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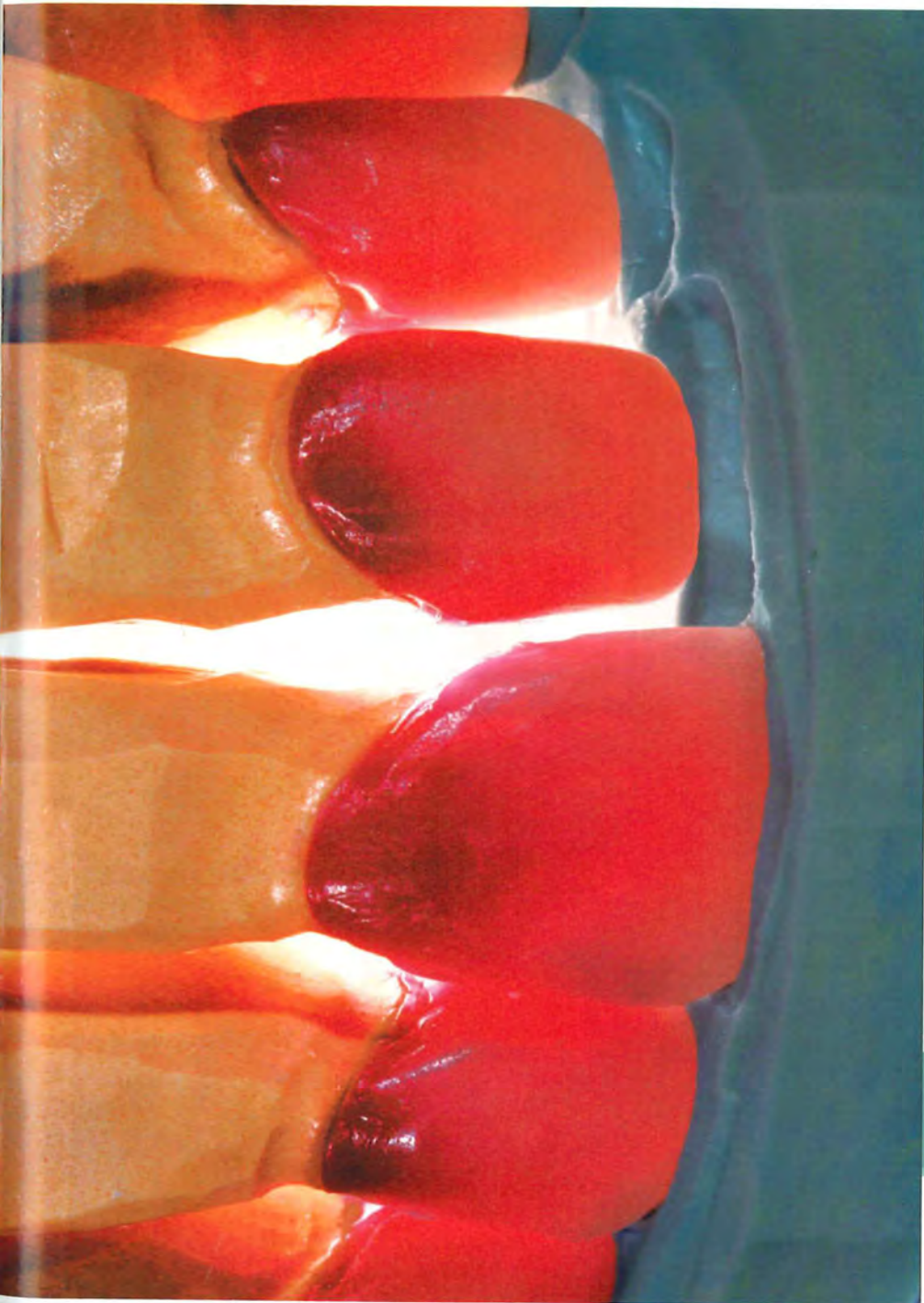
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SMALL-DIAMETER IMPLANTS FOR OPTIMAL STABILIZATION OF IMPLANT-SUPPORTED OVERDENTURES

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Implant-supported overdentures have gained significant acceptance by clinicians and patients, and are gradually becoming the standard of care for treatment of complete edentulism.¹⁻³ Various protocols for prosthetic fabrication and implant placement have been suggested and, at least for mandibular rehabilitation, the most commonly used protocol relies on placement of two implants in the anterior/canine area.⁴⁻⁷ While this protocol may provide appropriate overdenture stabilization for many cases, others may not be successfully treated with only two implants, and additional implants may be required for patient satisfaction.⁸ Anatomical factors, however, may limit the clinician's ability to place additional implants. Furthermore, financial restrictions may limit the patient's ability to have additional implants placed. This article presents an alternative approach aimed to improve stabilization of existing implant-supported overdentures that may overcome these limitations.

Case Presentation

A 52-year-old female patient presented for an implant evaluation. The patient's chief complaint was denture mobility during mastication and speech. Two endosseous root-form implants with locator abutments in the positions of #22(33) and #27(43) were present (Figures 1 and 2). Adequate implant integration and peri-implant mucosal health were observed. The implants had been placed 12 months prior to the initial visit and were loaded four months later. A mandibular implant-retained overdenture opposed the natural dentition and was in good condition. The locator attachment components were functioning normally and were not damaged. The patient also reported food retention in the locator attachment of the denture. Treatment plan options were given to the patient with the ideal plan adding at least two conventional implants in the anterior region since alveolar ridge width was inadequate for implant placement in the posterior



Figure 1. Preoperative appearance of the patient's mandible upon presentation. Note the presence of two regular-sized implants used for overdenture stabilization.



Figure 2. Preoperative radiographic appearance of the regular-diameter implants.



Figure 3. Occlusal appearance immediately following placement of the small-diameter implants (SDIs).



Figure 4. Additional stabilization was achieved with the placement of three SDIs.

areas without significant ridge augmentation procedures. Due to financial restrictions, the patient refused the plan and decided on the placement of small-diameter implants (SDIs) (eg, Atlas, Dentatus USA, New York, NY); to help gain additional retention at a reduced cost compared to the conventional implants.

At the time of surgery, consent forms were obtained. The patient rinsed prior to the initial surgery with 0.12% chlorhexidine solution. The location of the mental foramen was determined by palpation and confirmed by a two-dimensional panoramic radiograph. Local anesthesia (2% xylocaine with 1:100,000 epinephrine) was administered by infiltration. Using a flapless surgical protocol, the drilling sequence for the osteotomy preparations was followed according to the manufacturer's recommendations under copious irrigation. Three single-piece 2.4-mm × 14-mm titanium alloy dome-type implants (Atlas, Dentatus USA, New York, NY) were placed in the mandible in the areas of tooth #21(34), directly between the previously placed regular-sized implants, as well as in the area of #28(44) using a hand driver (Figures 3 and 4). The most distal implants were placed approximately 5 mm anterior to the mental foramen to prevent trauma to anterior loops of the inferior alveolar nerve.⁹

Immediately following implant placement, the existing mandibular denture was relined according to the manufacturer's recommendation. Denture marking caps were placed over the implant heads and painted with PIP paste to index the implant location on the existing denture.

A sequence of spherical and encasement burs established implant clearance and mechanical undercuts on the inner aspect of the denture. Finally, a resilient silicone material (Tuf-Link, Dentatus USA, New York, NY) was applied to the hollowed-out denture base and trimmed to fit properly in order to institute retention (Figure 5). The retromolar pads acted as tissue stops, and the ridge was cushioned by the silicone relines. Oral and written postoperative instructions were provided. The patient was advised not to remove the denture for four to six days with the exception of cleaning. The patient was reevaluated at one, two, and six weeks postoperatively.

Results

A total of three SDIs were placed and immediately loaded with the relined existing denture. After one week, healing was uneventful with localized swelling of the gingival tissues around the SDIs. The patient reported minimal discomfort after surgery. After 6 weeks postoperatively, the implants were stable and, once again, no pain was reported. The SDIs currently remain in function. The patient reported significantly improved stability of the overdenture during speech and mastication with the SDIs and additional retention at rest.

Discussion

Treatment utilizing conventional dental implants has been well documented and research has shown that endosseous implants have the advantage of eliminating or at least



Figure 5. Intraoral appearance demonstrates retention of the silicone material to the implant abutments.

reducing the extreme mobility of traditional dentures.^{10,11} In addition, surrogate measures, such as bite force and chewing abilities, also improve when implants stabilize dentures.^{10,14} In 2002, a group of experts met at McGill University and reviewed papers addressing the efficacy of overdentures. They concluded that two-implant overdentures should provide adequate treatment for edentulous patients.^{15,16} In fact, the American Dental Education Association has highly considered incorporating the use of conventional two-implant overdentures in the student curriculum as the standard of care for edentulous patients.^{12,17} The paradigm is starting to shift to implant-retained dentures, which will decrease the amount of functional complications associated with completely edentulous patients, as well as the functional deficits of patients who have already undergone implant therapy.¹⁸ Two-implant overdentures may not, however, provide adequate stability for all cases, and additional implants may be required to meet the patient's expectations, as illustrated in the aforementioned case. Furthermore, a minimal number of implants used as anchorage for an overdenture may put additional stress and wear on the abutments, thereby increasing the unit's dependence on the soft tissue.¹⁹ To alleviate this concern, an increased amount of implants would presumably lessen the single axis fulcrum movement and create fewer retention-release occurrences during function.¹⁷ The treatment question still remains for patients who cannot undergo surgery for additional implants due to financial limitations or inadequate

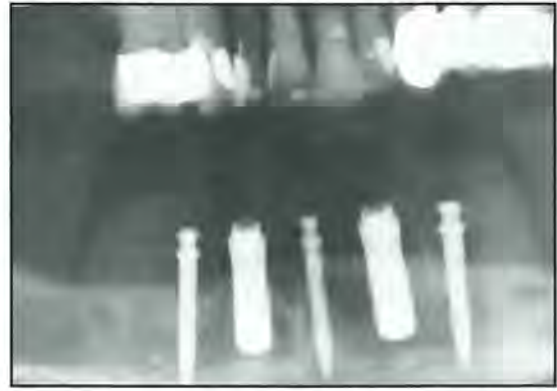


Figure 6. Postoperative radiograph obtained 6 weeks following implant placement confirmed implant stabilization and integration.

alveolar bone support. It is also important to consider that about 40% of denture-wearers have a significantly low income, emphasizing the need for treatment modalities with lower costs.^{20,23}

Research and clinical experience have demonstrated that narrow-diameter implants have proved to be successful as transitional implants.²⁴⁻²⁸ Normally, the transitional phase occurs when conventional implants are submerged and the transitional implants are immediately loaded to provide function for the patient during the three- to six-month healing period. Understandably, the protocol is to remove these transitional implants because the treatment case is shifting forward and a new prosthesis will be made to fit the larger conventional implants. The successful long-term use of SDIs has, however, triggered the development of implant design and surface configuration.^{29,30} These implants have received FDA approval for long-term use and should provide a feasible treatment alternative for denture retention. Nevertheless, this case is similar to the transitional implant situation described above, with a different purpose. Instead of allowing time for healing, the SDIs may be indicated for many other reasons, such as accommodating an indecisive patient with more time and improved function.

Conclusion

Small-diameter implants have a shape and thread design, which allow for an incision-free insertion, and simpli-

fied osteotomy preparation protocol. They are a feasible treatment option in cases dictated by a lack of alveolar ridge because of their diameter (2.2 mm or 2.4 mm). They are ideal for placement in limited amounts of bone, and their coronal profiles are attachments aimed at rescuing existing dentures.³¹ Because these implants are modeled specifically for overdentures, their cost is reduced to approximately a fourth of the cost of traditional implants, making them affordable for a much larger portion of the patient population.³² The efficacy of placing SDIs around previously placed conventional implants to help improve long-term retention has not yet been investigated. Additional studies are required to better investigate this treatment approach.

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