Prosthodontics NEWSLETTER

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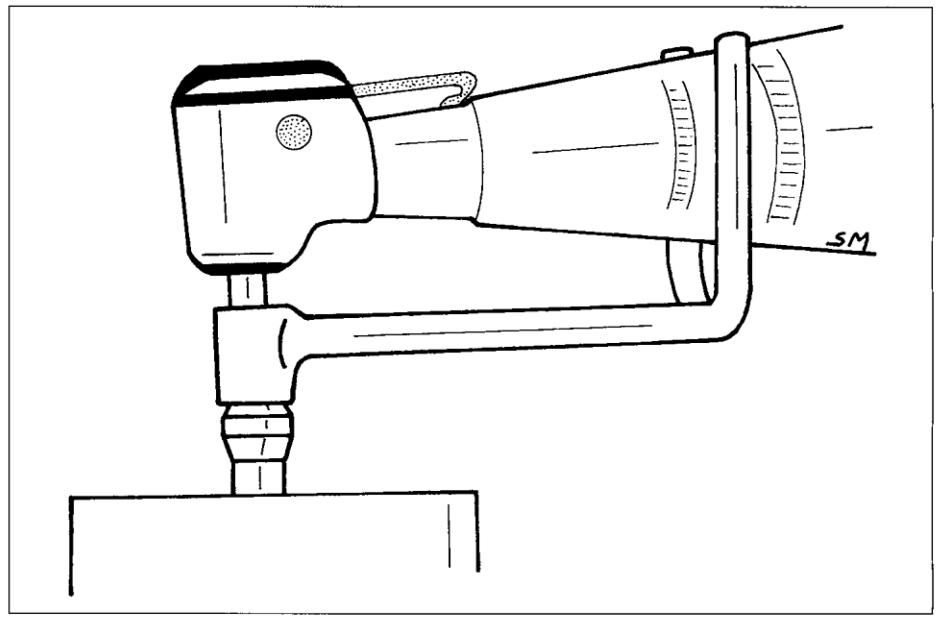


A torque driver equipped with a counter-torque device has been shown to substantially reduce torquing forces transmitted to an implant. See *Counter-torque Device for Implants* inside.

Research on Implant Prosthodontics: An Update

The use of implant-supported prosthodontics continues to increase, especially for the restoration of partially edentulous patients. Nevertheless, much of the treatment provided is based on empiricism rather than scientific scrutiny. As newly published reports become available, our knowledge of implant prosthodontic procedures improves. This issue of *Prosthodontics Newsletter* is devoted to recently reported research that has helped clarify our understanding of implant prosthodontics with respect to treatment outcomes.

Interdependence of Implant Success

In most studies relating to the success of implants, each implant failure is assumed to be an independent occurrence. Often a "raw success rate" is calculated by dividing the number of failed implants by the total number of implants placed. Because the causes of implant failure are not well understood, the assumed independence of each implant may not be valid. Biologic effects that are unique to each patient may play an important role in the prognosis of implants. Certain patients may be "failure prone," and the failure of one implant may signal a greater potential for subsequent failures.

A recent multicenter study evaluated the dependency among implants within the same patient/jaw compared with overall cumulative success rates. Statistical analysis indicated that a dependency among implants existed prior to loading. The risk of failure for the remaining implants in the same patient therefore increased after the first failure.

Comment

It is well known that patients who smoke cigarettes are more likely than non-smokers to experience failure of implants. There are other systemic conditions, such as diabetes mellitus, that have also been suggested as factors increasing the potential for failure. Given these variables, it appears that providing raw success data to patients when estimating prognoses of osseointegration of implants may be misleading.

Some implants will fail to osseointegrate and the rate of failure varies with bone quality and the location in the jaw. Patients are commonly given estimates of "chances of success" based on average percentages. Perhaps patients should be advised that generalized success rates are guidelines only and these percentages cannot always predict chances of success for a specific patient.

The results of this study suggested that some patients will be failure prone and some will be resistant to failure. Those patients who experience one failure have a higher probability of experiencing one or more subsequent failures, while those who have not lost an implant have less probability of losing an implant in the future.

Herrmann I, Lekholm U, Holm S, Karlsson S. Impact of implant interdependency when evaluating success rates: a statistical analysis of multicenter results. Int J Prosthodont *1999;12:160-66.*

Tooth–Implant Supported FPDs vs. Implant Supported FPDs

Implants are commonly used to support prosthetic restorations for partially edentulous patients. Fixed partial dentures (FPDs) may be totally supported by implants or they may receive their support from both implants and one or more natural teeth (see Figure 1).

The combined tooth–implant supported prosthesis is a controversial treatment method because of inherent differences in the biomechanics of natural teeth and osseointegrated implants. A recently reported 10-year follow-up study evaluated the performance of tooth–implant supported FPDs compared with freestanding implant supported FPDs.

Twenty-three patients with bilateral posterior edentulous spaces (Kennedy Class I) in their mandibular arches and opposing complete dentures were included in the study. Each patient received both types of prosthetic design.

On one side, the FPD was supported by two implants; on the other side, the FPD was supported by one implant and one natural tooth. After a 10-year period, 20 of the original patients were available for follow-up examination.

The tooth–implant combination showed no negative influences on any of the parameters studied. The authors concluded that the combined implant–tooth supported FPD is a predictable and reliable treatment method for the posterior mandible.

Comment

Although this study investigated a relatively small number of patients, the corresponding drop-out rate was also very small. Two patients died and

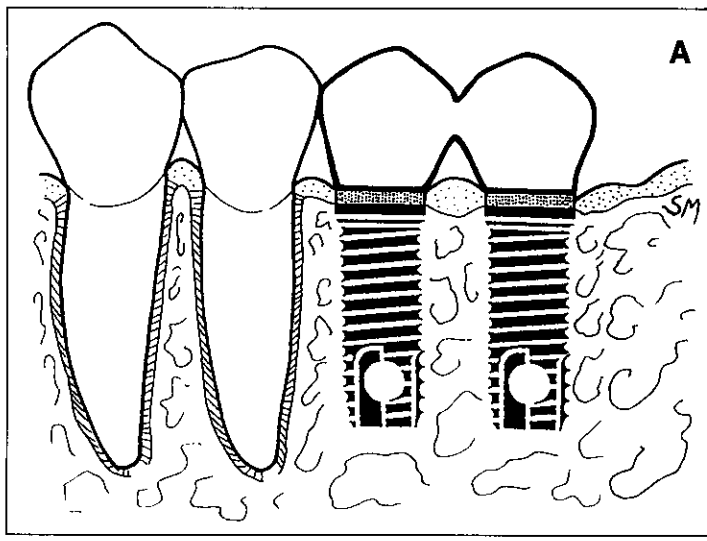


Figure 1. *Freestanding implant supported FPD (A) is the most prosthodontics. Tooth–implant supported prosthesis (B) is c*

one lived too far from the clinic to return for examination. It can be reasonably assumed that the results would not have differed for the three missing patients.

Furthermore, the follow-up time of 10 years is commendable. Most clinical studies report results after only 3 to 5 years.

Surprisingly, the authors reported very few complications for either type of prosthesis. Most clinical studies have reported higher percentages of mechanical complications with various types of implant supported prostheses.

For example, it appears that none of the abutment screws loosened for any of the implants for the entire period studied, while five "gold screws" were only "slightly loose" after 10 years. Most dentists have probably experienced more incidences of screw-related problems with 20 patients (40 prostheses) over 10 years.

Perhaps there are some missing data that were not incorporated into the study. Dentists planning treatment for implant prosthodontics for their partially edentulous patients would welcome additional comparative studies of different designs of implant supported prostheses.

Gunne J, Åstrand P, Lindh T, et al. Tooth-implant and implant supported fixed partial dentures: a ten-year report. Int J Prosthodont *1999;12:216-21.*

Fit of Implant-Supported Prostheses

"Passive fit" has been regarded as an important feature for implant-supported restorations. There are many articles that offer advice on methods to achieve passivity.

A recent literature review evaluated more than 100 journal articles devoted to this topic. The authors of the review concluded that, even with "advanced strategies," passive fit cannot be precisely obtained with the available technology.

Because of the number of steps involved and the inherent errors associated with each step, meticulous, accurate clinical and laboratory procedures were recommended by the authors to ensure the best fit of implant-supported prostheses.

Comment

Techniques to verify the accuracy of master casts, along with methods to improve the accuracy of the process of fabrication of prostheses, were discussed in this review article. Several highly sophisticated methods such as laser welding and electric-discharge milling ("spark erosion") have been advocated to improve the fit of prostheses.

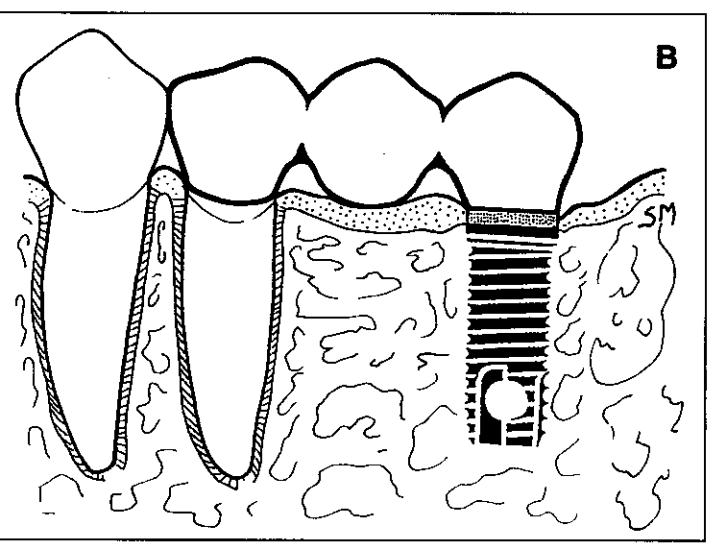
At this time, there is little scientific evidence supporting the ability of any of the "advanced strategies" to substantially enhance accuracy. Long-term effects of misfits between implants and prostheses can be biologic (loss of osseointegration) or mechanical (failure of structural components such as screws).

However, if "passive fit" is nonexistent, common sense suggests that some amount of misfit is "clinically acceptable."

There are no data to guide the dentist in determining what is a "clinically acceptable" fit. Without some major breakthrough in technology, dentists must use clinical judgment when evaluating the fit of any restoration.

If the fit of a prosthesis appears acceptable "beyond the dentist's ability to detect a misfit," it may not be a true passive fit, but it may, nonetheless, be a "clinically acceptable fit."

Wee AG, Aquilino SA, Schneider RL. Strategies to achieve fit in implant prosthodontics: a review of the literature. Int J Prosthodont *1999;12:167-78.*



ommon method of restoring an edentulous space with implant troversial because of differences in biomechanics of support.

Counter-Torque Device for Implants

Most implant systems use a screw to attach the abutment to the implant body. The clamping force (preload) developed with the screw joint is an important predictor of the stability of the abutment/implant connection.

Inadequate tightening can lead to screw loosening or fracture; therefore, metered torque-control devices are commonly used to ensure predictable clamping forces.

Next:

- A new diamond rotary instrument
- Resin-modified glass ionomer cements
- Porcelain thickness and dental shades

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

Nevertheless, the effects of these high-torquing forces on the implant/bone interface are not well understood. If torque is transmitted directly to an implant, the twisting force must be resisted by the investing bone and the osseointegration may fail.

Counter-torque devices are available to absorb the torque generated by torque controllers. A recent *in vitro* study investigated the ability of a counter-torque device to counteract forces that could be transmitted to an implant.

The study used 40 Brånemark-style implants with four different abutments. Half the abutments were tightened by using a torque controller without the use of a counter-torque device; half were tightened with the use of a counter-torque mechanism (Nobel Biocare AB, Göteborg, Sweden). Torquing forces were 20 Ncm, 32 Ncm and 45 Ncm.

Results indicated that an average of 91% of the tightening torque was transmitted to the implants when a counter-torquing mechanism was not used. When a counter-torque system was employed, less than 10% of the torque was transmitted to the implants.

Comment

It has been postulated that damage to the immature bone/implant interface during controlled tightening of the abutment–implant connection may be a cause in the failure of implants.

Currently, high torque values (32-40 Ncm) have been recommended when applying the final clamping force for implant abutments, especially to single abutments supporting unsplinted artificial crowns. Another study has demonstrated that a reverse torque of 45-58 Ncm can remove an implant from type 4 bone, which is commonly found in the posterior maxilla.

Furthermore, it has been suggested by others that torque meters are not always reliable after multiple sterilization procedures. Higher than expected torque may be delivered to an implant with a torque controller that has been used and autoclaved repeatedly.

The results of this investigation suggest that the counter-torque device studied can absorb more than 90% of the applied tightening force and will adequately protect the bone/implant connection.

Nevertheless, these counter-torque devices are not popular and are awkward to use. Perhaps these devices are important only when implants in type 4 bone are subjected to torquing forces of 40 Ncm or higher. The dentist may consider their use when tightening abutments for posterior implants that support single (unsplinted) artificial crowns.

Lang LA, May KB, Wang R-F. The effect of the use of a counter-torque device on the abutment-implant complex. J Prosthet Dent *1999;81:411-17.*

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.