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Pacific Northwest Prosthodontics specializes in fixed, removable and implant Prosthodontics as well as being highly trained in fully edentulous immediate implant provisionalization (aka all on 4) options for your patients with failing or missing dentitions.



Developments in Implant-assisted Removable Partial Overdentures

Managed inappropriately, conventional removable partial denture (RPD) therapy can cause hard and soft tissue damage secondary to prosthesis rotation under functional/parafunctional loading. When RPDs do not rotate under function (Kennedy class III), RPD durability is significantly improved. One way to counteract RPD rotation incorporates dental implants, with or without attachments, in the denture foundation before or after prosthesis fabrication. This issue of Prosthodontics Newsletter looks at factors involved in successfully applying dental implants to improve the support, stability and retention of implant-assisted RPDs.

Converting RPDs to Implant-assisted Removable Partial Dentures

Distal-extension removable partial dentures (RPDs) are a cost-effective treatment modality for partially edentulous patients but come with several drawbacks. Patient non-compliance in the form of nonuse and the need for retreatment is greater with distal-extension RPDs than with tooth-supported prostheses. Implant-assisted RPDs (IARPDs) decrease shear forces and bending moments, displacement of prosthesis during function, and stress on abutment teeth and soft tissue.

Park et al from Korea University performed a systematic review and meta-analysis to evaluate the effects of conversion from conventional RPDs to IARPDs

on functional performance, biological and mechanical maintenance and complications, and patient-reported outcomes. They found 19 publications covering 13 independent clinical studies of patients with Kennedy class I partial edentulism that compared patient satisfaction and objective parameters, including

- biological and mechanical complications
- implant survival rate
- marginal bone loss at the implant site
- peri-implant tissue condition

after converting from conventional RPDs to IARPDs.

After conversion, overall satisfaction in patient-reported outcome measures improved, as did the food comminution and homogenization

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Converting RPDs to IARPDs

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index. Masseter muscle thickness during maximum muscle contraction and maximum bite force significantly increased, along with a significantly wider active occlusal contact area. Patients also reported a longer mean usage time per day with IARPDs than with conventional RPDs. The implants had a weighted mean survival rate of 96.6%; the most frequently reported mechanical complication was adaptation or replacement of the attachment.

Comment

This systematic review and meta-analysis showed significantly improved treatment outcomes when prostheses were converted from conventional RPDs to IARPDs in mandibular Kennedy class I partially edentulous patients. General patient satisfaction increased and masticatory function improved.

Park J-H, Lee J-Y, Shin S-W, Kim H-J. Effect of conversion to implant-assisted removable partial denture in patients with mandibular Kennedy classification I: a systematic review and meta-analysis. Clin Oral Implants Res 2020;31:360-373.

Posterior Implants with Surveyed Crowns For IARPDs

Studies have demonstrated the advantages of implant-assisted removable partial dentures (IARPDs) over distal-extension conventional removable partial dentures (RPDs). However, while most clinical studies of IARPDs featured

overdenture or telescopic double crown types, very few have reported on the use of implants with surveyed crowns.

Potential benefits of these implants include their mimicking conventional RPD natural tooth abutments and the need for fewer implants. But potential drawbacks include the anatomic limitations of placing implants in the posterior region, the lateral force of the RPD clasp on the implant and the potential of terminal torquing force on a single posterior implant due to high stress concentrations.

To evaluate these issues, Jung, a private practitioner, and Yi from Seoul National University, Korea, conducted a retrospective study to measure the clinical outcome, survival and success rate of posterior implants with surveyed crowns supporting an IARPD. The 16 patients enrolled in the study

- used or were willing to use distal-extension RPDs of Kennedy class I or II design
- had no systemic disease or osteoporosis that would affect bone metabolism
- had enough bone volume to accommodate implants ≥ 7 mm in length and

≥ 4 mm in diameter without guided bone regeneration

Two implants ≥ 8.5 mm in length were used wherever possible; if residual ridge height was limited, short (7 mm) implants were used. After osseointegration, implants were restored with surveyed crowns, after which patients received IARPDs. All patients had a follow-up of >1 year; clinical assessments included crown-to-implant (C/I) ratio, marginal bone loss (MBL) and implant survival and success rates.

The 32 implants had a mean function period of >5 years, with a mean C/I ratio of 1.48 and a mean MBL of 0.11 mm. Only 1 implant failed to maintain osseointegration, while 2 additional implants were also classified as failures due to excessive MBL; IARPDs functioned normally in 15 patients. Kennedy classification was the only factor associated with MBL (Table 1).

Comment

Implant-supported surveyed crowns demonstrated high survival and success rates, and proved to be a stable modality for IARPDs. A surveyed-crown IARPD based on posterior implants was a reliable option to

Table 1. Mean bone loss by variable.

Variable		Mean bone loss	p value
Sex	Male	0.22 ± 0.41	.182
	Female	0.06 ± 0.21	
Implant type	Internal bone level	0.12 ± 0.36	.823
	Internal tissue level	0.13 ± 0.27	
Opposing dentition	Fixed + implant	0.09 ± 0.25	.561
	Removable	0.16 ± 0.35	
Kennedy classification	Class I	0.05 ± 0.14	.002 ^a
	Class II	0.87 ± 0.55	
Clasp design	Clasp	0.12 ± 0.25	$>.999$
	No clasp	0.14 ± 0.39	

^a Significant at $p = .05$.

improve function in patients with Kennedy class I and II partial edentulism and conventional RPDs.

Jung T-W, Yi Y-J. Clinical outcomes of posterior implants with surveyed crowns for implant-assisted removable partial dentures: a retrospective study. Int J Oral Maxillofac Implants 2023;38:53-61.

Abutment Types With Short Implants

Clasap-retained, removable partial dentures (RPDs) remain the simplest and most economical treatment for the rehabilitation of edentulous patients with Kennedy class I or class II edentulism. Converting distal-extension RPDs to implant-assisted RPDs (IARPDs) improves masticatory function, leading to improved nutrition intake. Short implants with large diameters in severely atrophied posterior mandibular sites have survival and success rates comparable to long implants, along with a high level of patient satisfaction.

Abou-Ayash from the University of Bern, Switzerland, conducted a prospective clinical study using patient-reported outcomes to evaluate 2 types of attachments on 6 mm short implants placed in the posterior mandible supporting mandibular IARPDs. The 13 enrolled patients, all of whom wore Kennedy class I RPDs, in addition to being in good general health, had stable opposing dentition, ≥ 6 mm of bone above the mandibular canal and a sufficient horizontal crest to accommodate an implant diameter of 4 mm. Patients received 2 short implants placed bilaterally in mandibular molar sites. Dome

Table 2. Mean Oral Health Impact Profile (OHIP-G49) scores at baseline and 12 months.

	Baseline	12 months	Difference	p value
Functional limitation	8.2	4.0	-4.2	<.001
Physical pain	7.8	1.7	-6.1	.012
Psychological discomfort	2.8	1.0	-1.8	.020
Physical disability	5.2	2.0	-3.2	<.001
Psychological disability	2.5	0.9	-1.6	.021
Social disability	0.8	0.6	-0.2	.567
Handicap	2.6	1.6	-1.0	.025
OHIP-G49 total score	27.5	9.9	-17.6	<.001

Lower scores indicate better outcomes. All p values reflect significant improvement except for the social disability subscale score.

abutments were then screwed onto all implants, and modified dentures were delivered. Two months later, the dome abutments were replaced with retentive ball abutments and the dentures modified again.

After 2 months of abutment use, patients completed the 49-item Oral Health Impact Profile (OHIP-G49). Overall OHIP scores and most subscale scores improved significantly compared with baseline (before surgery while wearing Kennedy class I RPDs), with no significant difference seen between the abutments. At 12 months after baseline, overall OHIP scores and most subscale scores improved significantly (Table 2). The patients indicated a clear preference for the ball abutment, even if it were 500 CHF (approximately \$550) more expensive; they all agreed they would undergo the treatment again.

Comment

Although this clinical study had a small sample size, a relatively short follow-up period and no control group, its prospective nature made it a valuable resource for planning future, larger studies. This study's results indicated that transforming RPDs to IARPDs improves oral health-related quality of

life, with patients preferring retentive abutments to nonretentive abutments.

Abou-Ayash S, Rudaz A-C, Janner S, et al. Converting bilateral free-end removable partial dentures to implant-assisted removable partial dentures using 6 mm short implants: patient-reported outcomes of a prospective clinical study. Int J Environ Res Public Health 2022;19:8998.

IARPDs: Patient-reported Outcomes

Distal-extension removable partial dentures (RPDs), widely used for partially edentulous patients with Kennedy class I or II dentition, have been associated with increased alveolar bone resorption and caries lesions, unsatisfactory retention and stability, and a relatively high complication or failure rate along with limited functional and esthetic properties. Implant-assisted removable partial dentures (IARPDs) can be a minimally invasive alternative to distal-extension RPDs, providing increased retention and stability while distributing masticatory forces more effectively and improving patient satisfaction.



Bandiaky et al from the University of Nantes, France, conducted a systematic review and meta-analysis to determine the impact of IARPDs on patient satisfaction and quality of life. They found 13 clinical controlled studies, with a total of 238 partially edentulous patients first rehabilitated with distal-extension RPDs and then with IARPDs and a follow-up of 2 to 180 months. Each study evaluated patient-reported outcome measures of IARPDs and distal-extension RPDs, along with any clinical complications of IARPDs.

All studies reported a significant increase in patient satisfaction with IARPDs compared with distal-extension RPDs. The 10 studies evaluating mechanical and biological complications associated with IARPDs reported implant survival rates >90%, with the mean marginal bone loss around the implants ranging from 0.64 mm to 2.11 mm and mean deep pockets ranging from 2 mm to 4 mm. One study reported significantly more complications in posterior implants; another concluded that the use of short implants may be a viable option for patients with distal edentulism and contraindications for more complex implant rehabilitation.

Comment

IARPDs provided a significantly improved quality of life and patient satisfaction compared with distal-extension RPDs. Regular monitoring of patients should avoid mechanical and biological complications.

Bandiaky ON, Lokossou DL, Soueidan A, et al. Implant-supported removable partial dentures compared to conventional dentures: a systematic review and meta-analysis of quality of life, patient satisfaction, and biomechanical complications. Clin Exp Dent Res 2022;8:294-312.

IARPDs: Mechanical And Biological Outcomes

Restoring the dentition of partially edentulous patients typically involves removable partial dentures (RPDs). Some patients complained of unsatisfactory retention and stability. One suggested alternative to traditional RPDs is the implant-assisted RPD (IARPD), a minimally invasive approach. Lemos et al from the Federal University of Juiz de Fora, Brazil, performed a systematic review and meta-analysis to determine the viability of IARPD use in partially edentulous patients.

The authors electronically and manually searched available literature for randomized controlled trials and prospective studies comparing patients who received IARPDs and patients who received conventional RPDs. All studies had to include outcomes for

- implant survival rate
- marginal bone loss
- patient-reported outcome measures

Sixteen reports met the inclusion criteria for 334 participants who received 581 dental implants (>80% conventional implants); all studies evaluated IARPDs in the mandible, while 3 also evaluated IARPDs in the maxilla. Follow-up ranged from 6 months to 15 years.

Each study reported an implant survival rate of >90% with no difference between conventional implants (3.3 mm to 6.0 mm diameter) and mini-implants (2.0 mm to 3.0 mm diameter), with a low cumulative

implant failure rate of 3% in the meta-analysis. Mean marginal bone loss was 0.98 mm with no difference by implant position, but mini-implants showed significantly less bone loss compared with conventional implants. All studies reported a significant improvement in patient-reported outcome measures with IARPDs compared with conventional RPDs.

Comment

This systematic review and meta-analysis suggested that IARPDs provide high implant survival rates with low values of marginal bone loss and improved patient quality of life. IARPDs should be considered as a treatment option for partially edentulous patients.

Lemos CAA, Nunes RG, Santiago-Júnior JF, et al. Are implant-supported removable partial dentures a suitable treatment for partially edentulous patients? A systematic review and meta-analysis. J Prosthet Dent 2023;129:538-546.

In the Next Issue

Partially edentulous implant impressions

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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