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Practice Limited to Implant Surgery & Prosthodontics



Complications in Implant Therapy

While over the past several decades implant therapy has been remarkably successful in addressing challenging patient needs, the wise practitioner remains informed about potential surgical, treatment and posttreatment complications. The presence of both biologic (e.g., bone loss, soft tissue inflammation, nerve damage) and mechanical (e.g., restorative material wear/fracture, loss of prosthesis retention, screw loosening, component failure) complications must be accurately identified and quickly addressed to avoid unfavorable outcomes. Continuous review of pertinent professional literature on this topic is a necessity. This issue of Prosthodontics Newsletter considers complications encountered in implant dentistry.

Implants and Systemic Medical Disorders

The increasing success of implant therapy to replace missing teeth has been driven by factors that have improved osseointegration between implant and bone. But patients with certain systemic medical conditions, particularly diabetes mellitus and osteoporosis, suffer a higher rate of implant loss than do healthy patients. Aghaloo et al from the UCLA School of Dentistry, California, undertook a systematic review of the relevant literature to evaluate the effect of systemic disorders and certain medications on implant osseointegration.

Diabetes mellitus: The authors identified 20 studies of implant sur-

vival in patients with diabetes mellitus. Most of these studies included patients whose diabetes was well-controlled (glycated hemoglobin [HbA1c] <8), since most practitioners limit elective dental surgical procedures, including implant placement, in patients with uncontrolled diabetes. Patients with uncontrolled diabetes reported no difference in osseointegration based on HbA1c level; however, the sample sizes were too small for definitive conclusions. Patients with well-controlled diabetes had implant survival rates similar to nondiabetic patients, although osseointegration

typically took longer to achieve and long-term studies showed increased levels of marginal bone loss and peri-implantitis.

Osteoporosis: Analysis of implant survival rates in patients

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Implants and Systemic Medical Disorders

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with osteoporosis included 17 studies of patients taking antiresorptive medications (usually bisphosphonates) and 4 studies of patients not taking antiresorptive medication. Implant survival rates, regardless of medication regimen, were similar to those in nonosteoporotic patients. Placement of implants in patients taking bisphosphonates must be balanced against the possible development of osteonecrosis of the jaw (ONJ), a potentially devastating side effect.

Other systemic conditions:

A systematic review analyzed several small studies of implant osseointegration in patients with human immunodeficiency virus (HIV). The review suggested that HIV-positive patients with controlled CD4+ T lymphocyte counts and receiving both prophylactic antibiotic treatment and highly active retroviral therapy had rates of implant survival comparable to the general public.

Studies of patients with cardiovascular diseases, hypothyroidism or rheumatoid arthritis found that these disorders and their treatments had little to no impact on implant survival; other studies have found implant therapy to be a valid option in patients with neurological disorders. In contrast, patients taking selective serotonin reuptake inhibitors or proton pump inhibitors have shown a higher rate of implant failure than have other patients.

Comment

The currently available evidence suggests that implant therapy is not contraindicated in patients with these systemic disorders. Nevertheless, special care must be taken in patients taking bisphosphonates to guard against the development of ONJ.

Aghaloo T, Pi-Anfruns J, Moshaverinia A, et al. The effects of systemic diseases and medications on implant osseointegration: a systematic review. *Int J Oral Maxillofac Implants* 2019;34(suppl):s35-s49.

Mandibular Overdentures on Stud Abutments

The accepted minimal standard of care for fully edentulous patients has been the 2-implant mandibular overdenture, which has a high implant survival rate and a positive effect on oral health-related quality of life (OHQoL). Little research has been done about maintenance needs and prosthetic complications, especially comparing the use of ball and stud attachments, an important factor in determining cost over the life of the restoration.

Matthys et al from Ghent University, Belgium, addressed this knowledge gap with a prospective 5-year study that evaluated clinical outcomes of 2-implant mandibular overdentures mounted on cylindrical stud abutments, including implant survival, radiographic bone level, peri-implant outcome, patient satisfaction, prosthetic technical outcome and complications. At a general dental clinic, 75 consecutive edentulous patients received mandibular overdentures supported by 2 implants in the anterior mandible. The final prostheses were placed 4 months after surgery using Locator abutments. Patients attended follow-up appointments at least annually; at 5 years, 56 patients remained in the cohort.

No implants were lost over the 5-year study. Mean bone loss was 1.25 mm, with the vast majority of it taking place in the first year. OHQoL, as measured by the Oral Health Impact Profile (OHIP)-14 (scored from 0 to 56, with lower scores reflecting greater OHQoL), showed significant improvement at both 1 and 5 years in all 7 domains and overall (Table 1). Poorer retention scores correlated with poorer OHQoL scores. Over the 5-year period, 375 maintenance events occurred; more than half of

Table 1. OHIP-14 total score.

	All patients	Subgroup A	Subgroup B
Intake	20.20	23.07	17.00
1 year	2.94	3.03	2.78
5 years	3.20	3.90	2.41

Subgroup A, more bone height and/or width in the mandible; subgroup B, less bone height and/or width in the mandible.

these involved a change of retention inserts. Only 9 of the original 112 abutments had to be replaced due to excessive wear.

Comment

The use of 2-implant mandibular overdentures retained on 2 stud abutments provides a good solution over the medium term in the edentulous mandible. The procedure should definitely be included as a treatment option among this patient group.

Matthys C, Vervaeke S, Besseler J, De Bruyn H. Five-year study of mandibular overdentures on stud abutments: clinical outcome, patient satisfaction and prosthetic maintenance—influence of bone resorption and implant position. *Clin Oral Implants Res* 2019;30:940-951.

Factors Associated with Early Implant Failure

Early implant failure—the failure of the implant to achieve osseointegration following surgery—has a major detrimental impact on prosthetic treatment of edentulous patients. Identifying potential risk factors for early implant failure in edentulous patients can help guide treatment planning.

Malm et al from the University of Gothenburg, Sweden, reviewed the records of all edentulous patients treated in 1 specialist referral clinic over a 28-year period. Their final data set included 25,029 implants placed in 3974 patients (4615 fully edentulous jaws). Over the period

Table 2. Early implant failure rate for turned and moderately rough-surfaced implants.

	Failure rate	
	Maxilla	Mandible
Turned implants	18.3%	3.7%
Moderately rough-surfaced implants	4.9%	2.5%

from which the records were obtained, the clinic shifted from using turned implants to moderately rough-surfaced implants; the number of implants placed per jaw decreased over time.

At 1 year, 8.6% of implants had failed; nearly three-quarters of these failures occurred before loading. Failure rates for the maxilla and mandible were comparable. Maxillae treated with turned implants had a significantly higher rate of early implant failure than did those treated with rough-surfaced ones, although no significant difference was found in the mandible (Table 2). A multivariable logistic regression analysis found significant higher odds for early implant failure associated with maxillary implants, turned implants in the maxilla, younger age of patient and a higher number of implants placed.

Comment

Given the 28-year period covered by this study, it is natural that some of the results may have been influenced by changes in treatment protocols, especially the change-over from turned to rough-surfaced implants. Increasing age associated with better outcomes seems counterintuitive, but could indicate that edentulism at a younger age may be associated with general health

problems, a potential factor in early implant failure.

Malm MO, Jemt T, Stenport V. Early implant failures in edentulous patients: a multivariable regression analysis of 4615 consecutively treated jaws. A retrospective study. *J Prosthodont* 2018;27:803-812.

Implants with Lower Crown-to-Implant Ratios

The use of short (<10 mm) and extra-short (<6 mm) implants has gained support for restorations in atrophic alveolar ridges; compared with protocols that include reconstruction of the alveolar ridges, employing these short implants requires less intraoperative time, fewer and less invasive surgical procedures, and reduced cost. Longer implants have shown more favorable survival rates at 5 years than do short implants. Short implants may have unfavorable crown-to-implant ratios, which could be a destabilizing factor for long-term success.

Ravidà et al from the University of Michigan School of Dentistry undertook a systematic review of the literature to correlate the effect of crown-to-implant ratio with implant survival, marginal bone loss and prosthetic complications. The



authors searched for prospective cohort studies and randomized clinical trials of ≥ 12 months duration made up of patients receiving ≥ 1 dental implant that reported crown-to-implant ratios. Fifteen studies that included 907 patients and 1548 implants met the inclusion criteria.

Implants, from 7 different manufacturers, ranged in length from 5 mm to 10 mm and in diameter from 4 mm to 4.8 mm. For the purpose of analysis, the implants were divided into 2 groups:

- crown-to-implant ratio of > 1.5
- crown-to-implant ratio of ≤ 1.5

No significant correlation was found between anatomical crown-to-implant ratio and implant survival, nor did the ratio correlate with any other variable, including type of restoration, screw-retained vs cemented crowns, splinted vs nonsplinted prosthesis, or smoking status. Crown-to-implant ratio had no significant effect on marginal bone loss nor on prosthetic complications. Nor was any significant correlation found for any outcome when the analysis was limited to extra-short implants.

Comment

The use of 1.5 as the dividing point for analysis of crown-to-implant ratio was based on a recent study suggesting that the implants with ratios ≤ 1.5 potentially increased the risk for marginal bone loss. These results indicate that short and extra-short implants exhibit results similar to those obtained with long implants. This knowledge expands the options available to the patient and the practitioner.

Ravidà A, Barootchi S, Alkanderi A, et al. The effect of crown-to-implant ratio on the clinical outcomes of dental implants: a systematic review. *Int J Oral Maxillofac Implants* 2019;34:1121-1131.

Restoration Success in General Practices

Implants have a proven track record of success, with a small ($\leq 5\%$) failure rate during the healing period and an even smaller ($\leq 1\%$) annual failure rate after prosthetic loading. Prosthetic complications are more common, but frequently these can be easily resolved. Because most studies take place in institutional environments, however, their applicability to general dental practices may be ambiguous.

To analyze the short-term survival of implants and the performance of implant-supported restorations, Klotz et al from the University of Heidelberg, Germany, undertook a retrospective study of patient data from a private, general dental practice. All surgeries, conducted by the practice owner and another dentist employing a standard protocol, used 2-piece implants with a diameter of ≥ 3.5 mm and length of ≥ 8 mm. Patients received various types of implant-supported prosthetic restorations. All patients had a follow-up visit ≥ 3 months after attachment of the definitive prosthesis.

Of the 186 implants studied, 9 (4.8%) failed during healing. The analysis of the restorations included 134 implants supporting 107 prostheses in 84 patients

who had a follow-up of ≥ 3 months. No further implants were lost, although 2 implants showed bone loss of > 2 mm due to peri-implantitis. Complications developed in 25 prosthetic units, most commonly loss of retention (14 cases) followed by screw loosening and veneer fractures. The authors computed probable complication-free survival rates of 92% and 84% for the restorations after 1 and 2 years.

Comment

In this data taken from a general dental practice, the success rates for implants and restorations were similar to those achieved in academic settings. While there was a higher rate of suprastructure-related complications, these issues are usually easy to fix.

Klotz A-L, Ott L, Krisam J, et al. Short-term performance of implant-supported restorations fitted in general dental practice: a retrospective study. *Int J Oral Maxillofac Implants* 2019;34:1169-1176.

In the Next Issue

Impact of treatment design on implant overdenture outcome

Our next report features a discussion of this issue 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.

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