IMMEDIATE REPLACEMENT OF NONRESTORABLE ROOTS

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KEY WORDS

Natural emergence profile
Expandable dental implant
Postoperative protocol
Atraumatic extraction
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Quality of bone
Immediate fixture abutment (IFA)

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The following paper represents a case report describing procedures and techniques that have been successfully performed clinically over a period of 52 months. The intent of these procedures is to replace nonrestorable roots in fresh extraction sites with immediate fixture placement and provisional prosthesis placement at the time of fixture placement.

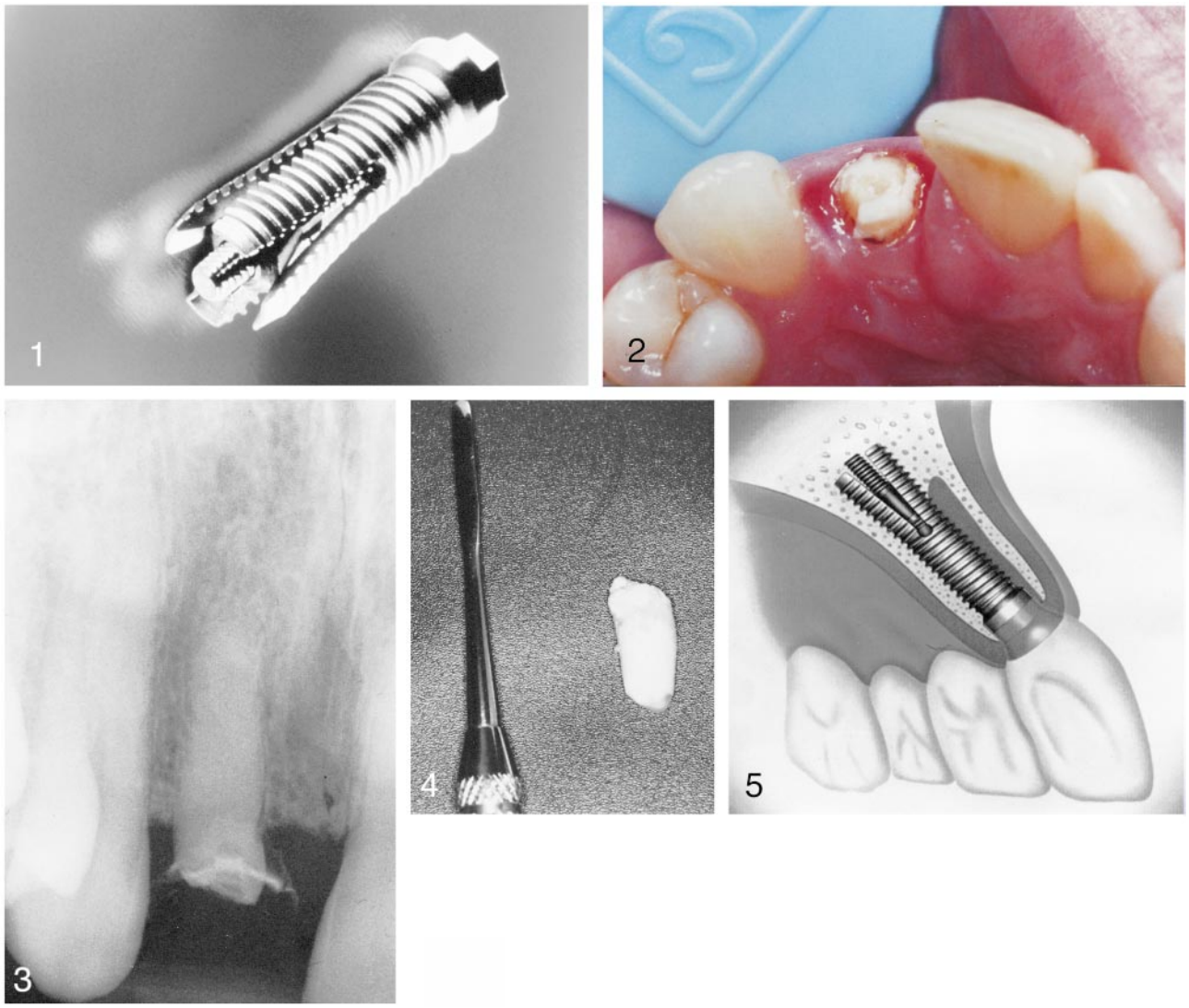
INTRODUCTION

Over a 25-year period in general family practice, the age of patient population changes, and therefore the needs of the patients change. As people age, the problem of failed endodontically treated teeth and fractured teeth increases and the challenge of restoring the damage becomes greater. In the past the routine way a general dentist treated these problems was to extract the failed tooth and prepare the adjacent teeth for a fixed prosthesis. With the advent of osseointegrated dental implant fixtures, dentists have been able to offer an alternative treatment and can now replace the nonrestorable tooth without altering the adjacent dentition. The typical routine for the general dentist is to offer this alternative and refer the patient to a dental implant specialist (periodontist or oral surgeon). The patient would present to the specialist, and 4 to 6 months later (sometimes longer depending if osseous or soft tissue grafting is involved) the patient would return to the referring dentist for the final prosthesis. This treatment has been reliable and consistent.

Over the last few years the immediate placement and loading of fixtures has become a subject of interest for our profession. A number of dentists have been placing and restoring, with provisional restoration, fixtures at the time of placement.[1–4] Recently, there has been an interest in filling fresh extraction sockets with fixtures and provisional restorations. Wöhrle[5] has had relatively good results in placing and immediately provisionalizing root-form fixtures (Replace, NobelBiocare, Yorba Linda, Calif). Salama et al[6] reported acceptable results with immediately restoring stepped-cylinder, nonthreaded, root-shaped fixtures (Frialit-2, Friadent Inc, Irvine, Calif).

To date, there are no scientific reports (only clinical reports) to indicate predictable immediate loading on a single-tooth freestanding dental implant. It seems that this evolution will continue until a reliable and predictable immediate-load implant system is perfected.

Predictable freestanding immediate-load dental implants in fresh extraction sockets can fulfill many of the areas of concern not currently addressed by



FIGURES 1–5. FIGURE 1. Sargon dental implant. FIGURE 2. Slide of preoperative fractured anterior tooth. FIGURE 3. Preoperative radiograph. FIGURE 4. Periotome used for atraumatic extraction. FIGURE 5. Correct angle of fixture placement.

conventional methods. One benefit is the ability to extract a dental root in the aesthetic zone and provide a restoration that will preserve the original form and function without osseous or soft tissue grafting. Additional advantages of immediate placement and provisionalization of a fixture is preservation of the original emergence profile and papillary anatomy with correctly contoured restorations. Preservation of the original soft tissue, dental arch integrity, and occlusion can allow aesthetics and patient satisfaction to be realized.

METHODS AND MATERIALS

The Sargon expandable dental implant (Sargon Enterprises Inc, Beverly Hills, Calif; Figure 1) was developed in 1990 by a general dentist to address the problem of replacing nonrestorable teeth. It is composed of titanium alloy (Ti, 90%; Al, 6%; V, 4%).[7] The design of this implant allows placement and stabilization at the time of extraction. It is available in lengths of 10, 13, and 16 mm. The diameter is 3.8 mm at the body and 4.1 mm at the collar. It can be expanded to 6.8 mm depending on the length of the fixture.

Case history

A 36-year-old woman with an unremarkable medical history was referred by a local orthodontist to treat her fractured anterior tooth, which was injured in a boating outing. The patient presented with what appeared to be a central incisor fractured at the crest of the ridge (Figure 2). The patient said she had lost tooth 8 in a bicycling accident as a young girl, and tooth 7 was moved orthodontically to the position of tooth 8. A few years later the tooth was restored with a porcelain crown, which she found and saved at the time

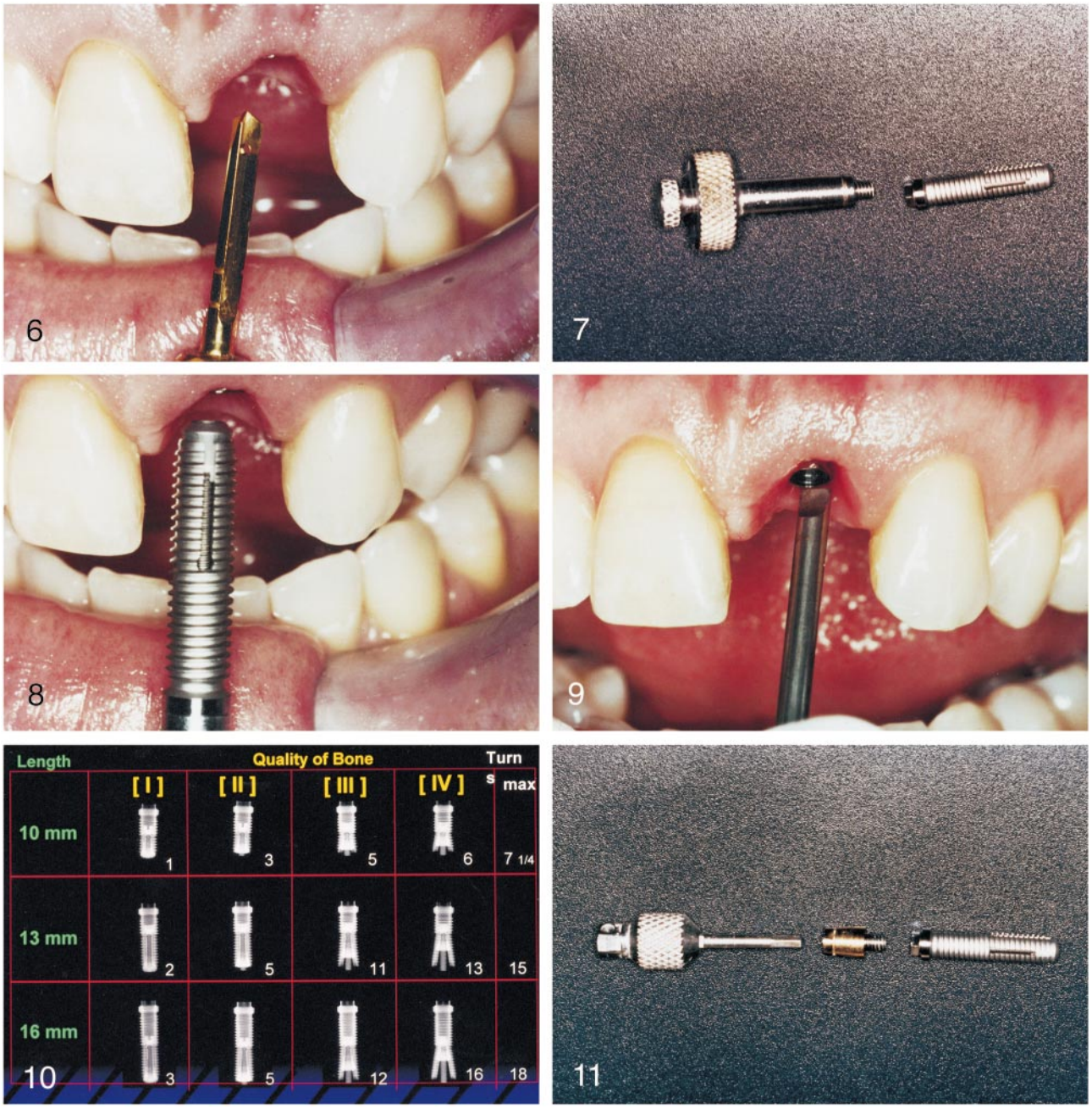
of the accident. Her hope was that her old crown could be recemented.

Clinical evaluation of the area around tooth 8 noted that the buccal plate of bone was intact (indicated by examination through the buccal mucosa with a periodontal probe). The periodontium was healthy and pink in color with normal probing measurements. Radiographically there was no infection or radiolucency present at the apex (Figure 3), and the canal appeared to be calcified. The tooth was deemed nonrestorable. After reviewing her treatment options, the patient decided to replace her existing nonrestorable root with a dental implant.

The surgical procedure, after routine premedications and local anesthetic, was to atraumatically extract tooth 7 with periotomes (Figure 4). The objective was to keep the buccal plate and surrounding soft tissue intact during the extraction. The Sargon surgical system is comprised of a 2 mm diameter spiral drill, a 2-mm pilot drill, 2- to 3-mm guide pin, 3-mm guide drill, 3.5-mm final drill, and 4.1-mm counterbore drill. All surgical drills were internally irrigated. Since this implant was not self-tapping, surgical taps were necessary and came as a 3.8-mm pilot tap and a 3.8-mm final tap at 17 and 23 mm lengths. The length of the implant was predetermined using the diagnostic aids available, such as periapical and panoramic radiographs (CT scans where necessary) and study models. In this case, a 13 mm length was chosen. After the extraction, the 2-mm rossett or spiral drill was used to establish the initial angle and location for the osteotomy. An rpm setting of 1200 to 1500 was used for the surgical drills using a reduction ratio of 1:16. The original angle of the root socket (Figure 5) could not be used for the osteotomy because of the possibility of perforation of the buccal plate; the angle was corrected and placed slightly palatal. Once the initial opening was established, the 2-mm pilot drill (Figure 6) was used to establish trajectory of the osteotomy. Care was taken not to injure the adjacent roots. At this point a digital radiograph (Megapixal Systems, DMD, Westlake Village, Calif) was taken with the guide pin in place to confirm angulation. The 3.0-mm guide drill was then used to prepare for the use of the 3.5-mm final drill. Clinical experience tells us that the final drill ends 0.5 to 1.0 mm longer than the intended implant, a fact that needs to be considered at the diagnostic stage. The 4.1-mm counterbore drill was used to establish the resting area for the 4.1-mm collar of the implant. It was at this point that the use of the dental implant motor was complete. The next step was to establish the thread for the implant. Using hand pressure, the pilot tap was inserted in the osteotomy with the tap hand driver (the tap system is configured for engine handpiece use if necessary, but the manufacturer recommends hand torque). The pilot tap was used to initiate the thread formation for the implant. It is suggested that the tap should be inserted and turned until the thread formation is established (about one-third the channel depth). The final tap was placed to the length of the osteotomy. The osteotomy was now ready for dental implant placement. The manufacturer suggests using hand torque for the insertion of the implant. The sterile implant was removed from the package and the implant driver (Figure 7) was connected to the implant. The implant was inserted into the osteotomy to length (Figure 8), and its position was then confirmed with a digital radiograph. The manufacturer suggests that the top of the implant should be 3 to 5 mm below the level of the cemento-enamel junction of the adjacent teeth. This allows a natural emergence profile with the provisional and final restoration.

Once proper depth of the fixture has been established, the next step was the expansion procedure. The expansion instrument (Figure 9) was inserted into the coronal aspect of the implant and engaged the expansion screw slot. The instrument was turned clockwise by hand until it could not be turned with finger pressure. A radiograph was then taken. The quality of bone was determined radiographically as well as by the number of turns required to stabilize the implant (according manufacturers guidelines; Figure 10). Loading of the implant with a provisional restoration depends on the amount of expansion that is accomplished at the time of surgery. The manufacturer's recommended type of bone for immediate loading is type I and II. Type III and IV bone is too soft for immediate loading and should be treated as a conventional implant. The experience of this author is that usually with fresh extraction sockets where there is no infection, the quality of bone is type I or II and can be immediately loaded with a provisional restoration. A conventional implant-level transfer impression can be taken that allows laboratory fabrication of the abutment and temporary crown. Alternatively, prefabricated titanium abutments (straight, 15° or 25° angles) or the manufacturer's aesthetic immediate fixture abutment (IFA) can be employed. In this case the IFA was used for immediate loading (Figure 11). The patient also kept the original prosthesis (Figure 12), which was relined with acrylic (Kulzer, Irvine, Calif) and cemented with noneugenol cement (Temerex, Freeport, NY). Because the original crown was used as the provisional restoration, the patient was very pleased. For ease of removal, a releasing channel was placed in the lingual of the crown. The procedure was accomplished in 1.5 hours. A postoperative phone call was placed to the patient that evening. The patient reported that she was comfortable and had experienced no pain.

The postoperative protocol recommended by the manufacturer (Figure 13) was followed. A critical aspect of postoperative care for this system was to avoid traumatic occlusion on the fixture. Care was taken to check the occlusion at every postoperative visit.



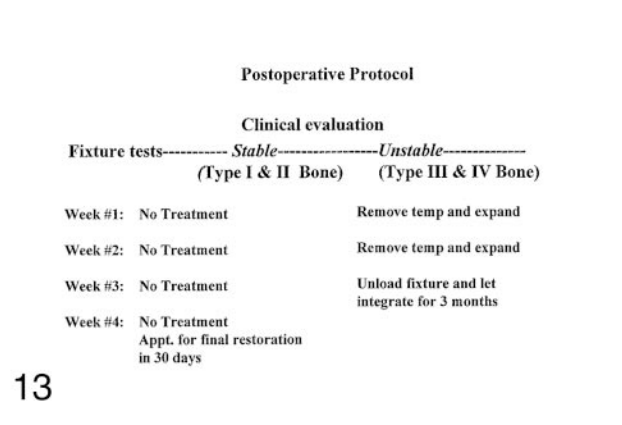
FIGURES 6–11. FIGURE 6. Two-millimeter pilot surgical drill. FIGURE 7. Expandable implant and implant hand driver. FIGURE 8. Fixture being placed into the osteotomy. FIGURE 9. Expansion instrument. FIGURE 10. Quality of bone as related to fixture expansion. FIGURE 11. Immediate fixed abutment (IFA).

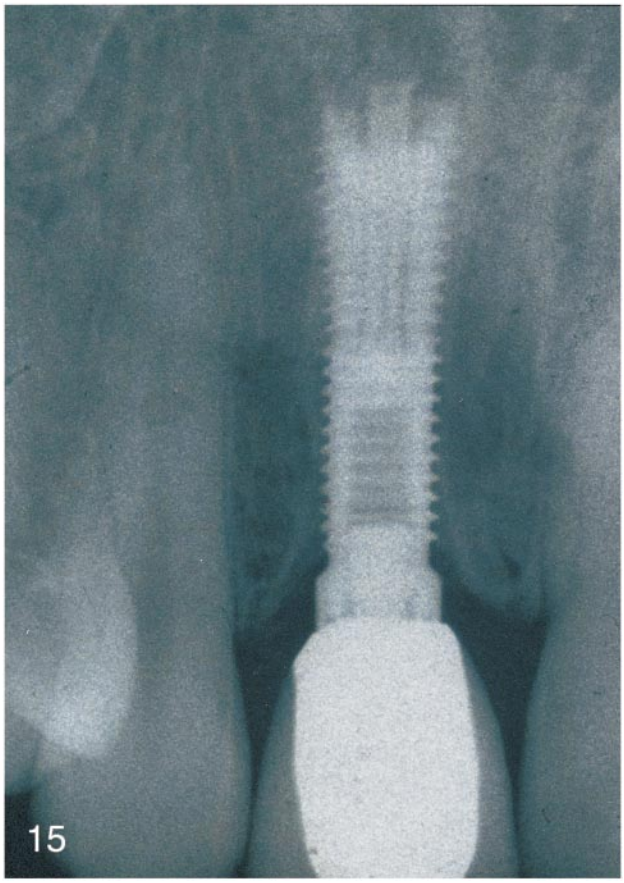
The slightest amount of traumatic occlusion at this critical stage of integration can cause failure. Over the next 3-week postoperative period of evaluation, the implant required no expansion and appeared to be stable, which was confirmed with the appropriate radiographs and clinical evaluation testing for mobility and stability. The implant was allowed to integrate for 8 weeks.

With this system the impressions for the final restoration can be taken using conventional techniques. The final restoration was fabricated and delivered to the patient for cementation using silicon cement, which can be retrievable (Improv, NobelBiocare).

RESULTS

The final restoration was placed (Figure 14) and a final radiograph was taken (Figure 15). Note the health of the surrounding gingival structures as well as the preservation of the natural and original emergence profile (Figure 16). In this case the patient was very





FIGURES 12–16. FIGURE 12. Original prosthesis used as a provisional restoration. FIGURE 13. Postoperative protocol. FIGURE 14. Final prosthesis. FIGURE 15. Emergence profile. FIGURE 16. Final radiograph.

satisfied because she was able to retain her original crown as a provisional restoration and received a new crown for the final restoration without altering her adjacent teeth.

DISCUSSION AND SUMMARY

Current trends for immediate loading suggests that for survival a good quality and quantity of bone as well as patient compliance is necessary.[8] Since the concept of immediate restoration of fresh extraction sockets is relatively new, long-term results have not yet been established. If further research indicates that an expandable dental implant can facilitate immediate replacement of nonrestorable roots in a predictable and reliable way, it will be a productive and desirable procedure.

New immediate dental implant procedures have shown great promise in certain situations and may add to the dental profession's alternative choices for restorative care. It is the hope of this author that the technique and procedures in this paper will bridge the

gap that now exists between the specialist and the general dentist. These procedures can be performed in a general dentist's office. As the general dentist becomes increasingly familiar with implant dentistry, diagnosis of these procedures will become more routine and our patients will benefit.

CONCLUSION

Expandable dental implants appear to add stability at the time of immediate placement into fresh extraction sockets. Also the ability to expand and restabilize the fixture if it becomes mobile during the healing phase is a great advantage to the operator in order to rescue the stability of the implant. Immediate placement of dental implants in root sockets can maintain the original emergence profile, which allows for natural gingival contour surrounding the final restoration. Finally, the ability to perform the entire procedure in the general dentist's office is a great advantage from the standpoint of the patient.

REFERENCES

1. Gelb SA. Immediate implant surgery. Three-year retrospective evaluation of 50 consecutive cases. *Int J Oral Maxillofac Implants.* 1993;8:388–399.

2. Pouilly NM, Haas R, Mailath G, Watzek G. The immediate implant. A retrospective study comparing the different type of immediate implantation. *Int J Oral Maxillofac Implants.* 1994;9:571–578.

3. Grunder U, Polizzi B, Goene R, et al. A 3-year prospective multicenter follow-up report on the immediate and delayed-immediate placement of implants. *Int J Oral Maxillofac Implants.* 1999;14:210–216.

4. Schnitman PA. Branemark implants loaded with fixed provisional prostheses at fixture placement: nine-year follow-up. *J Oral Implantol.* 1995; 15:345–361.

5. Wöhrle PS. Single-tooth replacement in the aesthetic zone with immediate provisionalization. *Pract Periodont Aesthet Dent.* 1998;10(9):1107–1114.

6. Salama H, Rose LF, Salama M, Betts MJ. Immediate loading of bilaterally splinted titanium root-form implants in fixed prosthodontics—a technique reexamined: two case reports. *Int J Periodont Rest Dent.* 1995;15: 45–61.

7. Lazarof S, Hobo S, Nowzari H. *The Immediate Load Implant System.* Tokyo: Quintessence; 1998.

8. Lazzada RJ, Porter SS, Testori T, Galant J, Zetterqvist L. A prospective multicenter study loading osseotite dental implants two months after placement. One-year results. *J Esthet Dent.* 1998;1:280–289. ■