

MINIMALLY INVASIVE IMPLANT SURGERY

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KEY WORDS

Bone expansion
Minimally invasive implant surgery

The use of dental implants in the esthetic zone is a viable alternative to the traditional fixed partial denture. A modification of the Tatum bone expansion technique is described as an option for patients considering the replacement of 1 or more missing maxillary incisors.

INTRODUCTION

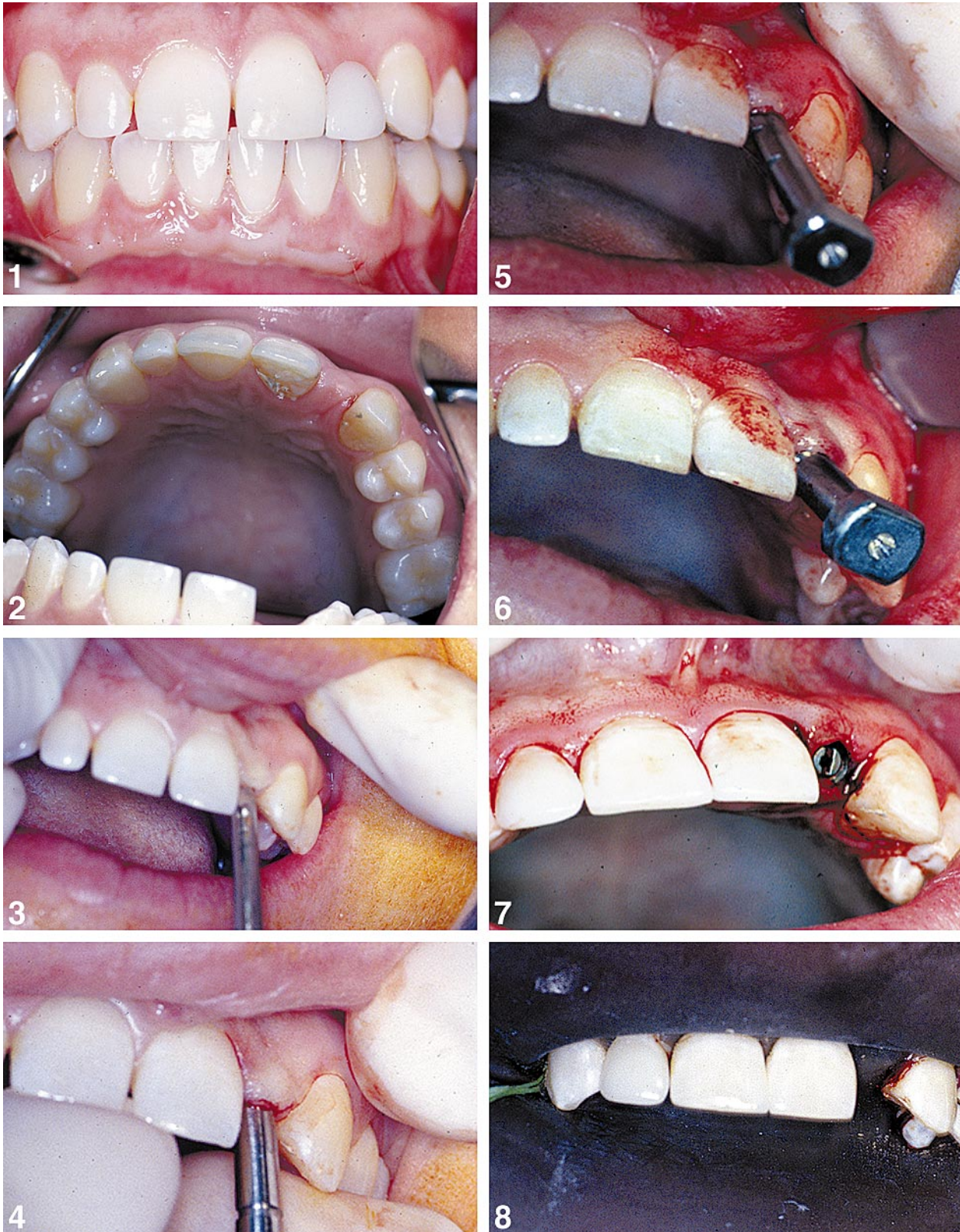
As dental implants have become a predictable foundation for restorative dentistry, the focus of treatment is shifting from the restoration of function to the restoration of function without esthetic compromise. This is especially true when replacing 1 or more maxillary anterior teeth. Esthetic treatment using dental implants in the anterior maxilla is often limited by the bony anatomy of the edentulous area. Bone grafting to augment the edentulous area is a predictable method of creating an adequate volume of bone for implant placement. Occasionally the need for bone grafting excludes some patients who would otherwise be amenable to implant reconstruction. The option of a minimally invasive technique appeals to a great number of potential implant patients. In the mid-1970s, Tatum¹ developed a bone expansion technique that addresses the natural resorptive pattern of the premaxilla. Resorption from the buccal aspect often results in inadequate ridge width for ideal implant placement. The ridge is often wider at the crest, with a labial undercut at the midroot area. The bone is mostly trabecular in nature with a thin layer of cortical bone on the labial and crest of the ridge. The pala-

tal wall is dense cortical bone. By using specially designed instruments, it is possible to treat the division A, B, or C-w premaxilla without soft tissue reflection through an incision that is 3 mm long. This technique, in combination with modern restorative materials and concepts, can produce restorations that rival the esthetic results of alternative treatments without the need for tooth preparation, bone grafting, or soft tissue manipulation. The advantages of minimally invasive procedures include greater patient acceptance, less morbidity, lower cost, fewer surgeries, and fewer complications. A case report illustrates the technique of minimally invasive implant dentistry as well as minimally invasive esthetic dentistry.

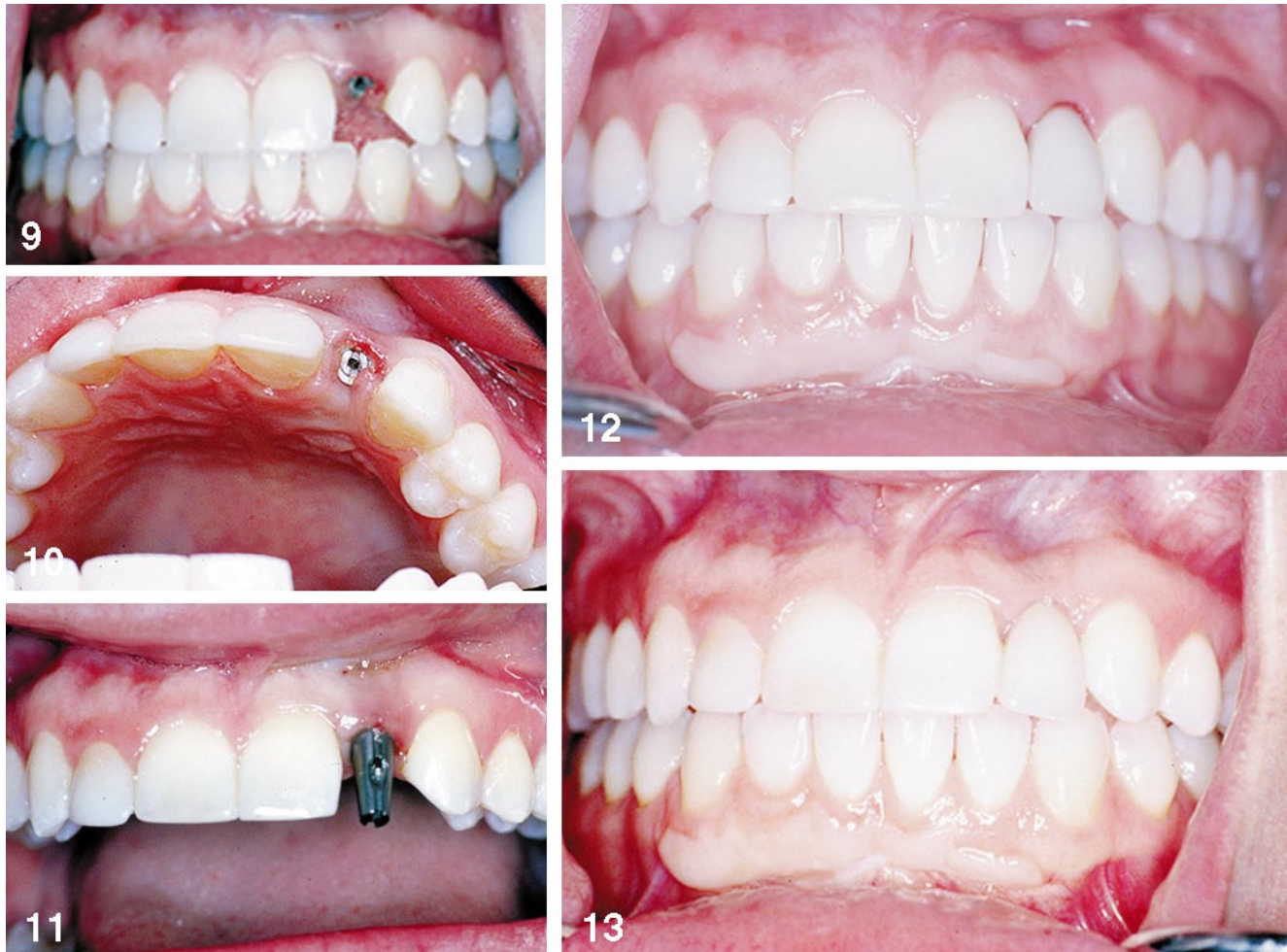
CASE REPORT

A 30-year-old female veterinarian in excellent health presented with a failing resin-bonded fixed partial denture replacing the congenitally missing left lateral incisor (Figures 1 and 2). This restoration was placed approximately 12 years ago after orthodontic treatment was completed. It had debonded on multiple occasions and was esthetically unacceptable. In addition to the failed restoration, the patient expressed dissatisfaction with the esthetics of her maxillary anterior teeth. She was un-

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FIGURES 1-8. FIGURE 1. Preoperative facial view. FIGURE 2. Preoperative occlusal view. FIGURE 3. Minimally invasive incision. FIGURE 4. Channel former in place. FIGURE 5. Socket former in place. FIGURE 6. Bone expansion complete. FIGURE 7. Implant in place. FIGURE 8. Cosmetic bonding.



FIGURES 9–13. FIGURE 9. Healed site facial view. FIGURE 10. Healed site occlusal view. FIGURE 11. Post try in. FIGURE 12. Cementation. FIGURE 13. Finished case Captex crown.

happy with the diastema and size of the right lateral incisor. Examination revealed excellent oral health with no previous restorative dentistry (except the failed fixed partial denture). There was no dental decay and no periodontal pathology. The temporomandibular joints were within normal limits, with no joint sounds or pain and a normal range of motion. The edentulous ridge was C-w in the Misch classification system.² She had adequate bone height but only 2 mm ridge width, as measured with bone calipers. The patient did not want another fixed partial denture and requested implant reconstruction at the time of consultation. Restorative options were explored with the patient, including monocortical block

grafting from the symphysis followed by implant placement or minimally invasive implant dentistry. The minimally invasive option of bone expansion was chosen for several reasons: shorter treatment time, lower morbidity, cost, fewer surgeries, and fewer potential complications. Direct cosmetic bonding was chosen to treat the natural teeth. Indirect porcelain veneers were considered too invasive for this patient.

Minimally invasive surgical technique

The soft tissue incision is a puncture with a number 15 blade bisecting the keratinized tissue and preserving both interdental papilla (Figure 3). All site preparation is performed through this initial incision without reflecting a flap

or elevating the periosteum. Maintaining the periosteal attachment preserves the blood supply to the underlying bone and acts as support for the labial plate as it expands.³ The crest of the ridge is explored with the blade, and the bone entry point is made 1 mm labial to the palatal wall. The dense palatal wall serves as a reference point for proper angulation and labial-lingual position. An error in placing the entry point too far labial will result in poor angulation, a long tooth, and unacceptable gingival architecture. The thin layer of cortical bone covering the ridge is easily penetrated by tapping the scalpel handle with a surgical mallet. The initial bone incision splits the cortical plates and serves as a purchase

point for subsequent instruments. A channel former is placed into the bone incision and advanced with the mallet (Figure 4). Care is taken to support the labial and palatal plates during the expansion.⁴ As the channel former is driven deeper into the bone, the labial plate will bow outward, and the operator's fingers are used to mold the bone around the instrument. A series of 3 socket formers is used to finalize the size and shape of the implant receptor site (Figures 5 and 6). The cross-sectional shape of the site is semicircular, with the flat side on the palatal aspect and the curved side to the labial. This shape allows the expansion of the pliable labial plate without altering the dense palatal bone. Unipost implants are prepared for placement by covering the crestal 2 and 3 fins with a slurry of Osteo-Gen and patient blood. This will retard epithelial migration during the healing phase. The implant is placed with the cover screw at the level of the gingival tissues (Figure 7). Sutures are rarely required, but in this case a single 5-0 Vicryl suture was used to support the papilla, not to close the surgical wound.

Bonding

Immediately after placement of the implant, a rubber dam was placed to isolate the maxillary anterior teeth. The minimal amount of bleeding from the surgical procedure was kept out of the operative field with the rubber dam. Noninvasive cosmetic bonding was selected to preserve the patient's own

enamel and avoid the long-term complications associated with more invasive restorative techniques. The incisors were etched with 37% phosphoric acid solution. Direct resin restorations were applied to the mesial surfaces of the central incisors to close the midline diastema, and to the entire facial surface of the lateral incisor to create a more acceptable morphology (Figure 8). The resin-bonded restoration was modified and bonded back into its original position as a provisional restoration.

Healing

The healing phase should be uneventful. Bleeding, pain, and swelling are minimal. The patient can return to normal activities the next day. The implant is not submerged, so the soft tissue has several months to heal and mature before the restorative phase begins (Figures 9 and 10). Care is taken to eliminate any potential for trauma to the implant during the healing phase. The final position of the marginal gingiva is predictable at the time of abutment placement.

Restorative phase

After a 3-month healing period, osseointegration is verified clinically by lack of mobility. A post is attached with resiment cement and prepared by using crown preparation techniques appropriate for all porcelain crowns (Figure 11). Margin placement is determined by tissue thickness, emergence profile, papilla development, lip line, and esthetic necessity. A Captek crown

was chosen for its unique properties. This crown has a gold coping to which porcelain is applied. It has esthetic properties similar to an all porcelain crowns but has a core that is sufficiently opaque to mask the underlying titanium alloy post. It does not require bonding, as do many of the all-porcelain systems, and can be cemented with traditional crown and bridge cements (Figures 12 and 13).

CONCLUSION

The demand for esthetic dentistry continues to grow, and techniques that can deliver exceptional results in an efficient manner will continue to change conventional restorative dentistry. A modification of the Tatum bone expansion technique is presented. This technique minimizes the amount of surgery required to treat an esthetically demanding case. Minimally invasive implant surgery can be an excellent alternative to the traditional fixed partial denture.

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