SINGLE-STAGE, IMMEDIATE LOADING, AND FLAPLESS SURGERY

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KEY WORDS

Flapless
Implant surgery
Immediate loading
Single stage

With appropriate patient selection, single-stage surgery, immediate loading, and flapless site preparation are dependable treatment approaches that offer significant benefits to implant patients. This paper briefly reviews the history of these approaches and describes the conditions necessary to achieve long-term success. Case studies also are included.

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INTRODUCTION AND BACKGROUND

Over the course of 30 years of experience in implant dentistry, the author has had the opportunity to observe long-term success and failure with various techniques and devices. An inescapable conclusion is that mobility determines the interface. When implants have been placed using atraumatic surgical techniques with no detectable mobility at the time of placement and have been stabilized so that no forces were exerted to cause movement during function, osseointegration and a favorable long-term prognosis usually have been achieved.

The author's initial experience from 1970 to 1985 was mostly with blade-type implants. These generally were loaded and placed into function immediately since they had a fixed abutment post as part of the implant. When placed in good quality (Type II) bone, stable fixation and long-term survival generally resulted. When placed in poor quality (Types III or IV) bone, they were less stable at the time of insertion. Movement during the healing phase sometimes resulted in fibrous tissue encapsulation, soft-tissue change, bone loss, and eventual implant removal.

The introduction of two-stage submergible blade implants helped eliminate the possibility of early implant loading that would cause movement, especially in poor quality bone. As a result, implant survival rates began to rise. When root-form endosseous implants (Fig 1) were developed, the concept of placing them atraumatically and allowing them to heal out of function became accepted as the best way to promote osseointegration.[1,2] In fact, the successes achieved by this approach made it tempting to embrace it as the only acceptable one. In recent years, however, when site conditions allow, a number of practitioners have once again begun placing implants using a one-stage procedure—that is, placing the implants so that their coronal portion protrudes through the soft tissue and a second surgical exposure is not necessary.[3]

The conditions necessary for achieving superior success rates when placing endosseous root-form implants in a single-stage procedure are analyzed,

FIGURE 1. Replace tapered implants are a recent example of root-form endosseous implants.

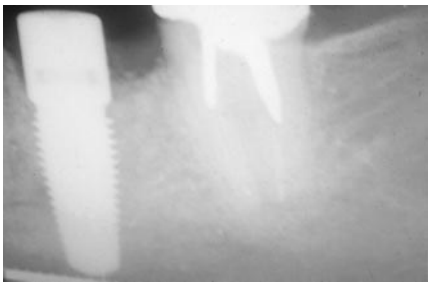


FIGURE 2. The radiograph shows a 5-mm tall healing abutment on a 6-mm diameter Replace implant placed immediately after extraction of a mandibular first molar.

as well as subsequent refinements to this approach, namely loading the implant at the time of placement and placing the implant without soft-tissue flap reflection. Case studies illustrating these approaches are included.

SINGLE-STAGE PLACEMENT

First, the indications for single-stage implant placement are addressed. Presently the author is placing approximately 700 implants annually and utilizing the single-stage technique for about 30% of these cases. The implants are placed in the hard and soft tissue at a level that obviates the need for any soft- and hard-tissue surgical manipulation after healing. The implant cover screw is already exposed and ready for removal prior to insertion of the abutment. Alternatively, if the soft tissue is greater than 2 mm in thickness, a low-profile healing tissue abutment may be utilized.

Clinical conditions for which the single-stage technique may be considered are as follows: (1) good quality bone (Types I or II)[4]; (2) adequate bone width and height (sufficient for placement of a 3.8-mm diameter, 12–mm–to 16-mm–long implant); (3) adequate keratinized soft tissue (at least 3 mm); (4) the presence of adjacent teeth that can absorb the occlusal forces and thus protect the implant from function that could initiate movement; and (5) the ability to completely stabilize the implant at the time of placement.

To accomplish single-stage placement, the soft tissue is first reflected and the bone is prepared to accommodate an implant of the desired length and width. The implant is positioned so that the top 1.0 to 1.5 mm (depending on the thickness of the soft tissue) extends above the crest of the bone (Fig 2). The implant cover screw or low-profile healing abutment is inserted and tightened, and the soft tissue is sutured so that the cover screw or abutment is left exposed. In the aesthetic zone, the doctor may choose to utilize a temporary partial prosthesis that has been hollowed in order to avoid placing any stress on the healing implant.

After a 3- to 6-month healing period, the cover screw or healing abutment is removed (Figs 3–6). The implant is then restored conventionally.

IMMEDIATE LOADING

Once single-stage placement became routinely successful, the next conceptual step was to consider immediate loading. Immediate loading refers to attaching the abutments and a fixed provisional prosthesis at the time of implant placement and is not a new concept. As described above, one-piece blade-form implants with fixed abutments were being placed and immediately put into function 20 years ago. What is new is the realization that most failures with single-stage placement can be avoided by careful attention to certain key requirements.

The requirements for immediate loading are (1) good quality (Types I or II) bone; (2) the ability to place an implant that is 12 to 16 mm long; (3) adequate keratinized soft tissue; and (4) the ability to protect the healing implant(s) from excessive occlusal forces. This can be achieved when adjacent teeth can be used to keep the fixed provisional prosthesis out of occlusion or when the implants are placed in an edentulous arch opposing a denture.

It should be noted that both single-stage placement and immediate loading are not restricted to healed alveolar ridges. Often when the patient's remaining mandibular teeth are removed, the implants can be inserted immediately into the extraction sites,[5,6] followed by placement of the abutments, suturing of the soft tissue, and placement of a provisional fixed prosthesis. In such instances, the implants must be longer than the teeth they are replacing, thus improving the crown-to-root ratio and providing for increased stability.

Case study

The patient was a 58-year-old man outfitted with a maxillary denture. His

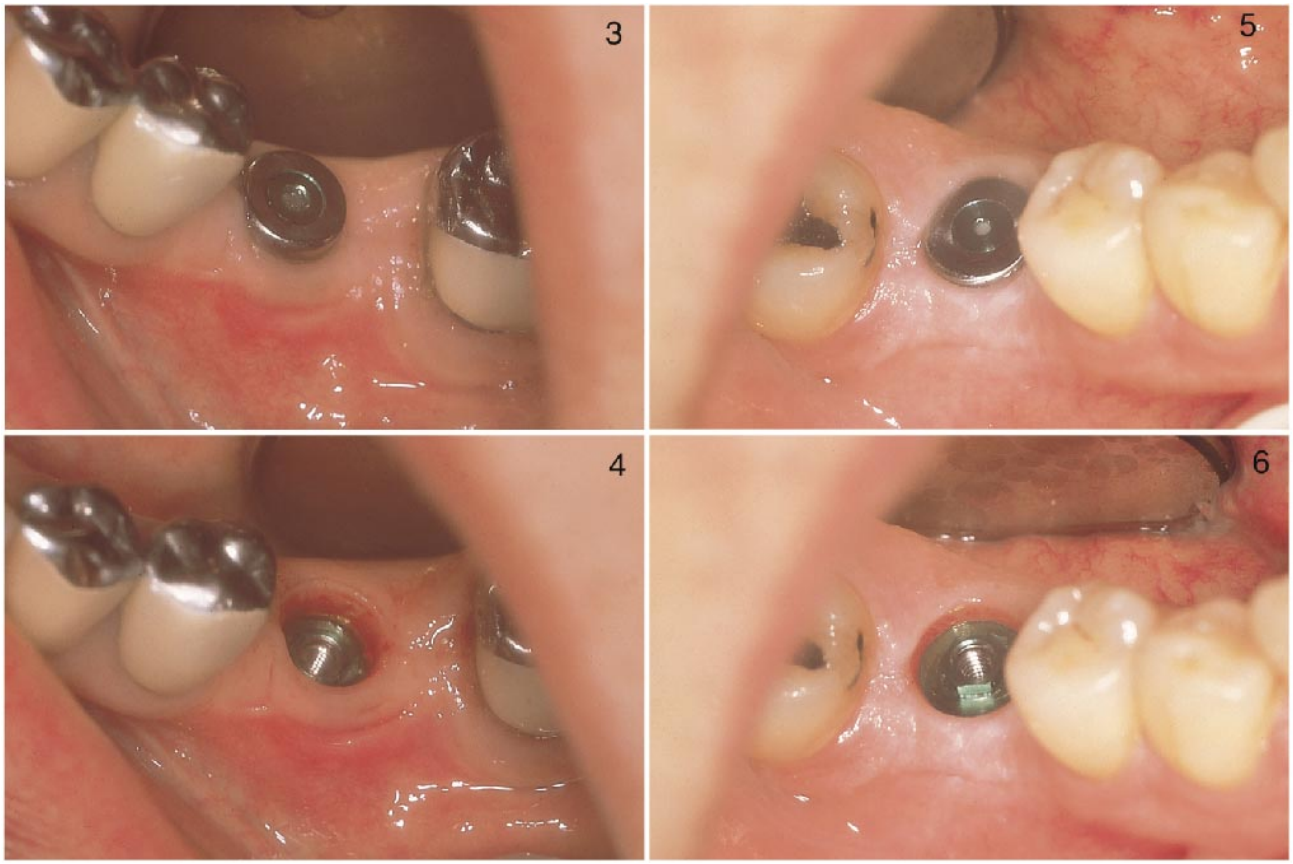


FIGURE 3. The implant shown in Fig 2, after healing.
FIGURE 4. After removal of the healing abutment shown in Fig 3, healthy soft tissue can be seen surrounding the implant.
FIGURE 5. Exposed cover screw of a 5-mm–diameter Replace implant, after healing.
FIGURE 6. After removal of the cover screw shown in Fig 5, healthy soft tissue can be seen surrounding the implant.

seven remaining mandibular teeth all exhibited Case 3 mobility and more than one-third crestal bone loss.

The teeth were removed, and six 16-mm–long Replace tapered implants (Nobel Biocare, Yorba Linda, Calif) were placed into the prepared sockets (Fig 7). Fixed abutments were attached, and the soft tissue was sutured (Fig 8).

A fixed acrylic provisional prosthesis was fabricated by using a heat-processed form that was constructed from the diagnostic wax-up (Fig 9). Temporary crown-and-bridge resin was placed in the form, and the form was then positioned over the lubricated sutures and abutment. The patient was instructed to close into centric relation occlusion. The temporary was then removed before its final set and allowed to harden out of the mouth. Excess acrylic was removed, and the margins were trimmed so that there was no impingement on the tissue. One pontic was swung off each side. Occlusion was examined and refined. The temporary was polished and cemented with ImProv provisional cement (Nobel Biocare) (Fig 10).

After 3 months the temporary prosthesis was removed. The parallelism of the implant abutments was adjusted, and the margins were refined to conform to the healed soft tissue (Fig 11). Interocclusal records were taken, and the patient's temporary was refitted.

The final fixed ceramic metal prosthesis was fabricated, tried in, adjusted, and cemented with ImProv (Fig 12). The finished case is seen in Fig 13, the panoramic radiograph.

Flapless Surgery

Last, let us examine the possibility of so-called flapless surgery, or the placement of implants into the bone without soft-tissue flap reflection requiring sutures after implant placement. Avoiding the creation of a flap results in less postoperative patient discomfort. Furthermore, leaving the periosteum intact on the buccal and lingual aspects of the ridge maintains a better blood supply to the site, reducing the likelihood of resorption.[7]

In the flapless surgical technique, a round tissue punch is used to remove the soft tissue on the crestal bone at the implant site. Before using the tissue punch, the clinician is advised to use a bone caliper to measure the buccal-lingual dimensions of the bone at approximately three different points: the top of the ridge, near where the center of the implant will be positioned, and near where the apex of the implant will be. These measurements should reveal

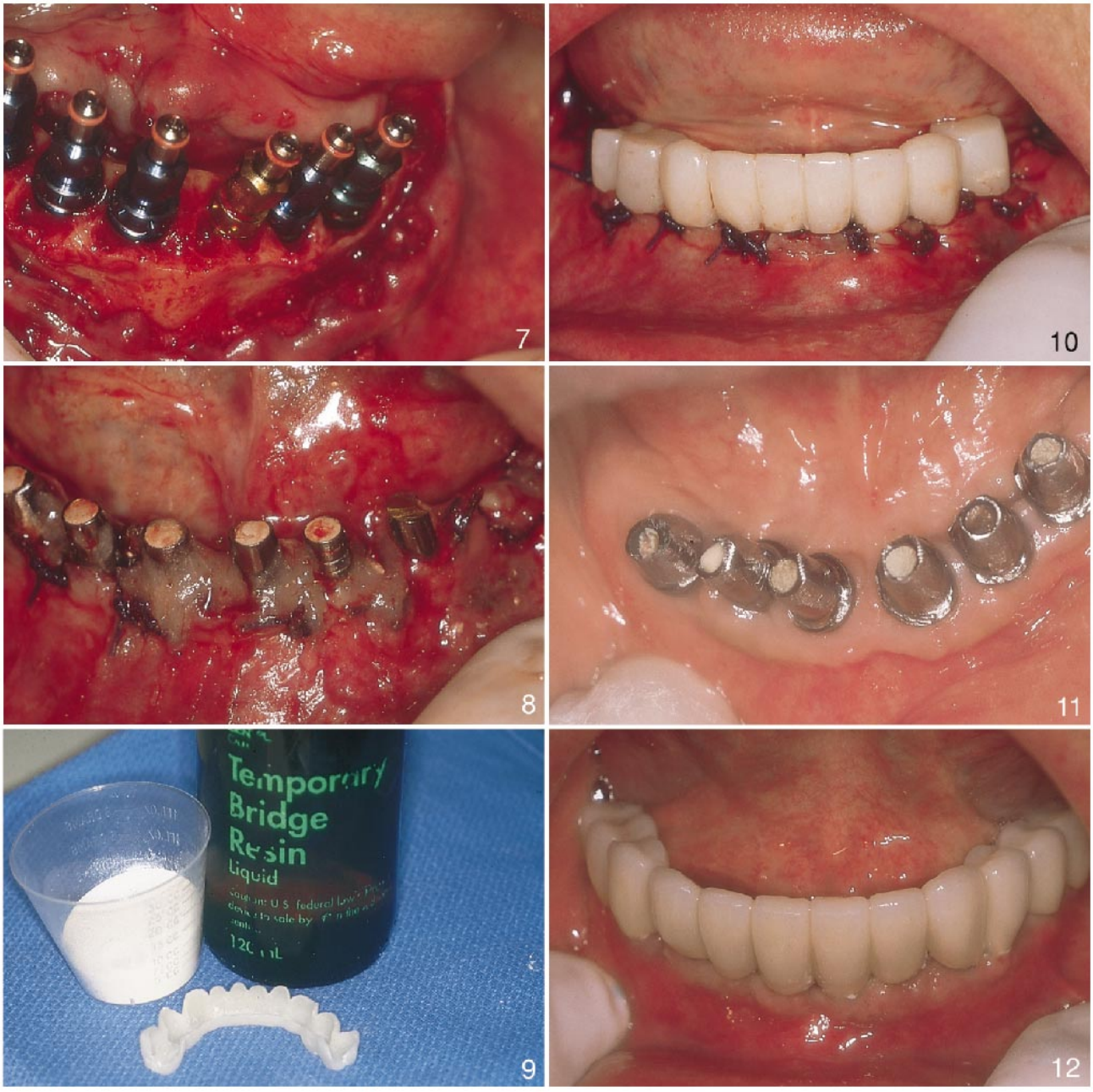


FIGURE 7. Six 16-mm–long tapered threaded implants have been placed into the fresh extraction sockets.
FIGURE 8. After the placement of fixed abutments, the soft tissue was sutured.
FIGURE 9. Fabrication of the fixed acrylic provisional prosthesis, showing temporary shell.
FIGURE 10. The provisional prosthesis is secured with provisional cement.
FIGURE 11. Healed soft tissue around the fixed abutment after 3 months.
FIGURE 12. The final ceramic metal prosthesis in position.

the presence of any undercuts in the bone. If an undercut of more than 15° is detected, traditional flap reflection is recommended to allow for greater visibility when placing the implant. If no significant undercut exists, the tissue punch is employed and a curette is used to remove the plug of soft tissue, exposing the bone. A number 3 round bur is used to penetrate the cortical bone, followed by a pilot drill. The implant is then inserted in the standard manner.

The flapless technique may be considered in conjunction with either single-stage placement or immediate loading. The same principles that are followed for both of these techniques must be observed in the flapless procedure, with the following additional factors: (1) more keratinized tissue

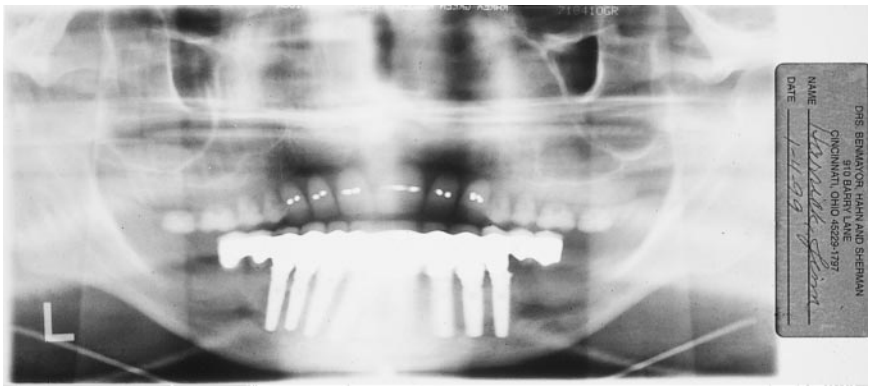


FIGURE 13. Panoramic radiograph of the completed implants and restoration.

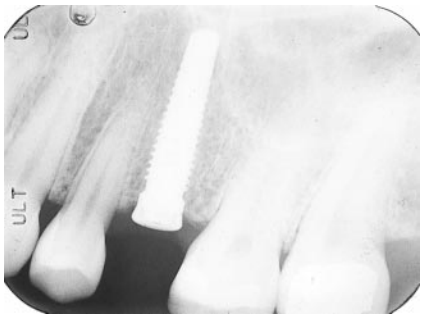


FIGURE 17. A periapical radiograph confirms that the 4.3-mm–diameter, 16-mm–long tapered implant has been placed mesial to the mesial anterior wall of the maxillary sinus.

must be present (at least 5.0 mm) because the flapless procedure requires the actual removal of some of the tissue; and (2) more bone width (at least 4.5 mm) must be available without undercuts of more than 15°. Since visibility is more limited when using the flapless technique, it is more difficult to ensure that the implant is positioned in the center of the crestal bone. Greater ridge width offers the practitioner an extra margin of safety.

Case study

The patient was a 35-year-old woman with a missing maxillary premolar. The area met the described conditions for a single-stage flapless surgery technique. A tissue punch was used to remove a circular plug of tissue directly over the osteotomy site.

The bone was entered to the desired depth using a 2-mm pilot drill. A radiograph was taken to check the angulation (Fig 14). An osteotomy was then created to accommodate a 4.3 mm, 16-mm–long, HA-coated, Replace tapered implant. The implant was inserted so that 1 mm of its hex remained superior to the crest (Fig 15). The fixture mount was removed and replaced with the implant cover screw (Fig 16). A periapical radiograph was taken, and this revealed that the tapered threaded implant was placed mesial to the mesial anterior wall of the maxillary sinus (Fig 17).

After a 5-month healing interval, the cover screw was removed and a fixed straight abutment was placed. An im-

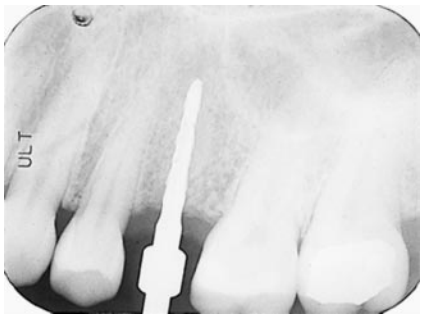
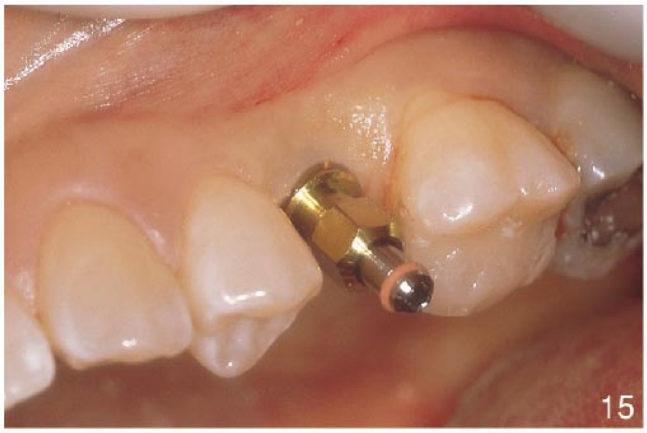


FIGURE 14. A radiograph is taken to confirm that the depth and angulation of the pilot drill hole are correct.



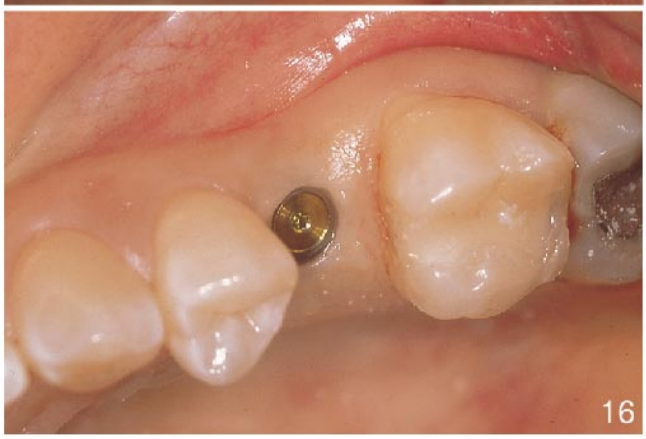


FIGURE 15. The implant, with fixture mount, is being inserted so that the hex remains 1 mm above the crest of the soft bone.
FIGURE 16. The implant cover screw is inserted and secured.

pression was taken along with a bite registration, and a temporary crown was fabricated and cemented. Three weeks later, a ceramic metal crown was placed and secured with provisional cement.

IMPLANT SELECTION

Threaded root-form implants are best suited when employing any of the three techniques discussed in this paper, since the threaded designs offer greater stability than do cylindrical root forms.[8] Tapered threaded implants may be an even better choice, since the tapered design further enhances the initial stability.[8] Because of the biological bonding promoted by hydroxylapatite coating,[9,10] the author routinely utilizes HA-coated implants.

CONCLUSION

Single-stage implant placement, immediate loading, and flapless surgery can result in success rates that are as high as those of conventional two-stage surgical techniques when proper techniques are utilized and patients with good bone quality, adequate keratinized tissue, and adequate bone height and width are selected. All three techniques can contribute to a higher degree of implant treatment acceptance due to less discomfort and generally shorter treatment times.

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