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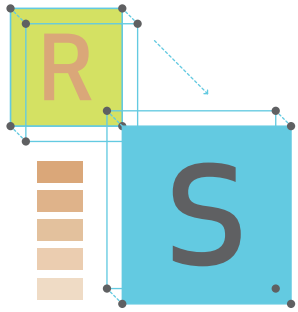

Narrow Diameter Implants for Mandibular Denture Retention

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ABSTRACT Narrow diameter implants are a lower cost alternative to conventional implants and are used to retain mandibular dentures. The experiences at a dental school predoctoral clinic are reviewed. The cumulative success rate for 626 fixtures placed in a six-year period is 92.6 percent with high patient satisfaction. Narrow diameter implants are a useful adjunct in the long-term management of edentulous patients.

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In 2002, an international symposium at McGill University concluded that a conventional denture was no longer the most appropriate option for restoring the edentulous mandible and that the two-implant retained overdenture should become the first choice prosthodontic treatment.[1] While the McGill consensus summarized numerous randomized controlled trials and longitudinal clinical studies as overwhelming evidence for preferring implant-retained dentures, the issues of affordability and access to this level of care were unresolved. In the United States, coverage of dental implants by third parties is in its infancy and is nonexistent in the Medicaid system. Edentulism in this country is strongly associated with low income, and most edentulous patients cannot afford the high cost of implant dentistry.[2]

The use of narrow diameter or mini-implants is potentially one of the solutions to the inaffordability dilemma. They are endosseous implants made of titanium alloy and less than 3 mm in diameter. They were introduced commercially to the dental profession in the 1990s and were first used for transitional prosthesis support.[3,4]

Recently, manufacturers have marketed them widely to the profession and patients as lower cost, less invasive, and technically easier alternatives to conventional implants. They are now used in a variety of applications, including orthodontic anchorage, single and multiple tooth fixed replacement, bridge repair, and removable prosthesis retention.[5-10] The small diameter of each fixture (1.8 mm to 2.4 mm), as well as the reduced surgical and prosthetic armamentarium, result in lower overhead and fees compared with conventional implants. A patient can receive a mandibular overdenture retained by four narrow diam-

FIGURE 1A. Four sites were marked on ridge crest tissue of anterior mandible and pilot osteotomies will be created through the tissue. The drill (Atlas Implant, Dentatus USA, New York, N.Y.) is used at slow rotational speed with copious sterile irrigant, to half the length of the proposed implant length if the bone is soft or to the full length of the implant length if the bone is resistant.

FIGURE 1B. Four Atlas implants have been placed in the anterior mandible. Note the lack of tissue trauma.

FIGURE 1C. Postoperative panoramic radiograph of 14 mm length Atlas implants.

FIGURE 2A. Preoperative view of periodontally compromised mandibular canines.

FIGURE 2B. The mandibular canines have been extracted and four 15 mm- length MDI collared implants (IMTEC Corp., Ardmore, Okla.) have been placed through the soft tissue at sites No. 21, 23, 26, and 28.

FIGURE 2C. The patient's original transitional partial denture was converted to an immediate complete denture and this was retrofitted over the implants at the conclusion of the surgery. The patient left the clinic with function and esthetics fully restored.

eter implants (**FIGURE 1**) for less than half the cost of the standard treatment with two conventional implants.

Additional benefits of narrow implants are the ability to place them in horizontally narrow sites (4 mm of bone required), minimally invasive surgical technique, and the ability to load the implants immediately.

A contentious issue with narrow diameter implants is the lack of evidence for clinical suitability and success, particularly the absence of objective long-term and prospective comparative studies. It has been shown that narrow diameter implants osseointegrate to the same extent as conventional implants, and success rates reported for limited patient cohorts over brief service periods have been favorable (93 percent to 98 percent).[11-13]

A multiclinic study of 1,029 mini-implants used for mandibular denture retention, with service range of five months to eight years, had an overall success rate of 91.2 percent, and 89 percent for fixtures in place for at least five years.[14]

Another study reported the long-term results for 2,514 mini implants placed in a single office over a five-year period and subjected to a spectrum of prosthetic anchorage in both jaws: single crowns, fixed partial dentures, removable partial dentures and complete dentures; the overall success rate was 94.2 percent.[15] The encouraging results of both these long-term studies are restrained by the disclosure statements that the lead authors had commercial interests in the products cited in the papers.

The University of the Pacific Arthur A. Dugoni School of Dentistry has an edentulous patient base typical of urban areas in the United States. Many of these patients struggle with unstable mandibular dentures but are unable to afford the undergraduate clinic's basic two-implant overdenture protocol that has been in place since 1982 and reliably improves oral function and patient self-confidence. Narrow diameter implants are part of the curriculum at Pacific and have been offered as an alternative and less costly treatment for our patients with edentulous mandibles since 2001.

In the last six years, more than 150 operators, most of them senior dental students with close faculty supervision, have placed 626 narrow diameter implants, and 37 percent of these were inserted at the time of extraction and

FIGURE 3A. This patient complained that both remaining implants were painful and loose. Four MDI collared implants had been placed at a private office 12 months previously, and two had been lost already. Both implants have total exposure of the collar (normally collars are completely embedded in soft tissue).

FIGURE 3B. Panoramic radiograph showed lack of bone around implant at site No. 20, with dangerous proximity to the mental foramen (fortunately, the patient had no paresthesia). The implant at site No. 24 demonstrated significant funneling in the bone. Both implants were removed.

immediate denture placement (**FIGURE 2**). Forty-six implants have been lost, due to loosening, chronic pain, or infection, for an overall success rate of 92.6 percent. The protocol of placing four fixtures intraforaminally provided 1 to 3 pounds of resistance to vertical displacement of the denture, and substantially reduced the tendency of the denture to wander laterally during function. The o-ring retainer (MDI system, IMTEC Corporation, Ardmore, Okla.) or soft liner (Atlas system, Dentatus USA, Ltd., New York, N.Y.) permitted the denture to be entirely supported by soft tissue. If the implants were placed without raising a soft tissue flap, patients noted the lack of surgical drama and generally, the healing interval was mild. When a conventional denture was retrofitted to the implants, patient appreciation of the improvement in denture comfort and function was universal.

The word-of-mouth referral of new patients by satisfied implant overdenture patients has been a notable aftereffect of this program at Pacific. Another significant outcome of the narrow diameter overdenture program for students at Pacific was the learning and practice of distributive justice, which is specifically, in this case, the allocation of implant resources and effective procedures among a diverse edentulous population.

The experiences at Pacific with narrow diameter implants reflected the learning curve associated with the development of a predictable protocol for a new elective surgical/prosthetic treatment. Exclusion criteria for patients were conservative: severe or recent cardiac pathology, severe hypertension, uncontrolled diabetes, or bleeding disorder, AIDS, any condition that seriously compromised bone healing potential or autoimmune response, intravenous bisphosphonates, heavy smoking, personality disorder or psychosis, substance abuse, and physician veto.

In addition, patients with Class IV edentulous mandibles (American College of Prosthodontists classification, indicating less than 11 mm of vertical bone height or absent clinical ridge) were excluded. Presurgical planning was accomplished with a study model and a panoramic radiograph.

If available, the existing denture was used as a general guide for artificial tooth position, location of the bulk of the denture base and for occlusal plane orientation. As a cost control measure, CT scans and laboratory fabricated surgical stents were not used on a routine basis.

Procedures to retrofit and reline existing dentures were more stringent than normally encountered in denture prosthetics, due to the unforgiving nature of implant attachments. Post-treatment swelling, surgical pain, and denture sore spots were encountered routinely. Three patients had severe local postsurgical swelling that did not respond to antibiotics, and all fixtures were removed within one month. The worst surgical complication was a chronic osteomyelitis around one narrow diameter implant, resulting in extravagant bone loss and delayed healing. There have been no paresthesias, as would be expected, because no implants have been placed in the posterior mandible, and all implants were placed at least 5 mm medial to the radiographic mental foramina.

The Implant Clinic at Pacific has had experiences other than treating its own patients. Multiple patients with narrow diameter implant problems and failures who were referred to Pacific from local communities have been evaluated and treated. Common issues included atypical implant location, extreme divergence of implant axes, infection, implant rejection, and poor prosthesis fit.

Also, the authors have received reports from other parts of the United States regarding inappropriate treatment with these implants (**FIGURE 2**). Egregious failures have been published.[16] Dentists who are accustomed to a disciplined approach to achieve success with conventional implants are dismayed by these instances of poor planning, execution, and follow-up.

To make matters worse in this field, aggressive marketing strategies feature patient-targeted infomercials and Web-based advertising; dentists are enticed with promises of enhanced profitability; and small diameter implants have become the organizational axis for profit-dominant denture franchises. This business-first energy obscures the message that narrow diameter implants can be a useful adjunct to dentistry and a benefit to many denture patients. The usual high standards of dedication to scientific inquiry and excellence in clinical practice are required of the professional and manufacturing communities before narrow diameter implants will be wholly accepted in dentistry.

Conclusions

Narrow diameter implants have been used successfully to provide retention for mandibular overdentures. More long-term studies are needed to compare narrow and conventional diameter implant outcomes, including honest analysis of the problem patterns with narrow diameter variety. ■■■■

REFERENCES

1. Feine JS, Carlsson G, Implant Overdentures — The Standard of Care for Edentulous Patients, Chicago: Quintessence Publishing Co., 155-7, 2003.
2. Eklund SA, Burt BA, Risk factors for total tooth loss in the United States; longitudinal analysis of national data. *J Public Health Dent* 54:5-14, 1994.
3. Petrungaro PS, Windmiller N, Using transitional implants during the healing phase of implant reconstruction. *Gen Dent* 49:46-51, 2001.
4. Brown M, Tarnow D, Fixed provisionalization with transitional implants for partially edentulous patients: a case study. *Pract Proceed Aesthet Dent* 13:123-7, March 2001.
5. Gray J, Smith R, Transitional implants for orthodontic anchorage. *J Clin Orthod* 34:659-66, November 2000.
6. Vigolo P, Givani A, Clinical evaluation of single-tooth mini-implant restorations: a five-year retrospective study. *J Prosthet Dent* 84:50-4, 2000.
7. Christensen GJ, The 'mini'-implant has arrived. *J Am Dent Assoc* 137(3):387-90, March 2006.
8. Spitler N, Rescuing bridges in trouble. *Implant News and Views* 4:1-4, November 2002.
9. el Attar MS, el Shazly D, et al, Study of the effect of using mini-transitional implants as temporary abutments in implant overdenture cases. *Implant Dent* 8:152-8, 1999.
10. Simon H, Use of transitional implants for prosthodontic, surgical and orthodontic applications: two-year data. *Clin Oral Implants Res* 11:49-52, August 2000.
11. Froum SJ, Simon H, et al, Histologic evaluation of bone-implant contact of immediately loaded transitional implants after six to 27 months. *J Oral Maxillofac Implants* 20:54-60, January 2005.
12. Cho SC, Froum SJ, et al, Immediate loading of narrow diameter implants with overdentures in severely atrophic mandibles. *Pract Proced Aesthet Dent* 19:168-74, March 2007.
13. English CE, Bohle GC, Diagnostic, procedural and clinical issues with the Sendax mini dental implant. *Compend Contin Educ Dent* 24:3-25, November 2003.
14. Bulard RA, Vance JB, Multiclinic evaluation using mini dental implants for long-term denture stabilization: a preliminary biometric evaluation. *Compend Contin Educ Dent* 26:892-7, 2005.
15. Shatkin TE, Shatkin S, et al, Mini dental implants for long-term fixed and removable prosthetics: a retrospective analysis of 2,514 implants placed over a five-year period. *Compend Contin Educ Dent* 28:92-100, February 2007.
16. Scortecci GM, Bert M, Leclercq P, Implants and Restorative Dentistry, London: Martin Dumitz, Ltd., Complications, prevention, correction and maintenance, 432-3, 2001.

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