

Tapered Implants: From Indications to Advantages



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Tapered implants have become routine for immediate implant placement after tooth extraction. It seemed extremely advantageous to use tapered implants in type 4 bone, where primary stability is difficult to achieve. The authors established a surgical implant placement protocol to be followed in areas where type 4 bone and a wide bone ridge (≥ 8 mm) are present. First, preparation of the implant alveolus is done exclusively with cylindric osteotomes, rather than with conic osteotomes or drills. The final cylindric osteotome is the same diameter as the final twist drill that is typically used in conventional preparation of the implant alveolus (a technique that can be adapted for use with other tapered implants). Because of the self-tapping property of the tapered implant used and its anatomic design, this surgical technique was developed to optimize the bone compaction effect in the coronal third of the implant, improving bone density and providing better primary stability values (≥ 70 ISQ, via the Osstell Mentor device). With the strong bond that is created between the implant surface and the surrounding bone using this technique, immediate loading can be predictable, even in the type 4 bone that is commonly found in the maxillary tuberosity. (Int J Periodontics Restorative Dent 2009;29:161–167.)

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Several previous studies have demonstrated that individuals with a strong susceptibility to periodontal disease can be successfully treated with osseointegrated implants.^{1–3} Implants placed in patients with a history of periodontitis have a 5-year survival rate similar to that observed for implants placed in non-diseased persons. Although the 10-year survival of 1-stage implants is somewhat lower than that observed in non-diseased patients, implant placement remains a good treatment alternative for periodontally compromised patients.⁴ Immediate implant placement into fresh extraction sites is considered to be a predictable and acceptable procedure.^{5–7}

Advanced periodontal destruction is often associated with extraction of the teeth. Oral rehabilitation in these cases may include an implant-supported reconstruction. Immediately loaded implants present an alternative treatment modality for periodontally compromised patients that might better meet patients' needs.^{8–10} Patient desires have pushed the clinicians toward earlier loading, which minimizes the inconvenience of a conventional transitional prosthesis

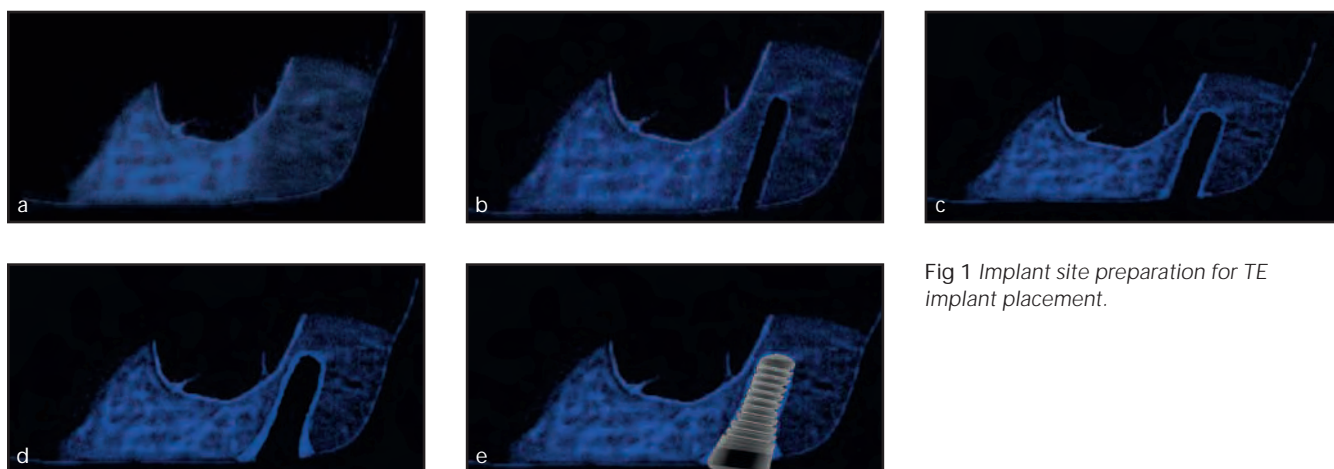


Fig 1 Implant site preparation for TE implant placement.

during the healing following extraction and implant placement.¹¹ Immediate placement of dental implants at the time of tooth extraction has yielded favorable, predictable results; early loading of immediately placed dental implants has been studied and has also been met with predictable results.^{12–14} Advantages include better bone and soft tissue preservation, reduced postoperative pain, significant reduction of clinical chair time, and greater patient acceptance. The main rationale, and one of the most important reasons for immediate implant placement, is to preserve alveolar bone height and width.¹⁵ Immediate placement can lead to a favorable crown-implant ratio, better esthetics, and a favorable maxillo-mandibular relationship.^{16,17}

Implant therapy involving maxillary sinus lifting in periodontally compromised patients can be successfully done, as well as the treatment of advanced periodontal destruction with immediately loaded implants and simultaneous bone augmenta-

tion.^{8,18} An implant-supported fixed prosthesis is an acceptable and predictable treatment option for rehabilitation in patients who have lost their teeth due to periodontal disease. This observation seems to be valid for both edentulous and partially dentate patients.¹⁹ The literature supports immediate placement and immediate loading in mandibles of edentulous patients using cross-arch stabilization of the implants and a fixed passively fitting prosthesis on multiple implants that show verifiable primary stability upon placement.²⁰ Immediate implant placement after tooth extraction has been shown to be a predictable technique.^{5,21–23}

Several dental implant systems have been created with tapered implant bodies designed to simulate the shape of the original tooth root. Such implants are typically indicated for situations of tooth extraction followed by immediate implant placement. For this same purpose, Institut Straumann recently introduced the TE (tapered effect) implant. The authors

have used this kind of implant in their practice in immediate postextraction cases and have also found them advantageous in type 4 bone if implant socket preparation is done with the osteotome technique. Primary stability seems to be a major criterion to predict success in these two special situations.²⁴ To ensure satisfactory primary stability, it appears that the implant needs to be placed 3 to 5 mm beyond the bottom of the bony alveolus.¹⁶ Some implant mobility is usually described, even in completely healed edentulous sites, which may be explained by the low bone density.²⁵

Osteotome Preparation for TE Implant Placement in Type 4 Bone

In addition to its primary indication for immediate implant placement, the authors have found that TE implants may also be placed, with good success, in type 4 bone, as can be found in the maxillary tuberosity, especially

Fig 2a (right) Initial panoramic radiograph.

Figs 2b and 2c (below) Panoramic radiograph and lateral cephalograph, obtained after extraction and grafting, with the radiologic guide in place.



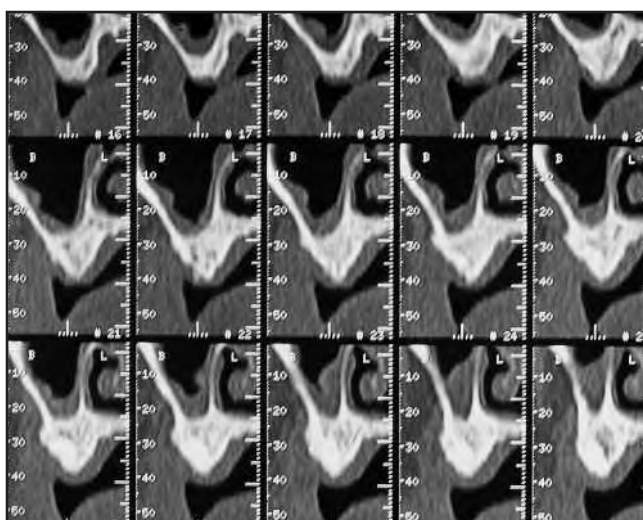
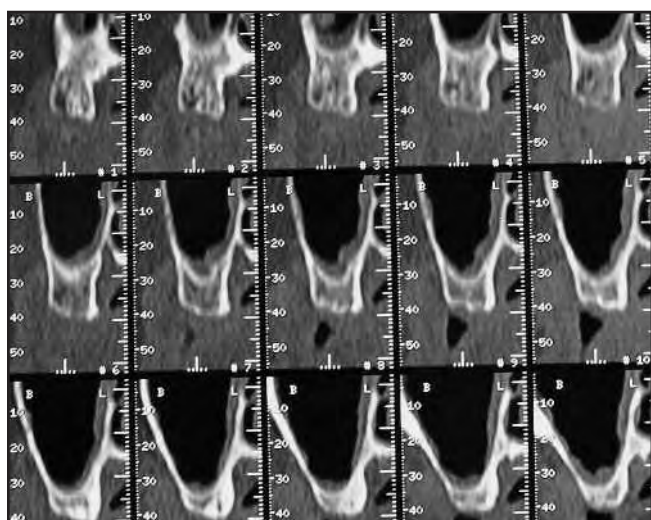
when the bone width (at least 8 mm) and height are sufficient. In such cases, direct initial preparation is recommended using a 2.2-mm cylindric osteotome without any initial mechanical drilling. This procedure compacts the trabecular bone, and it improves the clinician's tactile sensation of the presence of the posterior cortical wall of the maxillary sinus (Fig 1).

Implant socket preparation continues following the usual osteotome sequence, which further condenses the bone. The final bone compaction occurs during implant placement, especially at the implant's more conical

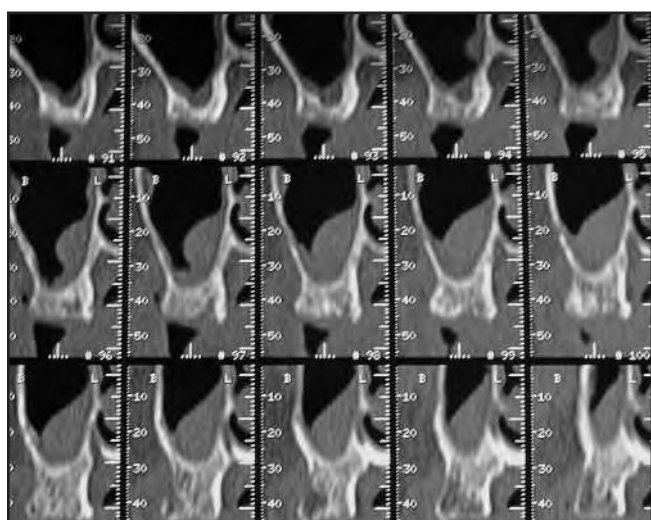
coronal third. Placement of the tapered implant is facilitated by its self-tapping characteristic and minimal thread pitch of 0.8 mm.

To illustrate the advantages of this technique, the authors present the case of a 60-year-old nonsmoking male patient who needed a full-arch maxillary rehabilitation (Fig 2a). First, all remaining maxillary teeth were extracted. At that time, some of the largest bone defects and largest extraction sockets were regenerated with bovine mineralized bone graft (Bio-Oss, Geistlich) and a bilayer collagen membrane (Bio-Gide, Geistlich).

Six months later, a panoramic radiograph and a lateral cephalograph were obtained (Figs 2b and 2c) with a radiographic guide in place. Computed tomography was also performed; some of the higher-density xenograft biomaterial could still be seen at the regenerated sites (Figs 2d to 2f). The computed tomography showed the presence of a wide and high maxillary tuberosity, with low-density bone and a low maxillary sinus, the mesial wall of which continued to a wide and high alveolar region in the premaxillary region. These anatomic characteristics were present on both sides of the arch.



Figs 2d to 2f Computed tomograms (from posterior to anterior) of the right quadrant.



Without elevating a flap, eight circular incisions were made according to a surgical guide that had been previously fabricated. Six standard Straumann implants (4.1 mm diameter, 12 mm length; Standard Plus) and two Straumann TE implants (4.1 mm and 4.8 mm diameter, 14 mm length) were placed. The two TE implants were placed in the maxillary tuberosity following the surgical technique previously described (Fig 2g). A panoramic radiograph obtained immediately

after surgery showed the angulated placement (about 30 degrees) of the implants in the tuberosity, which was done to prevent sinus perforation (Fig 2h). Resonance frequency tests (Fig 2i) (Osstell Mentor, Straumann) were performed on the two implants placed in the maxillary tuberosities. These showed ISQ values of 71 and 73 (first and second quadrants, respectively). As is known from the literature,²⁶ an ISQ value of ≥ 70 indicates a good bond between the implant

and surrounding bone, making early implant loading a more predictable treatment option.

All eight implants were loaded within 24 hours after surgery with a provisional full-arch fixed prosthesis (Figs 2j to 2l). The definitive implant-supported porcelain-fused-to-metal fixed prosthesis was delivered 6 months later. None of the eight implants placed in the maxilla were lost, even though two of them were placed in type 4 bone and immediately



Fig 2g Surgical phase showing six standard implants and two TE implants in place.

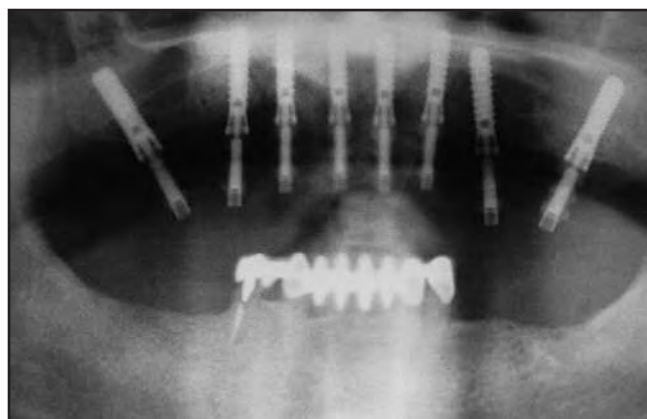


Fig 2h Panoramic radiograph taken immediately after surgery.



Fig 2i Resonance frequency testing with the Osstell Mentor device was performed on the TE implants.



Figs 2j and 2k Provisional full-arch fixed prostheses.

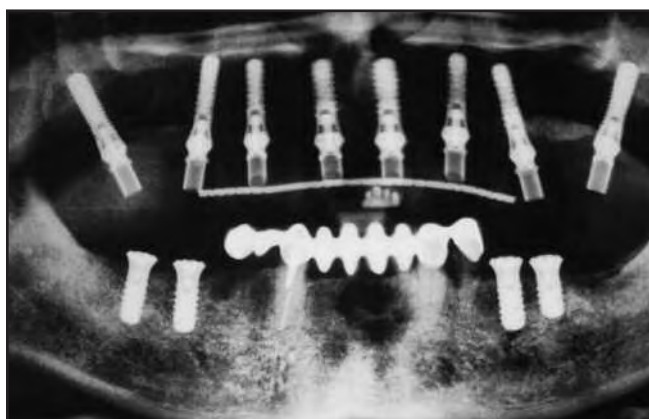


Fig 2l Panoramic radiograph with provisional prosthesis in place (acrylic is radiotranslucent).



Fig 2m Panoramic radiograph with definitive prosthesis in place.



Fig 2n Definitive porcelain-fused-to-metal full-arch fixed prosthesis.



Fig 2o Extraoral view of definitive prosthesis.

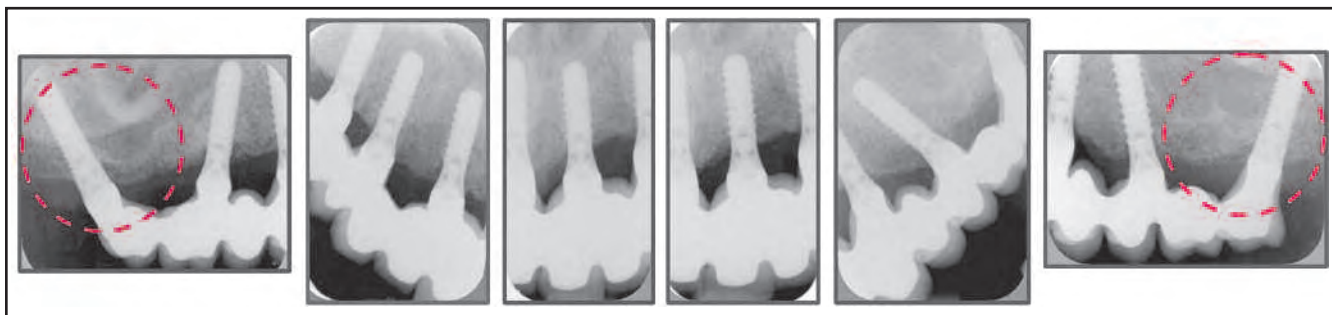


Fig 2p Periapical radiographs obtained at the 3-year follow-up.

loaded (Figs 2m to 2o). Periapical radiographs obtained at a 3-year follow-up appointment showed acceptable bone levels (Fig 2p).

Conclusion

In addition to its primary indication for postextraction placement, the authors suggest that tapered implants can be used successfully in type 4 bone in the maxillary tuberosities if socket preparation is done exclusively with osteotomes. More studies should be done to confirm this technique.

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