

IMMEDIATE IMPLANT LOADING: A CASE REPORT

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KEY WORDS

**Steri-Oss Replace Select
Transfer coping
Trichannel implant connection
TorqTite screw**

The therapeutic goal of implant dentistry is not merely tooth replacement but total oral rehabilitation. Considering dental implants as a treatment option can provide patients with positive, long-term results. Implants have developed into a viable alternative to conventional prosthetic reconstruction of edentulous areas. They provide excellent support for fixed or fixed detachable appliances, which increases function compared with conventional complete dentures. Implant dentistry has gone through many phases over the years. Modern technology and design allows us to predictably place our dental implants in immediate extraction sites and often load the implants at the time of placement. 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. This case study demonstrates full maxillary and partial mandibular reconstruction using dental implants. The implants were surgically placed immediately after extractions and loaded using a stable roundhouse composite temporary bridge. Following osseointegration, the implants were permanently restored with individual crowns.

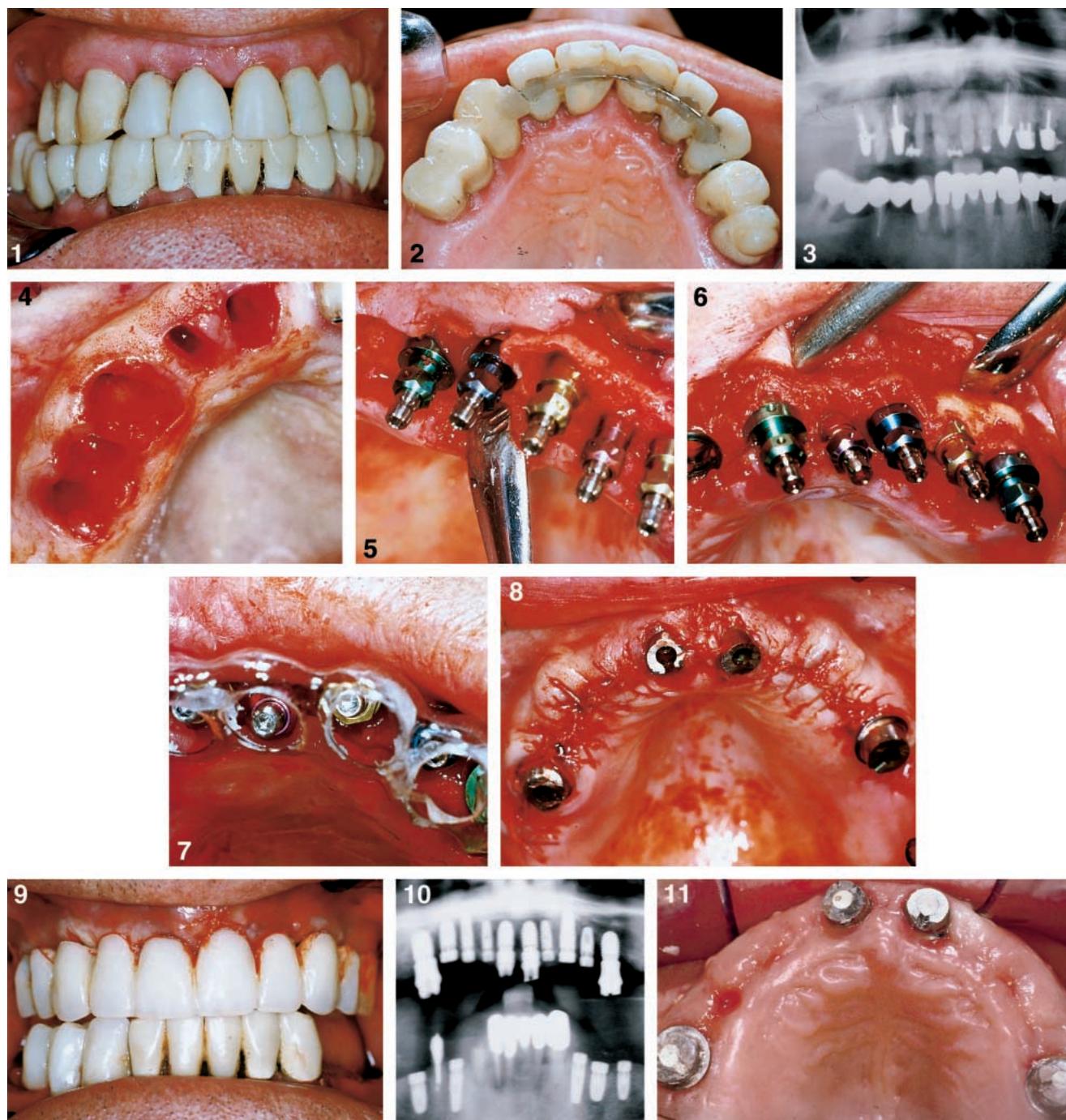
INTRODUCTION

Dental implants have long provided an excellent treatment option to restore edentulous spaces. The advent of the endosseous implant provided relative surgical simplicity. Patient understanding of the benefits of dental implant therapy is a motivator to patient acceptance. Conventional reconstruction with complete dentures has been a popular treatment option for many generations. Today, however, people with existing dentition often have a hard time psychologically accepting the idea of a removable appli-

ance. The concept of placing dental implants to support individual teeth is a newer concept with a positive solution to a difficult situation.¹ Smile design and emergence profile are key components in dentistry. Being able to restore dental implant in a tooth-by-tooth pattern, that is, in single freestanding units, is an exciting idea. The *Steri-Oss Replace Select* dental implant system is state of the art; it has three 1.5-mm-deep internal channels, which increases stability of the abutments, a tooth-root shape, and various crestal diameters that closely match the natural tooth size. The confidence in restoring

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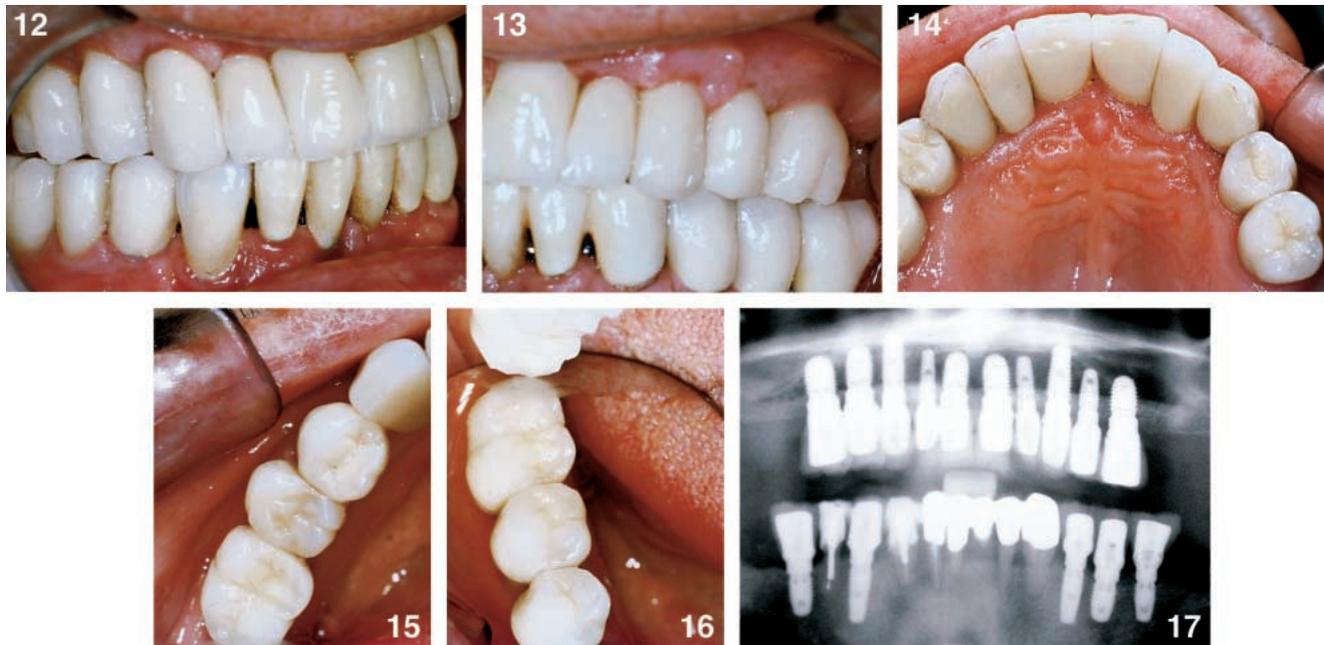


FIGURES 1-11. FIGURE 1. Preoperative intraoral view of maxillary dentition. Note the tissue irritation and compromised esthetics. FIGURE 2. Occlusal view of maxillary dentition preoperatively. Anteriors were splinted to retain. FIGURE 3. Preoperative panoramic radiograph. Note extensive periodontal bone loss. FIGURE 4. Extraction site in maxilla. FIGURES 5 AND 6. Color-coded insertion assemblies of maxillary implants placed in immediate extraction sites. FIGURE 7. Try-in of surgical stent illustrating proper implant positioning. FIGURE 8. Four strategically positioned abutments placed in 6.0-mm-diameter implants to retain maxillary composite temporary bridge. FIGURE 9. Panoramic of implants in position. FIGURE 10. Composite temporary bridge in place immediately after implant placement. FIGURE 11. Tissue health around abutments prior to second-stage surgery. Note health of gingiva.

edentulous areas with tooth-by-tooth dental implants provides the practitioner with a cost-effective technique that allows exceptional crown and

bridge esthetics. Once implants are surgically placed following extraction, temporization has to be considered. In the past, we were most comfortable

temporarily restoring the edentulous areas with removable appliances. Patients are often not responsive to this treatment. They prefer not to be eden-



FIGURES 12–17. FIGURES 12 AND 13. Final individual maxillary crowns in place. FIGURE 14. Occlusal view of crowns in place. FIGURES 15 AND 16. Mandibular right and left individual crowns in position. FIGURE 17. Final panoramic radiograph with crowns in position.

tulous for any length of time, let alone 6–12 months. The *Replace Select* system allows for immediate loading of temporary crown and bridgework. This case study will demonstrate the surgical technique used in placement of the *Replace Select* implant system, immediate loading of 4 strategically placed implants with a stable composite bridge, and final fabrication of individual crowns.

MATERIALS AND METHODS

The *Steri-Oss Replace Select* (Nobel Biocare, Yorba Linda, Calif) implant system was introduced in 1997. The implant has a tapering body and an internal prosthetic connection. The internal connection design is trichanneled. The internal length of the channels is approximately 1.5 mm. The implant has a wide crestal interface with a tapered thread design. The diameters, at the crest of the implant, are 3.5 mm, 4.3 mm, 5.0 mm, and 6.0 mm. This allows for a better emergence profile from the top of the implant. Anatomical considerations for the use of the implant include converging roots and concavities with the bone, which makes placing a parallel-

walled implant more difficult. Interface area of the implant increases dramatically as implant diameter increases. This may be more relevant than implant length. The tapered design of the implant promotes elevated levels of fatigue endurance since the coronal portion is wider in diameter than the apical portion. This taper also ensures a tight fit and promotes function coronally to help offset stress shielding along the narrow, smooth crestal band on the implant. This reduces bone resorption that may result from hypofunction. This is especially important during placement of the implant in a fresh extraction site. The taper also reduces the incidence of cortical plate bone perforation during osteotomy preparation near anatomic undercut areas and protects adjacent natural tooth roots.² The tapered design of the implant also often allows for better angulation of the implant. It is important to have an implant design that allows for placement of the fixture in a way that places forces down its long axis. Each *Replace Select* implant has a preattached insertion assembly with 3 noticeable machined dimples. The dimples axially coincide with the internal

connection to facilitate ideal alignment of the implant. The implant system has versatility and allows for esthetics and variable bone morphology.

A 73-year-old patient presented with significant periodontal bone loss, mobile maxillary teeth, which had been splinted over a period of years, and mobility in the mandibular right and left posterior region. The patient's medical evaluation revealed that he was a controlled type II diabetic. Hypertension was treated with various medications. His main concern was the looseness of the maxillary teeth and that food was trapping between his teeth.

The goal in treatment was to retain as much natural dentition as possible, replace missing teeth immediately following extraction, and create a positive dental experience. The patient was insistent that a maxillary complete denture would be unacceptable. In determining the course of therapy, the remaining bone was evaluated with panoramic and periapical radiographs. Although the dentition had little bone support, there was no sign of active infection. It was determined that place-

ment of dental implants in the socket areas followed by immediate placement of a composite temporary bridge would achieve our goals. The mandibular implants would be left unrestored during healing.

A thorough examination was performed clinically and radiographically. There was adequate width and height of bone to accept dental implants. Significant bone loss was noted around the maxillary right central and lateral incisor, which may cause the final crowns to appear longer in the area. This was not a major esthetic concern, however; due to a relatively low smile line. Tapered threaded dental implants were selected for initial stability and rapid osseous adaptation.

Figures 1 through 3 illustrate the esthetics and radiographic condition of the maxillary teeth from right to left second bicuspid and the mandibular right first bicuspid and first molar and left first and second bicuspid and first molar. It is obvious that the teeth in question required extraction. Options proposed include a conventional maxillary complete denture and mandibular removable partial denture, restoration using splinted dental implants, or single-unit implant retained crowns. The patient preferred to have single teeth in the areas to better simulate the function and esthetics of his dentition prior to extraction. Manual dexterity and ability to maintain the area was also considered.

The first surgical stage involved extraction and implantation (Figure 4). Angulation of the implants is determined by use of a surgical stent (Figures 5 through 7). This provides a guide for the emergence profile of the final crowns. Labial and lingual attached gingiva were elevated from the bone. Smile considerations are critical to the final esthetic result; therefore, as much tissue as possible should be supported by bone. Care was taken to not fracture the labial plate, and the sockets were curetted and evaluated for implant placement.

Angulation was determined by the

socket position. The *Replace Select* surgical kit (Nobel Biocare), which features color-coded surgical drills, implants, and prosthetic components to coordinate the selection of the tooling and implants, was used to perform step-by-step drilling. A round bur created the initial depression, and appropriate depth was referenced using a 2-mm-diameter pilot drill properly angled with the surgical stent and evaluation of the existing socket. Parallel pins were used to ensure orientation of the drill and subsequent implant positions. A 2.7-mm-diameter intermediate depth drill was next used to the predetermined depth, which was referenced by lines of the drill. The proper diameter tapered-depth drill was used to enlarge the implant site to the final diameter. Drilling was performed using 800 rpm to the top of the flutes. A thread former was used to make the final preparation prior to implant placement, rotating at 30 rpm.

Anatomic restrictions would not allow proper surgical placement in the maxillary molar areas, but since the patient had functioned reasonably well with second bicuspid occlusion, it was determined that that is all we would require. For this patient, the emergence profile was obtained by choosing the implant diameter closest to the missing root. This eliminated the need for ridge lapping of crowns and provided for better crown contours and periodontal maintenance.

The maxillary central incisor implants were initially placed. These were 6-mm-diameter by 10-mm-height implants, mirroring the natural root contours. The 3.5-mm by 10-mm implants were placed in the lateral positions, again duplicating the root form of the natural teeth. The 6-mm by 10-mm implants were placed in the second bicuspid areas, 5-mm by 10-mm implants in the maxillary right first bicuspid area and left canine area, and 4.3-mm by 10-mm implants in the right canine area and left first bicuspid area. The widest implants possible were used to obliterate the existing

socket sites. Length was determined by the position of the floor of the nose and sinuses. Machined abutments were prepared and placed into the 4 wide-bodied 6-mm implants and would act as initial support of a splinted composite bridge.

Each color-coded implant was carried to the surgical site with a color-coded insertion assembly, consisting of 2 pieces. A ratchet was required to place the threads. The threads are considered to be diminishing threads, where the apex compresses bone instead of threading, and engage the bone at the crest. This allows for immediate stabilization of the implant without placing excessive stresses on the adjacent bone. The implant also has a 2-mm machined collar for bone and tissue health at the crest.

The insertion assembly was then separated using a 0.05-in hex driver. Healing screws were inserted into the smaller maxillary implants. Salvaged autogenous bone was placed on the labial defect area of the right central and lateral incisor to plump up the gingiva. The gingiva was repositioned using 4.0 Vicryl sutures. Suturing is extremely important to maintaining tissue position.

Figure 8 radiographically illustrates the implants in place. Suturing is done around the prepared machined abutments (Figure 9). The composite temporary bridge was cemented using Temp Bond. This allowed for easy clean up and removal as necessary during suture removal (Figure 10).

This provisional appliance was not removed following suture removal. Studies show that immediate loading of implants with provisional prostheses after stage 1 surgery can result in a high success rate. Immediate loading attempted is usually attempted in edentulous arches only and the provisional creates crossarch stability. The implants should be at least 10 mm long.^{3,4} Wider diameter implants with increased surface area and that are immediately stable may give the most reliable result. The widest possible anterior-posterior distribution of im-

plants should be utilized to provide resistance to rotational forces. Cantilevers should be avoided. The mandibular arch would be restored with 4.3-mm by 13-mm implants in tooth areas 21 and 28, 4.3-mm by 10-mm implants in the 19 area, and 5.0-mm by 10-mm implants in areas 20 and 30. The diameter and height of the implant used was determined by the amount of available bone.

Following approximately 6 months of healing, the surgical site was evaluated (Figure 11). It is clear that, although there was some tissue shrinkage from the prepared abutments, the gingiva appears pink and firm. The tissue over the buried implants healed well. Fixtures are considered to be successfully integrated if they are in function without complications, there is no sign of radiographic radiolucency, and the mean marginal bone loss does not exceed 1.5 mm in total or 0.2 mm between scheduled examinations. The implants also need to be clinically stable.⁵

The tissue over the buried implants was removed using a simple tissue punch. Color-coded implant transfer assemblies were placed into each of the implants. To restore the implants properly, the laboratory working model must be a replica of what is seen intraorally. A radiograph is taken to ensure proper positioning of the impression posts into the implants.

Vinylpolysiloxane medium- and heavy-bodied impression materials were used. The transfer assemblies were removed and threaded into the appropriate color-coded implant analog. These were placed into the impression. The transfer assemblies have 3 flat sides and are shaped like a baseball diamond. This allows for accurate positioning of the assembly into the impression. The assembly can only fit in one way and is firmly seated. Heal-

ing abutments 3 mm tall were placed into all the implants except the 4 retaining the maxillary temporary. The temporary was relined to accept these taller components. This retained tissue continuity and allowed for tissue healing.

Dental laboratories need to consider the depth of the soft tissue and whether the abutments to be used should be straight or angled. The titanium abutments were prepared slightly subgingival to allow for the emergence profile. In this situation, straight abutments were selected and prepared with a slightly subgingival margin almost 0.7 mm from the top of the implants. The abutments were engaged into the implants and TorqTite screws tightened to 35 Ncm with a torque driver. Conventional porcelain fused to gold crowns were fabricated and seated over the prepared abutments. The crowns were cemented with Improv, a urethane-based eugenol-free provisional cement (Figures 12 through 16). Due to the size and position of the implants, the crowns resemble more closely the shape of a natural tooth without ridge lapping.

RESULTS

Figure 17 illustrates the final panoramic radiograph of the single implant crowns in position. Establishing triangular tissue in the interdental area can be challenging in the best of circumstances. The contour of porcelain helped establish some interdental papilla shapes. The individual crowns allowed for easier maintenance and patient compliance. Immediate loading of the implants placed within the socket sites with a temporary composite bridge provided the patient an outstanding alternative to a removable denture. It also made the decision to

have the proposed therapy psychologically bearable.

DISCUSSION

The *Steri-Oss Replace Select* implant system allows for surgical predictability, reliable osseointegration, simple prosthetic techniques, easy laboratory control, and prosthetic stability. Smile design and emergence profile considerations were addressed with proper planning and execution of the technique. Esthetic limitations should be addressed prior to implant placement. Various diameters of implants provide an opportunity for immediate loading due to increased surface area for osseointegration. Providing single tooth replacement of sequentially missing teeth is an outstanding treatment option.

REFERENCES

1. Adell R, Eriksson B, Lekholm U, Brånemark PI, Jemt T. Long term follow up study of osseointegrated implants in the treatment of totally edentulous jaws. *Int J Oral Maxillofac Implants.* 1990;5:347-359.
2. Weiss C, Weiss A. *Principles and Practice of Implant Dentistry.* St. Louis, Mo: Mosby; 2001.
3. Tarnow D, Emitaz S, Classi A. Immediate loading of threaded implants at stage 1 surgery in edentulous arches: ten consecutive case reports with 1- to 5-year data. *Int J Oral Maxillofac Implants.* 1997;12:319-324.
4. Lozada J, Tsukamoto N, Farnos A, Kan J, Rungcharassaeng K. Scientific rationale for the surgical and prosthodontic protocol for immediately loaded root form implants in the completely edentulous patient. *J Oral Implantol.* 2000;26:51-59.
5. Brånemark P et al. Brånemark novum: a new treatment concept for rehabilitation of the edentulous mandible. Preliminary results from a prospective clinical follow-up study. *Clin Implant Dent Related Res.* 1999;1:2-16.