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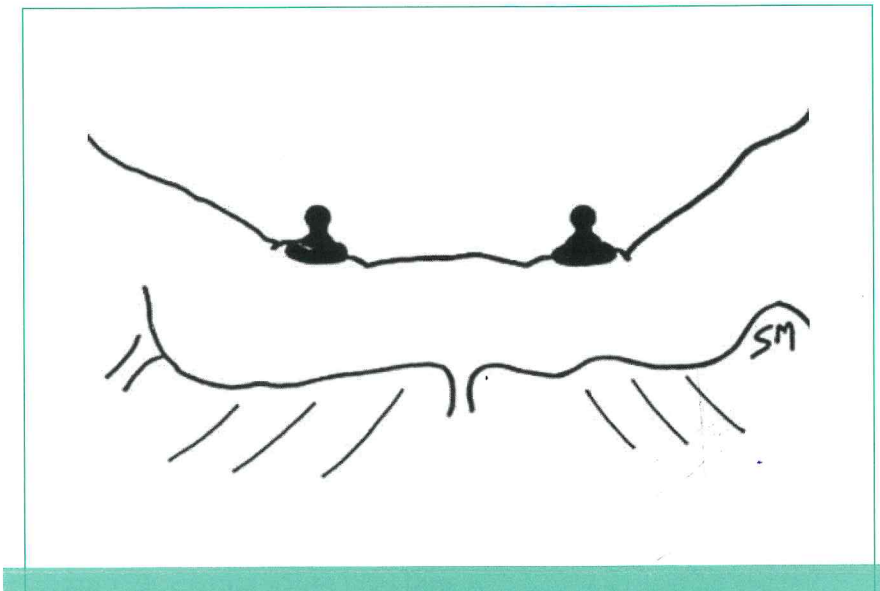

A clinical study evaluated the long-term maintenance of mandibular implant-supported overdentures retained by 2 unsplinted implants. See *MAINTENANCE OF MANDIBULAR TWO-IMPLANT OVERDENTURES.*

Implant-supported Overdentures

Totally edentulous patients unable to adapt to wearing conventional complete dentures have benefited from implant-supported overdentures. Because mandibular conventional complete dentures can be especially difficult for some patients to tolerate, implant support has been used successfully with these patients. This issue of *Prosthodontics Newsletter* presents a series of studies devoted to implant-supported overdentures.

Maintenance Of Mandibular Two-implant Overdentures

For >2 decades, a mandibular overdenture supported and retained by 2 unsplinted implants (cover illustration) and opposing a maxillary conventional complete denture has been used to treat the totally edentulous patient. Mackie et al from the University of Otago, New Zealand, evaluated long-term maintenance requirements of such overdentures over an 8-year period.

The study included 106 totally edentulous patients randomly assigned to 4 different implant systems. The orig-

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Maintenance of Mandibular Two-implant Overdentures

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inal conical Brånemark implant (Nobel Biocare, Yorba Linda, CA) possessed a machined implant surface. The other 3 systems (Southern Implants, Irvine, CA; Steri-Oss, Nobel Biocare; and Straumann, Andover, MA) had roughened surfaces. Participants were randomly allocated to 1 of 3 loading protocols: 2 weeks, 6 weeks and 12 weeks after placement. Each participant was provided with 1 of 6 different attachment systems. These included:

- Brånemark 2.25-mm ball patrices/Brånemark gold matrices
- Straumann 2.25-mm ball patrices/Straumann gold matrices or Straumann titanium matrices with stainless steel springs
- Southern 3.95-mm ball patrices/Southern plastic matrices
- Southern 2.25-mm ball patrices/Southern gold-platinum matrices
- Steri-Oss 2.2-mm ball patrices/Steri-Oss rubber matrices
- Locator abutment/Locator inserts (Zest Anchors; Escondido, CA)

After 6 years, 90 patients remained in the study; after 8 years, 68 patients remained. In the first year of service, 73.3% of the patients required ≥1 maintenance visits. In the sixth year, 44.4% of the patients required maintenance.

The most common overdenture-specific maintenance procedure was relining of the mandibular prosthesis, with a mean time of 3.37 ± 2.06 years to relining. Ten overdentures were remade, 50% at year 7. The most common matrix maintenance procedure involved replacement. Over a 6-year period, the matrices with the shortest longevity were the Steri-Oss rubber (1.4 ± 0.7 years), while the Straumann gold matrices lasted the longest (3.9 ± 2.1 years). Southern gold-platinum, Brånemark gold and Southern plastic matrices all lasted longer than did the Straumann titanium and Steri-Oss matrices. Patrix maintenance requirements were low, with 21.6% requiring replacement over the 8 years of the study.

Comment

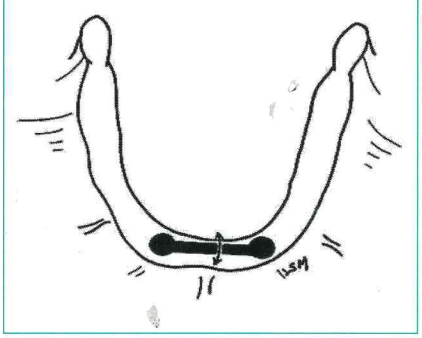
The number of maintenance procedures required in the study was substantial, and the type of attachment system had a major influence on prosthodontic maintenance. Patients receiving this type of overdenture treatment should be informed of the need for continuous follow-up and maintenance care.

Mackie A, Lyons K, Thomson WM, Payne AGT. Mandibular two-implant overdentures: prosthodontic maintenance using different loading protocols and attachment systems. Int J Prosthodont *2011;24:405-416.*

Overdenture Bar Misfit

Two implants are commonly used to retain mandibular overdentures. A common retention method involves the use of a bar that connects the implants (Figure 1). A poorly fitting bar can cause stress concentration at the implant/bone interface. However, the effect of misfit on the implants and implant components is not well understood, and some studies have suggested that implants can tolerate some degree of misfit.

Figure 1. A bar with a rounded occlusal surface connects the 2 implants in a supported overdenture



Spazzin et al from Meridional Faculty (IMED), Brazil, evaluated the effect of horizontal misfit on a 2-implant supported bar. A 3-dimensional finite element analysis model included 2 titanium implants and a bar placed in the anterior portion of a jaw with severe bone resorption. Horizontal misfits were 10, 50, 100 and 200 µm for a gold alloy (Au) bar. The second part of the experiment used 4 bar materials (gold alloy, silver-palladium alloy [Ag-Pd], commercially pure titanium [Ti] and cobalt-chromium alloy [Co-Cr]) with a misfit of 50 µm.

Misfit resulted in stresses in the inferior region of the bar, the neck of the screw, the cervical and middle third of the implant, and the cortical bone surrounding the implant. Stress levels increased in all areas with amplified levels of misfit for the gold alloy bar (Table 1). When the various bar materials were

tested, the higher stiffness of the bar presented a considerable increase in the stress levels in the cortical bone tissue and bar framework, but there were few stress-level changes with the retaining screw and implant itself (Table 2).

Comment

Most studies on bar misfit have addressed vertical misfit. This study evaluated horizontal misfit, which is also important. Although it is impossible to completely eliminate misfit, this study suggests that misfit should be minimized by using techniques such as soldering or laser-scanned computer-milled bars.

Spazzin AO, dos Santos MBF, Sobrinho LC, et al. Effects of horizontal misfit and bar framework material on the stress distribution of an overdenture-retaining bar system: a 3D finite element analysis. J Prosthodont *2011;20:517-522.*

Reinforcement of Implant-supported Overdentures

Because the denture base of an implant-supported overdenture can fracture, several materials have been used to reinforce it—the most common being cast metal strengtheners. Rached et al from Pontifical Catholic University of Paraná, Brazil, evaluated the dynamic and static strength of an implant-supported overdenture model reinforced with metal and nonmetal strengtheners.

Eight implant-supported overdentures designed with 2 metal O-ring capsules positioned 20 mm apart were fabricated from acrylic resin (Lucitone 199; DENTSPLY International, York, PA). Between the attachments, a 2.5-mm deep triangular frenal notch was placed.

Table 1. Maximum stress (MPa) in the models testing horizontal misfit

	Structures of the model			
Model	Cortical bone	Bar	Retaining screw	Implant
Au/10	33	38	31	25
Au/50	165	195	155	127
Au/100	330	395	312	253
Au/200	660	810	629	330

Table 2. Maximum stress (MPa) in the models testing bar material

	Structures of the model			
Model	Cortical bone	Bar	Retaining screw	Implant
Au/50	165	195	155	127
Ag-Pd/50	178	225	159	135
Ti/50	181	229	159	137
Co-Cr/50	188	253	161	141

The O-ring capsules, metal implant provisional cylinders and ball attachments (3.3 mm in diameter, 6 mm in height) came from the same manufacturer (Neodent; Curitiba, Brazil). The types of reinforcements were

- braided stainless steel strengthener (National Keystone; Cherry Hill, NJ)
- stainless steel mesh (Masel; Bristol, PA)
- unidirectional E-glass fibers (Stick; StickTech, Turku, Finland)
- bidirectional silanated E-glass fibers with porous poly(methyl methacrylate [StickNet; Stick Tech])
- woven polyethylene braids, 3 mm wide (Construct; KerrLab, Orange, CA)
- polyaramid (polyparaphenylene terephthalamide) fibers (Kevlar 49; GoodFellow Cambridge Limited, Huntingdon, United Kingdom)

For reinforcement, 2.5-mm and 1-mm spaces were developed; nonreinforced specimens were controls. Specimens were thermocycled at 5°C and 55°C for 5000 cycles with a 30-second dwell time and then subjected to a 100,000 cyclic loading process. Intact specimens were tested until failure on a universal testing machine (Model TT-B; Instron, Norwood, MA).

The unidirectional E-glass, polyethylene and polyaramid fiber groups with the 2.5-mm space recorded significantly higher mean flexural strength values than did the control group and the stainless steel mesh

group. In the 1-mm space, no significant difference was found among any of the groups.

Comment

The E-glass fibers, the woven polyethylene braids and the polyaramid material effectively strengthened the denture and are likely to have clinical applicability. For the 1-mm space, there was no advantage to reinforcement compared with the control group. The authors suggested that when only 1 mm of space was available, the acrylic resin was too thin in the area of the attachments, which led to incomplete formation of the fiber-reinforced composite.

Rached RN, de Souza EM, Dyer SR, Ferracane JL. Dynamic and static strength of an implant-supported overdenture model reinforced with metal and nonmetal strengtheners. J Prosthet Dent *2011;106:297-304.*

Immediate Loading and Patient Satisfaction With Mandibular Overdentures

Scientific evidence shows that a patient experiencing problems with a conventional mandibular complete denture can benefit from conversion of the denture to an implant-supported overdenture with immediate loading. Nevertheless, more scientific evidence is needed to link the incorporation of immediate loading to an increase in patient satisfaction and improved quality of life (QOL).

Borges et al from Patos de Minas School of Dentistry, Brazil, evaluated QOL and patient satisfaction after converting conventional mandibular complete dentures to immediately loaded overdentures retained by 2 implants. The 16 study participants (age range, 30–76 years; mean age, 59.2 years) all had mandibular conventional complete dentures. All mandibular dentures were rated acceptable, but most patients experienced problems with denture retention.

At baseline, all patients' oral-health–related QOL and satisfaction with their prostheses were evaluated. In a single-stage protocol for immediate loading, they received 2 Brånemark implants (Conexão Sistemas de Próteses Ltda, São Paulo, Brazil) in the anterior region of the mandible. Within 24 hours, a metallic bar with a circular transverse section was attached to the implants. A plastic clip (Conexão Sistemas de Próteses) was incorporated into the denture to provide implant retention. Prosthesis satisfaction and QOL were evaluated 1 week, 3 months and 6 months following prosthesis conversion.

Patient satisfaction results for mandibular prostheses before conversion were 43.75%, and 100% 1 week, 3 and 6 months after conversion, respectively. Patient satisfaction with both prostheses before conversion was 68.75%; it was 93.75% at both 1 week and 3 months after conversion and 87.5% at 6 months after conversion. After the mandibular denture conversion, patients reported immediate initial improvement in both satisfaction with the retention and stability of the denture, and their oral-health–related QOL.

Comment

In this study, patients were immediately satisfied with the improved retention of the mandibular prosthesis after implant placement and loading. Nevertheless, 25% of patients who had not previously complained of problems with their maxillary complete dentures complained about the maxillary denture's retention and stability after conversion of the mandibular complete denture. It appears that once the mandibular denture becomes more stable, patients' perception of the stability of the maxillary denture can change.

Borges TDF, Mendes FA, de Oliveira TRC, et al. Mandibular overdentures with immediate loading: satisfaction and quality of life. Int J Prosthodont *2011;24:534-539.*

In the Next Issue

- Longevity and failure of all-ceramic restorations
- Clinical performance of porcelain laminate veneers
- Prognosis of zirconia fixed partial dentures

Our next report features a discussion of these issues and the studies that analyze them, as well as other articles exploring topics of vital interest to you as a practitioner.

Do you or your staff have any questions or comments about **Prosthodontics Newsletter**? Please write or call our office. We would be happy to hear from you.