

# Immediate Implantation



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In the area of implant dentistry, evolution proceeds swiftly as methods that were considered radical or even controversial become standard in a relatively brief time. The fundamental tenets of Brånemark linger, but it is human nature to seek faster and better results. Initial forays into oral implantology concerned long-edentulated jaws. As the technology aged, waiting periods between tooth removal and implant placement shortened from years to months to weeks.<sup>1</sup> The original Brånemark protocol suggested 6 to 12 months of healing.<sup>2,3</sup> Now, clinicians perform immediate implantation—insertion of a fixture into a fresh extraction socket—with escalating frequency, at least in nonmolar, single-rooted areas.

A number of advantages arise from immediate implant placement—the obvious one being saved time. Abiding by convention, a surgeon waits until a socket fills with bone to secure his or her implant, but when does that process complete? An extraction site heals in 5 stages: clot formation, granulation, connective tissue and osteoid lay-down, trabecular bone, and complete epithelial closure.<sup>4</sup> At 4 to 8 weeks, osteoid inter-

spersed with new bony islands (woven bone). From 8 to 12 weeks, trabeculation emerges and expands volumetrically; a mature pattern topped by lamellar seal appears by 16 weeks.<sup>5</sup> Bone fill completes in roughly 4 months, but full maturation may extend longer.<sup>4</sup> The more vascularized maxilla tends toward a greater trabecular but thinner cortical morphology.<sup>6</sup> Aware of this, some dentists choose to wait longer before upper tooth implantation in hopes that density increases with time. In these cases, the typical interval between extraction and Stage I surgery ranges from 3 to 6 months.<sup>7</sup>

Immediate implantation removes the delay period, which in turn reduces patient and chair time as well as related cost. Another major benefit is bone preservation and subsequent enhanced esthetics, though these findings remain contested in the literature. A socket refills postextraction, but internal and external wall remodeling generates an overall loss in horizontal and vertical dimension, about 3 mm to 6 mm and 1 mm to 2 mm, respectively.<sup>8-11</sup> Resorption at the alveolar crest approximates 44%, especially 6 months after extrac-

tion.<sup>12,13</sup> Moreover, as the buccal plate is 2 to 3 times thinner than the lingual, it undergoes greater horizontal (56% vs 30%) and vertical (2 mm) reduction.<sup>11,14,15</sup>

Implant placement into a fresh socket halts such loss. Because little or no crestal diminution occurs, the practitioner should expect a superior cosmetic result.<sup>16,17</sup> Esthetics, however, also depend on the presence of adjacent teeth, related bone loss, and the original osseous profile. Recent experiments dispel the idea that resorption lessens with immediate implantation and report that the buccal and lingual walls surrounding the fixture resorb to degrees equal to those without placement.<sup>14,18</sup>

## Single-Tooth Implantation

Whether or not bone loss decreases with immediate implantation, the survival rate of fixtures performed this way parallel that of conventional ones, hovering around or above 95%.<sup>19,20</sup> Proper case selection and therapeutic management keeps failure a rarity. The following guide will help the practitioner to choose and conduct immediate implant cases.

- **Select site**—Osseointegration relies



**Figure 1**—Preoperative view. Tooth No. 10, which exhibits severe root resorption and Class 3 mobility on the Miller index, has a hopeless prognosis and requires extraction.



**Figure 2**—Well preserved hard and soft structures resulting from the atraumatic extraction of tooth No. 10.



**Figure 3**—Placement of the implant with primary stability. A freeze-dried bone allograft was not required because the implant diameter exceeded that of the extraction socket.

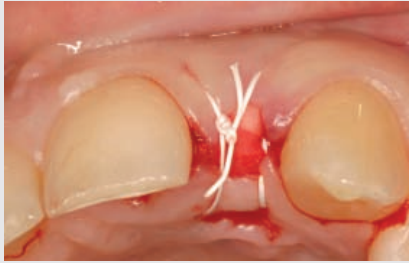
on primary stability of the implant on placement, so the smaller the socket that is left postextraction, the more bone the implant engages. Choose single-rooted teeth for more predictable results (Figure 1).

- **Design flap**—Attempt to extract the tooth without raising a flap. If grafting is anticipated, better access will be needed. Either create 1 or 2 vertical incisions at the line angles of the adjacent teeth or extend a sulcular incision around them to permit visualization.
- **Extract atraumatically**—Preservation of as much hard tissue as possible allows for primary stability, so extract teeth cautiously (Figure 2). Use of periostomes may be indicated.
- **Degranulate**—Remove any soft tissue and pathology from the socket to ensure healing. A Prichard curette, Neumeyer bur, or egg-shaped carbide finishing bur may be used.
- **Assess socket and ridge morphology**—This can be accomplished with either direct visualization or a probe. Ideal prosthetic posi-

tioning of the implant may create one of the following issues. Remember, that the intention is a correct restorative position. If the implant is stable in that location, proceed with immediate implantation (Figure 3). If the implant cannot achieve stability in that location, then abort implantation, graft, wait for healing, then perform Stage I surgery.

- Loss of buccal or lingual plate but <50% of the implant would be exposed.
  - If implant would rest within the envelope of bone or would protrude outside the envelope of bone, place the implant and cover with bone graft, then a membrane.
- Loss of horizontal dimension such that >50% of the implant would be exposed.
  - If implant would rest within the envelope of bone, consider expanding the site with osteotomes, place the implant, then cover it with bone graft followed by a membrane.

- If implant would protrude outside the envelope of bone, abort implantation and graft the region for delayed placement.
- Loss of vertical dimension.
  - If submerging the implant at this apical position is acceptable from esthetic, prosthetic (eg, crown-implant ratio), and maintenance standpoints, place implant.
  - If the above will create an unsatisfactory condition (especially the case if vertical loss exceeds 2 mm or 3 mm), abort implantation and graft the region for delayed placement.
- **Evaluate need for a circumferential graft**—When the implant is placed, there may be a void between the implant and the surrounding socket walls. This critical gap, or jumping distance, may heal spontaneously or require a graft to bridge the space; the exact distance amenable to spontaneous closure is unclear but probably does not exceed 1 mm to 2 mm.<sup>14,17,21</sup> To be



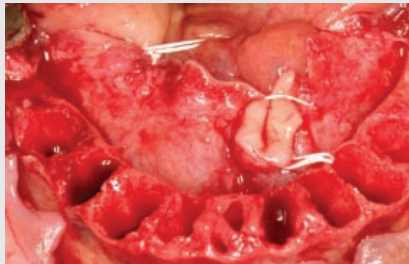
**Figure 4**—An absorbable collagen plug was positioned to cover the implant. Secondary closure achieved with 4-0 expanded polytetrafluoroethylene (ePTFE) suture.



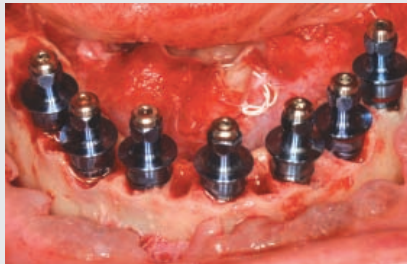
**Figure 5**—Final restoration of the immediate implant.



**Figure 6**—Preoperative view. The mandibular arch has a hopeless prognosis.



**Figure 7**—Mandibular edentulation performed with preservation of the buccal plate.



**Figure 8**—Placement of 7 immediate implants between the mental foramina.



**Figure 9**—Mandibular fixed hybrid prosthesis delivered.



**Figure 10**—Final restoration of maxillary and mandibular arches.

prudent, graft any gap between the implant and socket walls. There is no solid evidence that a graft impairs osseointegration.

- **Close**—Attain either tension-free primary closure if possible or cover the implant with a collagen plug and suture (Figure 4). It is probably safest to carry out immediate implantation using a 2-stage proto-

col, though no sound support disuades use of a 1-stage procedure.

- **Restore**—After the initial osseointegration period, which runs 3 (no graft required at time of placement) to 6 or even 9 months (graft required), proceed with loading and restoring the implant (Figure 5).

### Full-Arch Implantation

Immediate implantation entails placement of a fixture only into a fresh extraction site, not placement with temporization or load. Immediate transition into a prosthesis—or immediate implants that are temporized or loaded right away—exists but in such a scenario, a patient enters the operatory with (natural) teeth and exits with (prosthetic) teeth.

Studies on full-jaw reconstruction involve edentulation, implantation, and restoration with fixed, rigid, cross-arch fixation in 1 appointment and, at least in the short-term, appear to yield positive results, particularly if the opposing jaw lacks dentition.<sup>22-25</sup> This technique requires significant planning and preparation and takes hours of synchronization between the surgeon, restorative dentist, and laboratory. The following guide will help the practitioner to choose and conduct immediate, full-arch implant cases with temporization.

- **Select site**—Cases preferred for full-arch immediate implantation and fixed temporization typically involve the mandible because its thicker cortical plate and subsequent greater mean density proves

more amenable to primary stability (Figure 6).<sup>26</sup>

- **Fabricate surgical guide and interim prosthesis**—Fabrication of a surgical guide from the patient's immediate denture (hybrid) precedes the operation. The guide must occlude stably with the opposing dentition or prosthesis to maximize restorative fit accuracy after implantation. Moreover, the immediate denture should be made thicker than usual in the buccolingual dimension to resist fracture. After presurgical prosthetic completion, the patient is ready for edentulation. The operator raises a full-thickness flap and extracts the teeth in an atraumatic manner (Figure 7). To create proper interocclusal space and widen the ridge to accept implants, the crestal bone may be leveled with a carbide bur. The surgical guide dictates the amount of osseous reduction required.
- **Determine implant number and location**—Arch anatomy and morphology as well as occlusal needs of the patient determine the number and location of implants placed. Palpation or direct visualization of the mental foramina prevents compromise of these structures. The implant-to-foramen and implant-to-implant distance should be at least 3 mm to avoid paresthesia and horizontal bone loss, respectively.<sup>27</sup> With this in mind, the maximum number of implants allowable may be employed (Figure 8).
- **Evaluate posterior morphology**—If severe posterior resorption excludes conventional fixture placement, implantation can occur, but only

interforaminally. This can be a concern if the mandible has a square morphology. Compared with an ovoid-shaped or tapered jaw, a square-shaped mandible exhibits a diminished interarch distance (measurement from the anterior-most implant to the posterior-most fixture). To prevent overload, the unsupported extent of the prosthesis should not surpass 1.5 times the interarch distance. Therefore, the square-shaped jaw may support only an abbreviated restoration (ie, premolar occlusion).<sup>28</sup> When there is adequate bone beyond the mental foramina, implantation in those posterior regions permits use of a denture with a longer distal cantilever.

- **Restore**—After placement, the implants receive temporary cylinder abutments. The restorative dentist drills holes into the provisional to fit over these cylinders, lutes the denture to them with resin and reduces the height of each abutment as needed. After occlusal adjustment and polishing, the temporary denture is fixed to the implants with retaining screws. The patient leaves with a fixed interim hybrid prosthesis (Figure 9). Delivery of the final restoration takes place after the conventional osseointegration period, which hovers around 3 months (Figure 10).

### Conclusion

Immediate implantation is not yet routine but, with its appealing abbreviated treatment time and high survival rate, it is gaining in popular-

ity. Although studies on bone resorption hint that immediate implantation may not halt bone loss as originally hoped, the savings in chair time and patient cost make the procedure a viable treatment option. In both single-tooth and full-arch cases, proper case selection and careful attention to surgical detail will minimize implant failure and maximize esthetics. ©

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