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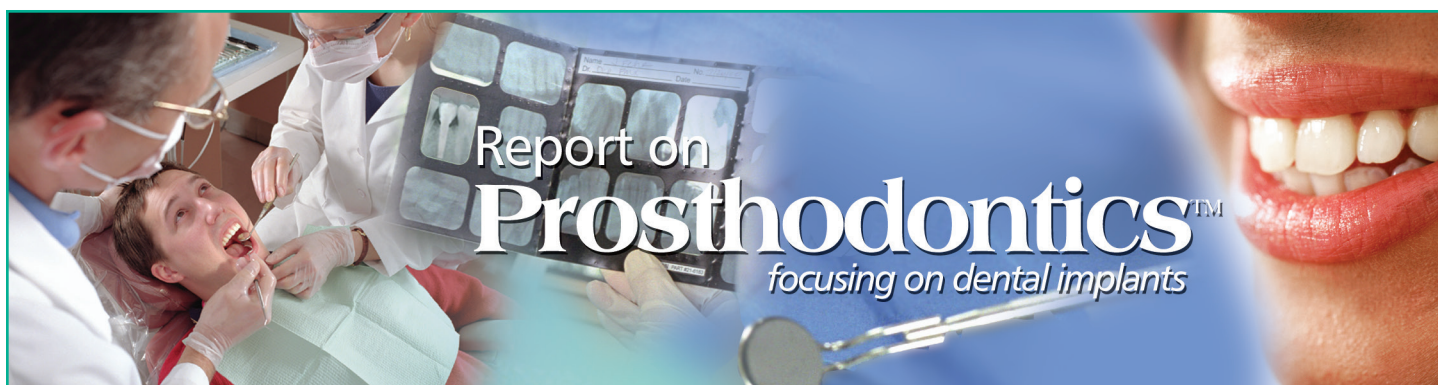
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## Implant-assisted Removable Partial Dentures

*Implant literature has focused on fixed restorations, overlooking implant-assisted removable partial dentures. While studies have shown these types of prostheses to be viable options, more research is needed. This issue of Report on Prosthodontics will review the current literature regarding the benefits of dental implants as the foundation of removable partial dentures.*

### Alternative Treatment For Implant-assisted Removable Partial Dentures

**D**ifficulty in providing patients with stable, comfortable, well-fitting removable partial dentures (RPDs) has been a complaint among dental professionals and patients. With the advent of dental implants, the surgical placement of implants and the fabrication of a fixed dental prosthesis became an alternative to RPDs. While not widely reviewed in the literature, another alternative is the placement of dental implant-assisted RPDs in the partially edentulous ridge of Kennedy class I and class II patients.

Chatzivasilieiou et al from Aristotle University of Thessaloniki, Greece, examined the literature to review the existing knowledge about this treatment modality. The published literature was searched for in vivo studies

reported in peer-reviewed English-language journals, regardless of the level of evidence.

To be included, the articles had to report on either maxillary or mandibular implant-assisted RPDs, with at least 1 dental implant. The quantity and quality of documentation on implant-assisted RPDs indicates that it is an alternative treatment option.

The authors discovered that the main indications for an implant-supported RPD in the edentulous ridge of Kennedy class I and class II patients were to achieve improved

- support
- comfort
- esthetics

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- Long-term Outcomes of Implant-supported Removable Partial Dentures
- Influence of Implant Position on Patient-based Outcome Measures
- Practical Considerations for Implant-assisted Removable Partial Dentures

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Kennedy class I and class II arches were converted to a biomechanically more favorable class III situation. Studies suggested that denture base stability contributed to a more stable occlusion, improved chewing ability, increased bite force and a high level of patient satisfaction. The authors also hypothesized that the greater support offered might prevent the development of combination syndrome.

Although implant-assisted RPDs may be more expensive than conventional RPDs, they are more economical than some alternative therapies. Patients saved >50% of treatment costs when implant-assisted RPDs were chosen over implant-supported fixed restorations. The authors concluded that implant-assisted RPDs appear to be a viable treatment option.

Chatzivasileiou K, Kotsiomiti E, Emmanouil I. *Implant-assisted removable partial dentures as an alternative treatment for partial edentulism: a review of the literature.* Gen Dent 2015;63:21-25.

## Long-term Outcomes of Implant-supported Removable Partial Dentures

The first report suggesting the benefits of dental implants to support a removable partial denture (RPD) was published in 1991. In Kennedy class I and class II situations, implants have been placed both adjacent to the most distal tooth (typically a canine or premolar) and more posterior in the molar region. Recently, Jensen et al from the University of Groningen, the Netherlands, evaluated implant survival, marginal bone levels, soft tissue and prosthetic complications, and patient-perceived oral health-related quality of life (OHRQoL) in patients receiving implant-supported RPDs.

A retrospective analysis was performed on all patients with Kennedy class I dentition who had been treated at the authors' institution between 1991 and 2014 with 2 implants placed bilaterally in the mandible supporting an RPD. Eligible for inclusion were 26 patients (3 patients were unable to participate, and their data were not obtained; the data for 2 patients, who lost their remaining dentition after 4.5 years and 14.4 years of RPD functioning, were used only for clinical outcomes and not for the patient-based assessment). Patients were divided into 2 subgroups:

- those with implants placed in the premolar region (anterior group)
- those with implants placed in the molar region (posterior group)

Three implants were lost in the posterior group; 1 implant failed to integrate, and 2 were lost due to peri-implantitis after 3 and 6 years of function, respectively.

Overall, plaque levels, bleeding on probing and soft tissue health scores were low. While the plaque score was significantly higher for the posterior group, there were no significant differences between the 2 groups in probing depth and mean marginal bone level. Biological complications occurred in 29 of the 46 implants; peri-implant mucositis was the most common. There was a significant difference between the posterior and anterior implant groups, with more biological complications found in the posterior group (Table 1).

During the mean observational period of 8.1 years, 65% of the RPDs had no technical complications; 2 appliances needed minor repairs, while 3 RPDs had to be replaced. In 3 patients, the RPDs were no longer in function, including 2 prostheses converted to complete overdentures

Table 1. Clinical assessments of 23 patients at follow-up (mean ± standard deviation)					
	Implants (n = 43)	Anterior (n = 16)	Posterior (n = 24 <sup>a</sup> )	p value	Effect size (r)
Plaque index	0.9 ± 0.7	0.6 ± 0.7	1.1 ± 0.7	.035	0.32
Bleeding index	0.7 ± 0.6	0.5 ± 0.6	0.8 ± 0.6	.074	0.27
Gingiva index	0.5 ± 0.7	0.1 ± 0.3	0.8 ± 0.8	<.001	0.54
Probing depth (mm)	3.3 ± 1.4	3.3 ± 1.2	3.3 ± 1.5	.634	0.07
Change in marginal bone level <sup>b</sup> (mm)	−0.9 ± 1.0	−1.0 ± 1.1	−0.8 ± 1.0	.821	0.03

<sup>a</sup>Three additional posterior implants were lost during the study. <sup>b</sup>A negative value depicts resorption. r, correlation coefficient for bivariate analysis.

**Table 2.** Number of biological and technical complications related to implants and RPDs, respectively

Implants biological complications	Total (n = 46)	Anterior (n = 16)	Posterior (n = 30)
No complications	17	9	8
Complications <sup>a</sup>	29	7	22
Peri-implant mucositis	24	6	18
Peri-implantitis	2	1	1
Implant loss	3	0	3
RPDs technical complications	Total (n = 23)	Anterior (n = 8)	Posterior (n = 15)
No complications	15	4	11
Complications	8	4	4
Minor repair	2	1	1
Replaced	3	2	1
Not in function	1	1	0
Reverted to a full arch denture	2	0	2

<sup>a</sup>Significantly more complications associated with posterior implants ( $p = .048$ ).

in 2 patients who had lost their remaining teeth. There was no significant difference in technical complications between the 2 groups (Table 2).

The overall OHRQoL assessment was favorable. In general satisfaction, the patients scored high. No significant difference was found between the 2 groups. The authors concluded that in a Kennedy class I situation in the mandible, an implant-supported RPD is a viable treatment option with high rates of implant survival and patient satisfaction.

Jensen C, Meijer HJA, Raghoobar GM, et al. Implant-supported removable partial dentures in the mandible: a 3–16 year retrospective study. *J Prosthodont Res* 2016;doi:10.1016/j.jpor.2016.07.002.

## Influence of Implant Position on Patient-based Outcome Measures

The use of dental implants to improve removable partial denture (RPD) foundations has led to greater patient satisfaction and better retention, stability and chewing ability. Planning treatment for Kennedy class I cases begs the question: Which is the better location of implant position, adjacent to the premolar or molar region?

In a prospective study, Jensen et al from the University of Groningen, the Netherlands, compared the effect of implant location on oral health-related quality of life (OHRQoL) with perceived patient satisfaction. In this randomized clinical trial, patients with full maxillary dentures and bilateral free-ending mandibular RPDs received 2 implants bilaterally in the premolar and molar regions. The selection of which pair of implants to load first was random; after 3 months, the other pair was loaded. Five patient-based outcome measures were assessed prior to treatment, after 3 months with the new RPD without implant support, after 3 months of function with premolar implant support and after 3 months of function with molar implant support:

### ■ OHRQoL

- patient-reported general health status
- general contentment
- daily wearing time of the RPD
- patients' preference of implant position

Comparison of the OHRQoL scores showed a statistically significant difference at the 4 assessments. The overall scores for the implant prosthesis (premolar or molar) were significantly better than the pretreatment or new RPD without implant support scores. While patients with the new RPD showed some improvement in functional limitations, physical pain and psychological discomfort, the dental implants further enhanced the perceived improvement. For the “Social Disability” and “Handicap” domains, there was no difference between premolar and molar position. For the patient-perceived general health status, there was no statistically significant difference among the 4 groups.

Using a visual analog scale, the patients were asked to assess their expectation of contentment after implant therapy. They were then asked to express their contentment after receiving the new RPD, and with each of the different implant configurations of implant-supported RPDs. There was a higher degree of contentment with implant-supported RPDs than with the old or unsupported new RPD ( $p < .005$ ). There was no difference



in the degree of contentment between the 2 implant-supported RPDs.

The mean wear time was significantly different between the new RPD and the implant-supported RPDs. Patients wore their implant-supported RPDs longer per day compared with the RPD without implant support. The implant position did not influence wearing time. However, 56.7% of the patients preferred the molar implant support.

*Jensen C, Raghoobar GM, Kerdijk W, et al. Implant-supported mandibular removable partial dentures; patient-based outcome measures in relation to implant position. J Dent 2016;55:92-98.*

## Practical Considerations for Implant-assisted Removable Partial Dentures

The success of any prosthodontic treatment lies in a careful understanding of treatment indications and biological and technical considerations. This is particularly true of implant prosthodontics. Omura et al from the University of Tennessee Health Science Center reviewed the diagnostic, treatment planning, clinical and maintenance considerations that are important to successfully treat patients using implant-assisted removable partial dentures (RPDs). The authors reviewed the literature to create a systematic approach when considering this treatment modality.

The authors found that the availability of space for attachments and the framework itself must be examined. Decisions must be made regarding implant locations, such as placement of the implant adjacent to the posterior tooth or in a posterior location, which will convert the design from a Kennedy class I or II to a Kennedy class III situation. It also is important to consider the biomechanical implication of these decisions. The amount of foundation bony support influences the number and distribution of implants, which in turn affects the biomechanical nature of the prosthesis and ultimately has an impact on prosthetic maintenance.

As with any RPD, the treatment-planning process should include determining the framework design. It is at this point that the restorative space for the framework, teeth

and attachments should be examined. Whether or not to use a clasp should be based on sound biomechanical consideration of good design philosophy. The attachments should be selected during this phase of treatment, not after implant placement.

According to the authors, there is no clear evidence in the literature to establish the most appropriate occlusal scheme. Therefore, the criteria used for conventional RPDs will suffice at this time. Vertical load is favorable. If the patient has opposing natural dentition, then a mutually protected occlusion should be chosen, but if the opposing dentition is a complete denture, then a balanced occlusal scheme may provide an advantage.

Maintenance should include evaluation of the teeth and soft tissue along with the prosthesis. For these types of prostheses, periodic recall evaluations should entail the assessment of changes in the prosthesis, such as

- occlusal wear
- chipping of denture teeth
- structural deterioration of the prosthesis base

Practitioners should include an evaluation of the attachments to determine any loss in retention or damage to the attachment components. The effectiveness of oral hygiene and home care should be evaluated and reinforced.

*Omura AJ, Latthe V, Marin MM, Cagna DR. Implant-assisted removable partial dentures: practical considerations. Gen Dent 2016; 64:38-45.*

### In the Next Issue:

- Patients' oral health-related quality of life with implant-supported fixed or removable partial dentures
- Effects of implant-based prostheses in partially edentulous patients
- Outcomes with implant-supported fixed prostheses and removable partial dentures

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