

Immediate Dental Implants: A Literature Review



Medical Science

KEYWORDS : Edentulism, Immediate Implant, Periodontology.

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ABSTRACT

Presently dental implants are one of the most exciting and rapidly developing aspects of dental practice. Implant dentistry has come a long way from skepticism to being accepted as the best modality to treat complete or partial edentulism. In the last two decades a great deal of activity in the field has occurred with the development of better materials and newer techniques that have resulted in improved clinical performance of implants. Placement of dental implants into fresh extraction sites offers a number of significant advantages to both the patients and the clinicians. Although some of the early implant practitioners assume that long term implant survival depended on placement on healed alveolar ridge, the growing body of evidence confirms that immediate implant placement yields excellent and predictable results. Considering the important role of a Periodontist in the insertion and maintenance of implant, the available literature has been reviewed

INTRODUCTION

Dental implants are small titanium metal screws that are placed into prepared sites in the jaw bone where they become solidly integrated with the bone. The implant can then be used to support crowns, bridges and dentures, eliminating the need for conventional dental plates or multi-unit bridges¹.

Presently dental implants are one of the most exciting and rapidly developing aspects of dental practice. Dental implant placement traditionally was advocated for healed extraction sites. However, with the development of a better understanding of the biologic principles of bone healing around dental implants, placement in fresh extraction sockets has been tried and reported with a high degree of success, such implants have been described as immediate implants. These are different from other similarly named implant procedures, namely immediately loaded implants and delayed immediate implants.²

Many researchers have advanced the idea of immediate implant placement. Lazzara in 1989 was one of the initial surgeons to attempt it. His rationale was better maintenance of alveolar architecture, the use of longer implants and shortened treatment times.³ Gomez-roman in 1997, using a tapered implant system reported a 98.84% five-year success rate with 83 implants placed immediately after extraction.⁴ These studies shows that now immediately after tooth extraction implants are being placed with good results.

INDICATIONS

The following are the indications of immediate implants.

- Endodontically failed tooth
- Root fracture,
- Root resorption
- Periapical pathology
- Root perforation
- Unfavorable crown to root-ratio (not due to periodontal loss).⁵

CONTRAINDICATIONS

Absolute contraindications to immediate implant placements have been agreed to by many and they are as follows;

- Presence of periodontal disease.
- Presence of acute/subacute periodontal or periapical infection.

Unfavourable anatomy
Bisphosphonates therapy.⁶

CASE SELECTION CRITERIA

General considerations

It is essential to first identify the specific oral problems of the patient. It is also important to discuss his or her esthetic and functional demands. The available bone volume must be assessed by palpation and/or probing through the mucosa, together with evaluation of obtained panoramic and periapical radiographs.⁷

Radiographic evaluation of the immediate implant candidate.

When considering the extraction of a tooth caused by a lack of periodontal support, root fracture, or no resolving periapical pathologic condition, a periapical radiographic image provides useful information. Occlusal radiographic images are helpful in assessing the mandibular symphysis.

Lateral Cephalometric radiographic images provide a one-to-one image of the relationship between the maxilla, mandible and the skull base.

The use of CT scans is advocated when more accurate information regarding the topography of osseous structures is needed. It gives information regarding availability of space for position, number and length of fixtures to be installed. It is a time saving method compared to conventional tomography and eliminates the need for panoramic and intraoral radiographs. The need to assess accurately the position of the inferior alveolar canal, the mental foramen, and the contour of the lingual surface of the mandible are primary indications for using CT.⁸

Surrounding Anatomy

Responsible case selection also involves careful examination of surrounding anatomical structures. One needs to take into consideration the proximity of structures such as the maxillary sinuses, the mental foramina, mandibular sublingual concavities, and the inferior alveolar neurovascular bundle. 3-5 mm of sound bone beyond the apex is desirable in order to better facilitate osseointegration.⁵

GUIDELINES FOR EXTRACTION WHEN PLANNING FOR IMMEDIATE IMPLANT PLACEMENT

The following guidelines for extraction are provided when

planning for immediate placements of implants.

Preoperative Evaluation

Patients should be thoroughly evaluated before all elective procedures. After immediate implant sites have been selected to ensure minimal risk to vital structures, the dentist should fabricate a stent that can be used as a guide to achieve fixture alignment during the surgical phase.

Antibiotic Therapy Initiation

If pre surgical evaluation reveals any sign of potential acute infection, antibiotic therapy should be initiated 3 to 5 days before surgery.

Preservation of the Bony receptor site

After reflection of the muco-periosteal tissues, care should be taken to remove the tooth with as little trauma as possible. The teeth may be brittle or even ankylosed to the surrounding bone, particularly when endodontic therapy has been previously carried out. In such cases, a high speed, contra-angle hand piece with a 700 XXL bur can be used to section the tooth longitudinally.

Procedural Delays

Placement of the implant should be delayed in presence of a purulent exudate. Patient should be informed of this possibility preoperatively.

Avoidance of excessive pressure

During socket preparation care must be taken not to create any form of pressure on thin cortical bone. Such excessive pressure can cause bone resorption, leading to failure because of compression or avascular necrosis.

Osteotomy preparation

Bone morphology dictates the feasibility, design and surgical approach to immediate implant treatment. There must be adequate bone around the implant to withstand the surgery and the stress during implant function. One millimeter of bone remains the empirically derived peripheral requirement. Anything less would be restrictive surgically and make perforation a likely risk.⁹

Improvements for placement

Ideally the implant should be sealed in at least two-thirds in the host bone. When adjacent vital structures allow it, the apex should be at least one mm to 2 mm longer than the tooth being replaced to improve the initial placement stability and the crown-root ratio for the final restoration. In addition the implant diameter at the cervical area should be as wide as possible to prevent soft tissue in growth. Above all, the implant should be totally immobilized in the site without benefit of graft material to assist it at this time. Failure to achieve immobility will greatly compromise the chances of osseointegration. If there is visible mobility, the implant should not be placed. The defect can be bone grafted, and the implant can be placed 4 months later. Replacing missing bone or adding to existing bone is very often essential to the success of an immediate implant and the ensuing restoration.¹⁰⁻¹¹

Bone grafting in case of marginal defects is an important step during the placement of immediate implants.

Brugnami et al. in 1996 and Dealemans et al. in 1997 recommended the use of autografts instead of allografts due to the absence of immune reactions associated with the former.¹²

Soft tissue closure

Primary closure of the soft tissues is usually recommended.

When closure is not possible, the use of vertical relaxing incisions or horizontal ribboning of the periosteum or both should be considered to increase flap manipulation.

Ladsberg CJ. in 1997 described immediate trans -gingival positioning of the implant after tooth extraction, covering the defect with a full thickness graft taken from the palatal region.¹³

Successful osseointegration

Osseointegration is defined as "a direct structural and functional connection between ordered living bone and the surface of a load carrying implant". It has also been described as "direct anchorage of an implant by the formation of bony tissue around the implant without the growth of fibrous tissue at the bone-implant interface". The chances for successful osseointegration can be increased by a stress-free nonfunctional healing period.¹⁴

SURGICAL TECHNIQUE

The surgical procedure is usually performed with the patient under local anesthesia, with conscious sedation, if necessary. At the desired site, after the extraction of tooth in question with minimum trauma to the surrounding tissues, the socket is debrided and irrigated to remove the remnant diseased and necrotic tissues.

The design of the soft tissue flap will have to accommodate for specific vital structures. In the anterior maxillary arch, where the patient exhibits a high smile and excessive exposure of gingival tissue, a horizontal incision across the palate is preferred to avoid any scarring of labial gingival tissues. Similarly in the posterior part of the mandible, where the mental nerve exits the foramen, a vertical incision will permit the adequate release of the soft tissue flap for proper exposure of the surgical site. Once the surgical site is exposed with adequate debridement of extraction socket, the osteotomy site is prepared with bone drilling. Low speed (less than 2000rpm) drilling tool with controlled torque is used for the osteotomy. Overheating more than 47°C as well as crushing and/or smearing of bone over medullary spaces must be judiciously avoided and achieved with low speed drilling and adequate cooling. Surgical templates with radiographic marker are helpful in determining the site as well as inclination of the proposed implant. A graduated series of drill sizes are indicated, bone debris in the drill flutes must be removed during site preparation. The placement of implant as well as soft tissue closure may vary as per the submerged and non-submerged implant systems as well as for the one-stage versus two-stage implant systems.

For the submerged or two-stage implant system, the soft tissue flap is closed after placing the implant and covering it with a healing cap. Similarly, for the one-stage implant system the soft tissue is closed after placing the gingival conformer over the implant. The point to remember is the placement of implant 1-3 mm sub-crestal in the anterior zone for esthetic emergence. After the closure of soft tissue, the removable prosthesis or screw retained acrylic provisional crown is placed depending on whether the implant system is two-stage or one-stage respectively. For optimum plaque control in the implant surgical site, the patient is prescribed 0.2% chlorhexidine mouth rinses for two weeks.¹⁵⁻¹⁷

ADVANTAGES AND DISADVANTAGES OF IMMEDIATE IMPLANTS

Advantages

Maintenance of soft tissue profile

Prevention of the bone loss in both vertical and horizontal directions

Reduces the need for augmentation procedures

Reduced number of surgeries, thus reducing the overall cost and morbidity

A significantly reduced period of wearing of an interim prosthesis that is usually removable and often objectionable to many patients hoping to receive a fixed implant- supported restoration

Eliminates the emotional trauma associated with loss of anterior teeth

Post extraction alveolar process resorption is reduced thus affording improved functional and esthetic results.

Shortening in treatment time, since with immediate placement it is not necessary to wait 6-9 months for healing and bone neo formation of the socket bed to take place.

Preservation of the vestibular cortical component allows precise implant placement, improves the prosthetic emergence profile, and moreover preserves the morphology of the peri-implant soft tissues thereby affording improved esthetic-prosthetic performance.

Single tooth-by-tooth reconstruction provides easy access for the patient to floss and clean the areas compared with the relative difficulty in maintenance when crowns are splinted.

Disadvantages

More extensive soft tissue manipulation is required if the submerged healing protocol for immediate implants is to be used.

The procedure may be technically more demanding.

The ideal modality for the treatment of marginal voids is subject to considerable controversy. (Use of bone grafts and barrier membranes)

The additional cost associated with grafting and use of barrier membrane offsets the perceived advantage that the cost is lower due to a lesser number of surgeries.²

IMPLANT LOADING

A submerged healing period of 3– 6 months was originally considered a prerequisite for achieving osseointegration of titanium implants. However, during the past 10–15 years this traditional protocol has been questioned and numerous clinical studies have reported on the outcome of early and immediate loading of implants in various clinical situations.¹⁸

EARLY LOADING

The implant is loaded with the provisional / definitive prosthesis within days/weeks of the implant being placed. More specifically it is in between immediate loading (i.e. within 24 hrs of implant placement) and delayed loading (i.e. after the conventional healing period of 3-6 months). Testori et al. placed 475 implants in the posterior region of mandible of 175 patients and restored within two months. Out of which 9 implants were failed with 97.7% of survival rate after 3 years.⁴⁰ Cochran et al. placed 383 sandblasted, acid-etched, and large- grit implants in posterior jaws of 307 patients with loading after 6-9 weeks. The survival rate

after 1 year was 99.1%.¹⁹

IMMEDIATE LOADING

The therapeutic goal of implant dentistry is not merely tooth replacement but total oral rehabilitation. Modern technology and design allows predictable placement of dental implants in immediate extraction sites. It is also possible to load the implants at the time of placement using a composite temporary bridge. Following osseointegration, the implants are permanently restored with individual crowns.

Ledermann showed as early as 1979 that immediate-loaded titanium plasma-sprayed screw implants (Straumann) could support overdentures in the mandible. The first report on immediate-loaded Branemark implants with fixed prostheses was presented in 1990 by Schnitman et al. Five or six Branemark implants were placed between, and two additional fixtures were placed distally to the mental foramina. Three of the installed implants in strategic positions were connected to a provisional prosthesis, converted from the patient's denture. The remaining fixtures were allowed to heal in a conventional manner. The authors concluded that the implant treatment was successful in seven patients, who were reconstructed with a mandibular fixed-detachable bridge. Also, the overall, long-term implant therapy was not adversely affected by using the immediate-loading technique.²⁰

REASONS FOR IMMEDIATE IMPLANT FAILURE AND COMPLICATIONS

Dental implant failures are very rare. Failure in surgery is due to improper selection of patients. Implants fail for numerous reasons. They could be biological or microbiological factors, biomechanical factors, biomaterial factors, or due to implant surface treatments. Complications involved in the dental implant procedure are nerve damage, infection, the body's rejection of the implant and the implant itself breaking. The most widespread cause of dental implant failure is poor oral hygiene. Good oral hygiene can greatly reduce infection. Improper selection of patient is another reason for dental implant failure. Patients with sufficient quality or quantity of bone to support the implant fixture only are to be selected for the implant surgery. Otherwise, implants are doomed to be utter failures. Medical history and systemic health of the patient should be clearly checked by the dentist before surgery.

Another possible reason for implant failure may result from insufficient irrigation of the surgical site or from using low torque and excessive drill speed during placement. Failure results from extreme temperature elevation in bone during placement, leading to necrosis of the supporting bone around the implant. Inadequate implant restorations may also contribute to implant failure. Poorly restored implants may have overhangs or be over-contoured, which may lead to plaque buildup and ultimate failure. Smoking can also lead to higher rates of dental implant failure. The implant patient should not smoke since smoking is exceptionally harmful to all oral tissues, especially when implants are present. It affects the healing of bone and soft tissue, by reducing the nutrients and minerals in the tissues and by reducing blood supply.²¹

CONCLUSION

The increased esthetic demand as well as short course of successful treatment option has drawn the attention towards the use of immediate implant placement with immediate or early loading. This option not only eliminates or reduces the healing period of conventional implant ther-

apy, but the patients can return to their normal daily life with provisional or definitive prosthesis attached over it.

Current evidence suggests a high success rate of 95% - 98% with immediate implant placement and loading when case selection criteria have been well followed.²² Hence immediate dental implant case selection based on sound clinical practice and research can maximize the advantages afforded by immediate implants and minimize treatment failures.

REFERENCES

- Keiji Koyanagi, Development and clinical application of surgical guide for optional implant placement. The journal of prosthetic dentistry. Vol 88(5) Nov 2002; 548-552.
- Khurram A et al. Implant Placement in Extraction Sockets: A Short Review of the Literature and Presentation of a Series of Three Cases. Journal of Oral Implantology. 2008; 34(2): 97-106.
- Lazzara RJ. Immediate implant placement into extraction sites: Surgical and restorative advantages. Int J Perio Rest Dent 1989; 9:333-43.
- Gomez Roman G, Schulte W, d'Hoedt B, Axman Kramer D. The Frilalit 2 Implant system: Five year clinical experience in single tooth and immediate post extraction applications. J oral Maxillofac implants.1997;12:299-309.
- Kumar AG. Criteria for immediate placement of oral implants – a mini review. Biology and Medicine.2012; 4 (4): 188–92.
- Cartsos VM, Zhu S, Zavras AI. "Bisphosphonate use and the risk of adverse jaw outcomes: a medical claims study of 714,217 people". *Journal of the American Dental Association*.2008; 139 (1): 23–30.
- Wagenberg BD, Ginsburg TR. Immediate implant placement on removal of the natural tooth:retrospective analysis of 1.081 implants.Compendium of Continuing Educ Dent 2001; 22: 399-404.
- Andersson J-E, Svartz K: CT Scanning in the preoperative planning of osseointegrated implants in the maxilla. Int J Oral Maxillofac Surg 1988;17:33-35.
- Jack H. The Emergency Implant: Immediate Extraction Replacement in the Esthetic Zone. International Journal of Oral Implantology and Clinical Research.1 2010;1(1):1-10
- Abbush CA. Extraction immediate implant placement: 5- year statistical review. Presented at the Annual Meeting of the Academy of Osteointegration, Orlando, 1994.
- Hahn J. Indication for the use of tapered implants, Den t Surg Products 1997;4:34.
- Ibbott CG, Kovach RJ, Carlson-Mann LD et al. Acute periodontal abscess associated with an immediate implant site in the maintenance phase: a case report. Int J Oral Maxillofac Implants 1993; 8: 699-702.
- Dealemans P, Hermanns M, Godet F et al. Autologous bone graft to augment the maxillary sinus in conjunction with immediate endosseous implants: a retrospective study up to 5 years. Int J Periodontics Res Dent 1997; 17: 27-39.
- Becker W, Lynch SE, Lekholm UA et al. Comparison of ePTFE membranes alone or in combination with platelet-derived growth factors and insulin-like growth factor-1 or demineralized freeze-dried bone in promoting bone formation around immediate extraction socket implants. J Periodontol 1992; 63:929-40.
- Becker W, Goldstein M. Immediate implant placement:treatment planning and surgical steps for successful outcome. Periodontology 2000.2008;2:79-89
- Qiu LX, Lin Y, Li JH. Minimally invasive extraction and immediate implant placement with single-stage surgical procedure: a clinical observation of 21 cases. Zhonghua Kou Qiang Yi Xue Za Zhi. 2007 ;42(11):647-50.
- Gomez-Roman G, Kruppenbacher M, Weber H, Schulte W. Immediate postextraction implant placement with root-analog stepped implants: surgical procedure and statistical outcome after 6 years. Int J Oral Maxillofac Implants. 2001;16(4):503-13.
- Testori T, Alan M. Immediate occlusal loading of Osseotite implants in the lower edentulous jaw. Clin Oral Impl Res 2008; 15:278-84.
- Cochran DL, Buser D, Weingart D et al. The use of reduced healing times on ITI implants with a sandblasted and acid etched (SLA) surface. Clin Oral Implants Res 2002;13:144-153.
- Schnitman PA, Wohrle PS, Rubenstein JE et al. Immediate fixed interim prostheses supported by two-stage threaded implants: methodology and results. J Oral Implantol 1990; 16: 96–105.
- Internet reference <http://ezinearticles.com/?Dental-Implant-Failure&id=405361>.
- Nkenke E, Fenner M. Indications for immediate loading of implants and implant success. Clin Oral Impl Res 2006; 17:19-34.