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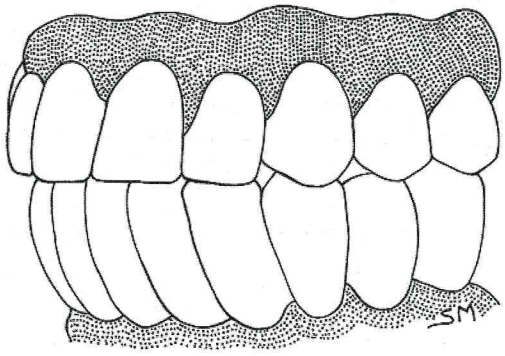

A recent clinical study evaluated complete-arch, mandibular, implant-supported fixed prostheses fabricated with a zirconia substructure. See IMPLANT-SUPPORTED, COMPLETE-ARCH ZIRCONIA FIXED DENTAL PROSTHESES.

Outcomes and Complications with Implant-supported Prostheses

Implant-supported prosthodontics remains an important component of a prosthodontic clinical practice. A patient who has had difficulty manipulating a mandibular complete denture can have the conventional denture replaced with an overdenture supported and retained by implants. A patient with a single missing tooth can have the tooth restored with an implant-supported single crown, and a patient with an entire arch of missing teeth can have the arch restored with a complete-arch, implant-supported fixed prosthesis. Patient satisfaction with implant dentistry tends to be very high, but complications can occur. This issue of *Prosthodontics Newsletter* reviews studies related to outcomes and complications with implant-supported prostheses.

Ten-year Crossover Clinical Trial of Implant-supported Overdentures

Patients dissatisfied with their mandibular complete dentures usually can be treated successfully with overdentures supported and retained by 2 implants. The different types of attachments include ball-socket retainers, magnets and splinted-bar retainers with clips. Bar attachments, in cross section, can be round, egg-shaped or U-shaped.

To determine if any one approach was superior, Cune et al from the Univer-

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Inside this Issue

Ten-year Crossover Clinical Trial of Implant-supported Overdentures

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sity Medical Center Groningen, the Netherlands, conducted a 10-year follow-up study of patients treated with implant-supported mandibular overdentures retained by ball-socket and bar-clip attachments.

In a crossover clinical trial, 18 patients having problems with their mandibular dentures received overdentures supported and retained by 2 implants. Each patient received 3 different attachment styles.

- Magnet (Dyna magnet ES, type extra strong; Dyna Dental Engineering)
- Bar-clip (round bar in conjunction with metal omega-shaped IMZ clip; Friadent)
- Ball-socket (Ball-socket attachment, Frialit-2; Friadent)

All implants were Frialit-2 implants (Friadent) and were placed in the mandibular anterior region. One of the 3 attachment systems was randomly incorporated into the overdentures. After 3 and 6 months, the attachments were changed, also in random order. After approximately 1 year, the patient chose 1 attachment type, and the dentures were fitted with the requested system.

After 10 years, 14 patients were available for recall, 7 with ball-socket attachments and 7 with bar-clip attachments. Among the 4 lost to follow-up was the only patient who had chosen a magnet-retained mandibular overdenture. Probing depths, bleeding indices around the implants and bone height were measured. Results indicated no statistically significant differences in satisfaction scores between the patients with ball-socket attachments and those with bar-clip retained dentures. Complications or revisions to the dentures included denture fractures, denture relines, clip replacement, loosening of the ball-attachment matrix and remake of the dentures.

Comment

Without showing the superiority of either the ball-socket or the bar-clip system, this study indicated that long-term satisfaction can be achieved with mandibular overdentures retained with either system. The ball-socket system is simpler and less costly because it does not incur a laboratory fee, which is an advantage. Results can be applied only to the 2 brands and designs of the attachments studied. Other designs of ball-socket and bar-clip attachments may not produce similar results.

Cune M, Burgers M, van Kampen F, et al. Mandibular overdentures retained by two implants: 10-year results from a crossover clinical trial comparing ball-socket and bar-clip attachments. Int J Prosthodont *2010;23:310-317.*

Fracture Resistance of Implant-supported Single Crowns

Implant-supported fixed restorations retained by screws for an edentulous mandible have long been used and are well documented. As treatment options evolved and single missing teeth were replaced with implant-supported crowns, screw retention commonly was used to attach the crown to the implant abutment. However, to avoid the presence of a screw-access hole (SAH) in the center of the occlusal surface of the crown, the recent trend has been to cement a crown over the implant abutment, rather than retain it with a screw.

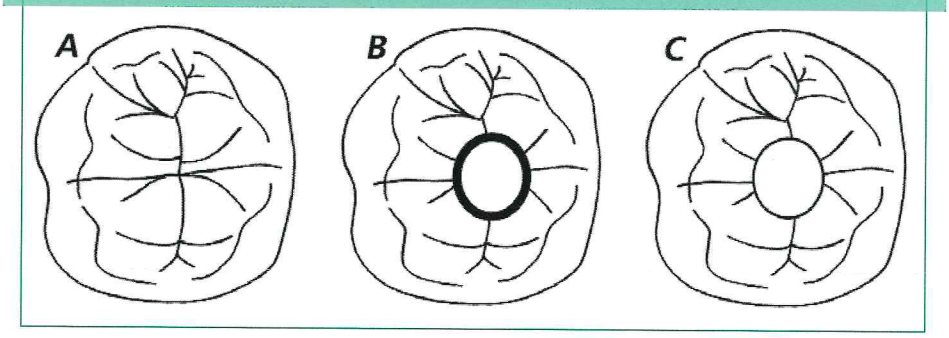
A study by de Oliveira et al from the University of São Paulo, Brazil, evaluated the effect of 3 designs for single, metal-ceramic, implant-supported mandibular molar crowns on the crowns' fracture strength.

- Group 1 (the control) had an uninterrupted occlusal surface and was cemented to the implant abutment with resin-modified glass ionomer cement (Rely-X Luting 2; 3M ESPE). The implant abutment had been connected to the implant with 32 Ncm of torque.
- Group 2 had an SAH on the center of the occlusal surface and an access channel reinforced with metal.
- Group 3 also had an SAH in the center of the occlusal surface without metal support (Figure 1).

The screw-retained crowns were all held in place with 32 Ncm of torque.

For each group ($n = 10$), 5 specimens were subjected to dynamic loading (1,200,000 × 100 N × 2 Hz). All crowns in each group were then subjected to an axial compressive load (500 Kgf × 0.5 mm/minute) in a universal testing machine. The

Figure 1. A cemented crown with intact occlusal surface porcelain (A), a screw-retained crown with metal reinforced screw-access channel (B) and a screw-retained crown without metal reinforcement of screw-access channel (C).



load was placed with a 6-mm diameter rod at the central fossa of the occlusal surface, making contact with the buccal and lingual cusps of each crown.

None of the specimens fractured during the cyclic loading test. The mean load at fracture was statistically higher for the cemented group compared with the mean loads for the 2 groups with SAHs. Mean loads for the groups with metal reinforcement of the channels and without reinforcement did not differ statistically. Between the subgroups dynamically loaded and those that were not, there were no statistical differences for all 3 groups in the mean loads.

Comment

Porcelain fracture of implant-supported metal–ceramic crowns has been reported as a clinical complication that can lead to failure of the restoration. The results of this study suggested that cemented crowns with an intact occlusal surface would be less prone to porcelain fracture compared with crowns that incorporate an occlusal screw-access opening. Because the fracture loads did not differ between the 2 access-hole designs, the authors suggested that metal reinforcement of the screw-access channel can be eliminated, improving the esthetic result.

de Oliveira JLG, Martins LM, Sanada J, et al. The effect of framework design on fracture resistance of metal-ceramic implant-supported single crowns. Int J Prosthodont *2010;23:350-352.*

Implant-supported, Complete-arch Zirconia Fixed Dental Prostheses

Yttria-stabilized tetragonal zirconia polycrystalline (Y-TZP) ceramics possess very high flexural strength and fracture toughness, and have been used as a substructure for fixed partial dentures (FPDs). However, most clinical trials of this material involve short-span FPDs cemented to natural teeth.

Larsson et al from Malmö University, Sweden, prospectively evaluated complete-arch Y-TZP mandibular implant-supported fixed dental prostheses over a 36-month period. Ten patients were enrolled in the trial, 9 of whom received 10-unit fixed prostheses and 1 patient who received a 9-unit prosthesis (cover illustration). Each prosthesis was supported by implant abutments (Profile BiAbutment ST, Astra Tech) prepared with an approximate 15° convergence angle and attached to 4 dental implants (Fixture MicroThread ST 4.0; Astra Tech).

Y-TZP substructures were fabricated according to the manufacturer's instructions. The substructures were then veneered with veneering porcelain (Cercon ceram S; DeguDent) fired in a calibrated furnace.

The completed prostheses were cemented with a resin cement (Panavia F 2.0; Kururay), and followed for 1 to 2 weeks. The FPDs were evaluated at baseline and at 12, 24 and 36 months. The marginal integrity and surface characteristics were rated excellent, acceptable, retrievable or not acceptable.

At the 3-year follow-up, all prostheses were still in use, and all patients were satisfied. None of the substructures had fractured; however, chipping of the veneering porcelain was observed in 9 of the 10 patients. A total of 34 of the 99 units (34%) demonstrated chipping. Most chip-off fractures (74%) were cohesive failures within the veneering porcelain. All margins were rated either excellent (70%) or acceptable (30%) at the 3-year recall.

Comment

Because of the high rate of chipping of the veneering porcelain after only 3 years, the authors suggested that this treatment method should be viewed with caution.

Other studies have reported chipping, but in most studies, including this one, chipping was considered minor and could be satisfactorily polished intraorally.

Larsson C, von Steyern PV, Nilner K. A prospective study of implant-supported full-arch yttria-stabilized tetragonal zirconia polycrystal mandibular fixed dental prostheses: three-year results. Int J Prosthodont *2010;23:364-369.*

Bone Loss Around Implants Supporting Mandibular Overdentures

Stability of bone around a dental implant is considered a measure of success. The lapse between the time the implant is placed and the time it is loaded with an overdenture has been a topic of considerable debate. However, data related to the effects of the loading protocol on long-term implant bone levels have been limited.

In a randomized, controlled clinical trial, Ma et al from the University of Otago, New Zealand, evaluated implant bone levels of 101 edentulous patients treated with 2 unsplinted implants and mandibular overdentures over a 10-year period. At the 10-year recall, the 79 available patients were randomly placed into 3 loading protocols for their implants: a conventional loading protocol (12 weeks) and 2 early-loading protocols (6 weeks and 2 weeks).

Single-stage surgery was performed on all patients, and 4 different implant systems were used.

- Brånemark original conical implant (Nobel Biocare)
- Southern Implants
- Steri-Oss (Nobel Biocare)
- Straumann

Six different overdenture attachments were used.

- Brånemark 2.25-mm ball
- Straumann 2.25-mm retentive anchor
- Southern 3.95-mm ball
- Southern 2.25-mm ball
- Steri-Oss ball
- Locator abutment

Standardized radiographs were taken at baseline (loading) and at 1-, 2-, 3-, 5-, 8- and 10-year recalls. Mesial and distal bone levels were measured for each implant. The mean marginal bone loss after the first year was 0.21 ± 0.25 mm. At the 10-year recall, the mean marginal bone loss was 0.29 ± 0.53 mm. After the first year, there was greater bone loss for the implants subjected to the 2-week loading protocol compared with the other protocols; the results were statistically significant.

This trend continued throughout the 10 years of the study. At the end of 10 years, the mean marginal bone loss for the 2-week loading group was 0.48 ± 0.62 mm compared with 0.15 ± 0.42 mm for the 6-week group and 0.23 ± 0.50 mm for the 12-week group.

Comment

The amount of bone loss reported by the investigators was extremely low. Although more bone loss was seen with the 2-week loading protocol and results were statistically significant, these small differences cannot be considered clinically significant. The authors suggested that these low rates of bone loss are likely the result of the implants' being placed in patients with extreme ridge resorption, so that the implants were placed primarily in basal bone.

Ma S, Tawse-Smith A, Thomson WM, Payne AGT. Marginal bone loss with mandibular two-implant overdentures using different loading protocols and attachment systems: 10-year outcomes. Int J Prosthodont *2010; 23:321-332.*

In the Next Issue

- Marginal fit of zirconia fixed partial dentures
- Resistance to fracture of endodontically treated teeth
- Fatigue behavior of monolithic ceramic crowns and veneered zirconia crowns

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.