

Figure 6A shows the implant immediately after placement. The area around the implant was grafted with freeze-dried demineralized bone allograft and resorbable collagen membrane and sutured to obtain primary flap closure (Fig 6B).

Clinical examination of the implant 6 months later revealed excellent soft tissue health and bone fill. Figure 7 shows the final radiograph and restoration in place. Note that the ideal occlusal scheme could not be re-established, because the patient could not afford full reconstruction.

Summary and conclusion

While implant insertion at the time of tooth extraction is desirable for a number of reasons previously discussed, there are a number of challenges, such as unfavorable extraction socket morphology, inadequate soft tissue for implant coverage, and bone defects, that may present unique challenges to the clinician in the quest for ideal implant position.

Dental implants that are placed immediately into carefully selected extraction sockets have high survival rates comparable to implants placed in healed sites.³⁴ The immediate placement of implants provides significant advantages, including fewer surgical procedures, shorter treatment time, and improved esthetics. There are significant areas of information that need to be clarified regarding the use of bone grafts either with or without barriers, around immediate implants. Until these are clarified with evidence-based studies, clinical judgment behooves dentists to use prudence in their case selection for immediate implant placement. The key to implant success is to achieve primary stability. There should be adequate contact of the implant to at least three of the four bony walls of the osteotomy.

Finally, there are many clinical advantages to immediate implant placement. As mentioned previously, the greatest advantage, which seems to be often implied although rarely mentioned, is the enormous psychological benefit this method of treatment offers patients. The loss of a tooth can be emotionally difficult for many, whether this stems from the actual loss,

the anxiety of undergoing a surgical procedure, or the thought of functioning in society with a missing tooth or poor replacement. In the case of immediate implants, the patient's loss is simultaneously replaced with little or no need for additional surgery and a long-term functional and esthetic restoration can be completed in just a few months.

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