Immediate Implant Success!!...Simplified

Neeraj Chandra, Veritika Srivastava, Shankar T Gokhale, Ashish Aggarwal, Shivangi Chandra, Arijit Sarkar

ABSTRACT

Diagnosis and treatment planning are key factors in achieving successful outcomes after placing and restoring implants placed immediately after tooth extraction. The efficacy of immediate implant placement has been established and shown to be predictable if reasonable guidelines are followed. Some or all of the following suggestions, depending on individual circumstances, should be considered when evaluating a patient for dental implants: thorough medical and dental histories, clinical photographs, study casts, periapical and panoramic radiographs as well as a linear tomography or computerized tomography of the proposed implant sites. Reasons for tooth extraction include root length, periodontal attachment levels, periodontal health of teeth adjacent to the proposed implant sites, unrestorable caries, root fractures with large endodontic posts, root resorption, teeth with deep furcation invasions being considered as need of endodontic retreatment.

Keywords: Dental implants, Computerized tomography, Dental scan, Furcation.

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INTRODUCTION

Nearly 45 years ago, the advent of implant dentistry changed our ideas about tooth replacement therapy for our patients. Branemark discovered that fully edentulous patients could be dentally rehabilitated using machined screws made up of commercially available pure titanium, which can be osseointegrated in the jaw bone, enabling the attachment of a fixed prosthesis. Since then, endosseous dental implant of various shapes and surface texture has been used in partially edentulous patients, achieving a measured rate of success of 96.7% at 8 years. Now to achieve this safe, predictable and cost-effective mechanism of rehabilitation, Branemark developed a list of clinical recommendation regarding treatment protocols. According to one of the recommendations, there should be waiting time of at least 12 months was necessary following tooth extraction before an endosseous dental implant could be placed. The rationale for this reasoning was to allow resolution of any hard or soft tissue pathology in a proposed recipient site.

The removal of single or multiple teeth will result in a series of the alterations within the edentulous segment of the alveolar ridge. Hence during socket healing, the hard tissue walls of the alveolar will resorb, the center of the socket will be filled with cancellous bone and the overall volume of the site will become markedly reduced. In particular, the buccal wall of the edentulous site will be diminished. There is also alteration of soft tissue in extraction socket and will undergo marked adaptive changes. Immediately after the tooth extraction, there will be lack of mucosa and the socket entrance is thus open. During the first week following the extraction of the tooth, cell will proliferate within the mucosa will result in an increase of its connective tissue volume. Eventually, the soft tissue wound will become epithelialized and a keratinized mucosa will cover the extraction site. The contour of the mucosa will subsequently adapt to follow the changes that occur in the external profile of the hard tissue of the alveolar process. Thus, the contraction of the ridge is the net result of bone loss as well as the loss of connective tissue.

There was a consensus report published in the year 2004, describing issues related to the timing of implant placement in extraction socket. Attempts had previously been made to identify advantages and disadvantages with early, delayed and late implant placements (Table 1).

WHY IMMEDIATE IMPLANT?

It has now become common to insert implants immediately after removal of teeth that were scheduled for extraction for various reasons. The advantages include easier definition of the implant position, reduced number of the visits in dental office, reduced overall treatment time and costs, preservation of bone at implant site, optimal soft tissue esthetics and enhanced patient acceptance.
Table 1: Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Definition</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Type 1</td>
<td>Implant placement as part of the same surgical procedure and immediately following tooth extraction</td>
<td>Reduced number of surgical procedures; Reduced overall time; Optimal availability of existing bone</td>
<td>Site morphology may complicate optimal placement and anchorage; Thin tissue bio-type may compromise optimal outcome</td>
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<td></td>
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<td>Potential lack of keratinized mucosa for flap adaptation; Adjunctive surgical procedures may be required</td>
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<td>Technique-sensitive procedure; Site morphology may complicate optimal placement and anchorage</td>
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<td></td>
<td>Increased treatment time; Varying amounts of resorption of the socket walls</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Adjunctive surgical procedures may be required; Technique-sensitive procedure.</td>
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<td>Increased soft tissue area and volume facilitates soft tissue flap management; Allows resolution of local pathology to be assessed.</td>
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<td>Type 2</td>
<td>Complete soft tissue coverage of the socket (typically 4-8 weeks)</td>
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<td>Type 3</td>
<td>Substantial clinical or radiographic bone fill of the socket (typically 12-16 weeks)</td>
<td>Substantial bone fill of the socket facilitates implant placement; Mature soft tissue facilitate flap management.</td>
<td>Increased treatment time; Adjunctive surgical procedures may be required; Varying amounts of resorption of the socket walls</td>
</tr>
<tr>
<td>Type 4</td>
<td>Healed site (typically &gt;16 weeks)</td>
<td>Clinically healed ridge; Mature soft tissue facilitates flap management.</td>
<td>Increased treatment time; Adjunctive surgical procedures may be required; Large variation in available bone volume.</td>
</tr>
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</table>

It was proposed that the placement of implant in fresh extraction socket may stimulate bone formation and osseointegration and hence counteract the adaptive alterations that occur following extraction of tooth. One can say in type 1 implant placement may allow the preservation of bone tissue of the socket and the surrounding bone.

Clinical studies in man and experiments in dogs have examined the influence of the immediate implant on bone modeling and remodeling in the surgical site.

**INDICATIONS FOR IMMEDIATE IMPLANT PLACEMENT**

According to William Becker, one can go with immediate implant placement when there is insufficient crown root ratio, furcation involvement, periodontal health status of teeth adjacent to the proposed implant site, nonrestorable carious lesion, root fracture with large endodontic posts, endodontic teeth with root resorption, periodontally hopeless tooth and nonvital tooth with fracture at gingival margin with roots shorter than 13 mm. Teeth requiring root amputation, hemisection or advanced periodontal procedures may have questionable prognosis and patients should be given the option of implant. Similarly, in cases of crown-lengthening procedures, removing 3 mm or more of the periodontal attachment during crown lengthening procedure may result in a root length less than optimal attachment level. Patients with thin biotype often show with tissue recession at implanted sites.

A minimum of 4 to 5 mm of bone width at the crest and at least 10 mm of bone length from the crest to the safe distance above the mandibular canal are recommended. Sufficient distance must also be available to the maxillary sinus and the floor of the nose.

**PRESURGICAL IMPLANT SIDE EVALUATION**

Diagnosis and treatment planning are key factors in achieving successful outcomes after placing and restoring implants placed immediately after tooth extraction. Following some or all of the following suggestions, depending on individual circumstances, should be considered when evaluating a patient for dental implants: thorough medical and dental histories, clinical photographs, study casts, periapical and panogram radiographs as well as a linear tomography or computerized tomography of the proposed implant sites.

In most cases involving immediate implant placement, it will be found that in the apical region of the sockets of anterior teeth and premolars in the maxilla, the bone lamella is significantly thinner labiobuccally than palatally. In the mandible, the lingual aspect of the socket is often thinner than the labial. These factors are important in selecting the most appropriate angulation of the pilot drills, which determine the longitudinal axis of the implant site. Failure to do so, may result in perforation of alveolar bone plates during drilling, which will significantly reduce the chance of success.

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 a useful diagnostic tool. Salisbury and Salama's preoperative 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.20

- **Type I:** Ideal for immediate implantation because of 4- or 3-wall sockets with minimal bone resorption. Sufficient bone available beyond the apex, acceptable 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 II:** 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 III:** 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.21

**PRETREATMENT CONSIDERATIONS**

The periodontist and other members of the dental team often share the responsibility of evaluating the patient for implants. A systematic coordinated plan delineating the responsibilities of each member of the team should be developed and followed. Treatment considerations for implant patients should include an evaluation of:

- Oral health status
- Medical and psychological status
- Patients motivation/ability to provide home care
- Patients expectation of therapy outcome
- The various habits and conditions which may place the patient at higher risk for implant failure e.g. alcoholism, smoking, bruxism, periodontal disease and radiation therapy
- Periodontal and restorative status of the remaining dentition
- Surgical considerations for patients requiring implant placement should include evaluation of: anatomy and location of vital structures, bone quality, quantity, and contour and soft tissues.22,23

The following diagnostic aids may be utilized in presurgical considerations to assist in determining the number, location, type, and angulation of the implants and abutments:

- Diagnostic casts, mounted or mountable
- Imaging techniques

- Surgical template
- Presence of infection and pathology.

Opinions vary from removing all residual infection prior to implant placement to the position that moderate infection (without active suppuration) is actually beneficial for immediate implant success.24 The most interesting comes from Gelb, who states that residual infection is not a contraindication. He argues that sites with residual infection (without active suppuration) have increased vascularity and cellular elements. Both vascular tissue and cellular elements are supportive of osseointegration, regeneration, and repair.25 Hence, the residual infection may provide a favorable environment. However, as with surgical criteria, clinicians must consider patient-specific factors such as cigarette use, alcohol consumption, oral hygiene, periodontal status, and the presence of an interim prosthesis.26

**PREVENTION OF CORTICAL BONE LAMELLA**

Every effort should be made to minimize bone trauma during surgical removal of the tooth. This can be achieved by sectioning the gingival attachment up to the tooth by means of the periosteum. After extraction, the socket should be thoroughly degranulated by careful curettage.27 The patient is anesthetized and various flap procedures can be used to gain access for tooth extraction. Many clinicians postpone treatment of sites exhibiting infection. Villa recently reported on a case series of patients where implants were installed immediately after extraction.28 The extracted teeth exhibited signs of periodontal or endodontic infection. At 2 years, the cumulative survival rate was 100%. The results of this study indicate that once the infected teeth were removed and implants placed, there are no adverse results for the implanted sites.29 Teeth to be removed and implants placed immediately after extraction can be accessed.

![Fig. 1: Atraumatic extraction of tooth](image-url)
using either an open, flapped approach or with a minimally invasive technique. Care must be taken while exercising the tooth, not to luxate buccal-lingually. Excessive force in this direction can damage the buccal plate. After tooth removal, a curette is used to explore the location of the buccal plate and confirm that it is intact (Fig. 1). Multirooted teeth must be sectioned and the remaining roots gently removed with mediostal luxation. The surgical guide is placed over the surgical site and a sharp precision drill is used to penetrate the palatal wall of the extraction socket. This drill guides the drills used to create the osteotomy. In the maxillary anterior region, it is important to avoid placing the implant directly into the extraction socket.

Placement of the implant in this position will invariably cause the implant to perforate the buccal plate and jeopardise implant survival. The axis of the implant must be even with the incisal edges of the adjacent teeth or slightly palatal to this landmark. A direction indicator should be used to verify the correct angulation and trajectory of the proposed implant. Standard drilling procedures are performed according to the manufacturer’s instructions. In the esthetic zone, the implant head should be a minimum of 3 mm apical to an imaginary line connecting the cementoenamel junctions of the adjacent teeth and apical to the interproximal and crestal bone (Fig. 2). A healing abutment or cover screw is placed in the implant. The healing abutment should be even with or slightly apical to the adjacent marginal tissues interproximal papillae adjacent to the implant can be adapted with interrupted sutures under minimal tension.

THE BONY GAP

On occasion, the marginal tissues do not adapt to the healing abutment. With a wide gap, experimental studies have shown that connective tissue will form between the coronal implant aspect and the surrounding bone. With small gaps, on the other hand, animal and human studies have demonstrated bone fill between the implant and the bone, with or without the use of grafting material or barrier membranes (Fig. 3).

In practice, when a bony gap is present, no effort is made to surgically advance the flap. A small amount of allograft or alloplast is layered between the bony margin and the implant abutment. This material is left exposed. Within a few weeks, some of the material will exfoliate and gingival mucosa will migrate over the exposed materials and provide an uneventful healing.

Results from studies using bovine bone to augment small gaps adjacent to immediately placed implants demonstrate that the bovine bone does not affect the survival of implants. It is important to recognize that placement of bovine bone, allografts, or other substances with or without barrier membranes may support or improve soft tissue contours; however, these materials cannot be relied upon to enhance osseointegration (Fig. 3).

DIAGNOSTIC CONSIDERATIONS

It is always advisable to go for either Denta Scan or CBCT before implant placement. DentaScan is a unique new computer software program which provides computed...
preoperative modeling of endosseous dental implants and subperiosteal implants. It enables the dental surgeon to visualize the bony structures preoperatively; he does not have to make decisions at the time of surgery when the mucoperiosteal flap is already elevated to visualize the bony structures directly (Figs 4A to C).

CONCLUSION

This paper has reviewed the predictability, rationale, treatment planning steps, and treatment for implant placement immediately after tooth extraction. Multicenter studies have validated the predictability of placing implants at the time of extraction provided these procedures are appropriately planned. To date, evidence for placement of bone substitutes adjacent to small bone defects related to immediately placed implants indicates that this technique appears safe, although these materials do not appear predictably to promote osseointegration.

There is insufficient evidence that socket preservation procedures predictably maintain socket anatomy without crestal resorption. Bone substitutes implanted into extraction sockets may interfere with normal bone healing and ultimately osseointegration. A minimally invasive surgical technique in the placement of immediate implants offers several advantages and should be employed wherever possible.

REFERENCES


Figs 4A to C: (A) Cropped panoramic view, (B) cross-sectional view and (C) three-dimensional view.

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