# Indications for Removable Partial Dentures: A Literature Review

Bernd Wöstmann, Dr Med Dent[a]/Ejvind Budtz-Jørgensen, DDS, Dr Odont[b]/Nick Jepson, BDS, PhD, FDS[c]/
Eiko Mushimoto, DDS, Dr Med Dent, PhD[d]/Sigvard Palmqvist, LDS, Odont Dr/PhD[e]/
Afrodite Sofou, DDS, Dr Dent[f]/Bengt Öwall, LDS, Odont Dr, Dr Med HC/PhD[g]

***Purpose:*** The purpose of this report was to evaluate indications for the use of removable partial dentures based on a comprehensive literature review. ***Materials and Methods:*** Using a model similar to a Delphi process, the literature relating to the indications and contraindications for the prescription of removable partial dentures was discussed by seven experienced educators in a 2.5-day workshop. ***Results:*** Evidence for indications and contraindications for the prescription of removable partial dentures is not clearly stated in the literature; however, some basic principles are defined. There appears to be a trend in favor of the use of the shortened dental arch concept or implant-supported restorations instead of conventional removable partial dentures, given the evidence that the long-term use of removable dentures is associated with increased risks of caries and periodontitis and low patient acceptance. The presence of sound abutment teeth appears to encourage the use of removable partial dentures, as the fixed partial denture alternative requires sacrifice of healthy hard tissues. When economic factors influence the decision-making process, removable partial dentures are often chosen. ***Conclusion:*** While evidence-based indications and contraindications for prescribing removable partial dentures are still lacking, major underlying principles for clinical decision making are identified. *Int J Prosthodont 2005;18:139–145.*

The context of increasing life spans and evidence from various national dental health surveys in industrialized countries indicate that the proportion of edentulous people will continue to decline and that more people will retain more teeth into old age.[1,2] Projections based on data from such surveys[2,3] suggest a decline in tooth loss but an increased need for management of partial edentulism in patients with compromised oral or general health status. This trend of age-related increased tooth retention suggests that partially edentulous cohorts will be older than before and probably less disposed than younger people to such treatment with extensive tooth- or implant-supported fixed partial dentures (FPD). Consequently, socioeconomic factors and population trends suggest increased future treatment needs with different partial prostheses.

The present review is based on the hypothesis that the decision to prescribe a removable partial denture (RPD) is mainly based on a subjective mix of professional, functional, cultural, and economic considerations rather than on compelling scientific evidence. Therefore, the authors sought to identify evidence-based indications for RPDs.

## Materials and Methods

The seven authors who evaluated the literature are clinical academic prosthodontists with at least 18 years' active practice experience.

[a]*Professor, Department of Prothodontics, Justus Liebig University, Giessen, Germany.*
[b]*Professor Emeritus, Division of Gerodontology and Removable Prosthodontics, Section of Dental Medicine, University of Geneva, Switzerland.*
[c]*Senior Lecturer, Restorative Dentistry, School of Dental Sciences, University of Newcastle upon Tyne, United Kingdom.*
[d]*Associate Professor, Department of Prosthodontics, Iwate Medical University College of Dentistry, Japan.*
[e]*Associate Professor, Department of Prosthetic Dentistry, Faculty of Health Sciences, University of Copenhagen, Denmark.*
[f]*Associate Professor, Department of Prosthetic Dentistry, School of Dentistry, Aristotle University, Thessaloniki, Greece.*
[g]*Professor and Chair, Department of Prosthetic Dentistry, Faculty of Health Sciences, University of Copenhagen, Denmark.*

***Correspondence to:*** *Dr Bernd Wöstmann, Justus Liebig University, Dental Clinic, Schlangenzahl 14, Giessen D-35392, Germany. Fax: + 49 641 99 46139. e-mail: Bernd.Woestmann@dentist.med.uni-giessen.de*

**Table 1** Key Words Included in Electronic Search

| Key words | Hits | Key words | Hits |
|---|---|---|---|
| RPD | 283 | Satisfaction AND RPD | 15 |
| | | Removable denture | 168 |
| Nutrition AND dental | 3,523 | Nutrition AND denture | 170 |
| Subsearch: | | | |
| AND (tooth or teeth) AND NOT child* | 468 | | |
| Satisfaction AND dental | 2,365 | Satisfaction AND denture | 763 |
| Subsearch: | | | |
| AND prosth* | 521 | | |
| Quality of life AND dental | 695 | Quality of life AND denture | 113 |
| QoL AND dental | 32 | QoL AND denture | 10 |

### *Search Strategy*

An online search was conducted using the key words listed in Table 1 in the following databases:

- Cochrane Database of Abstracts of Cochrane Reviews
- MEDLINE
- PubMed
- Current Contents
- DIMDI (German Institute for Documentation in Medicine)

The search was augmented by a manual search of relevant journals and textbooks unavailable through online databases. Case reports and technical procedure descriptions were excluded from the analysis. From the remaining references, those that focused on the following areas related to RPDs were selected:

- Masticatory function
- Nutritional status
- Quality of life and patient satisfaction
- Interactions between RPDs and oral structures (caries, periodontitis, residual ridge resorption)
- Temporomandibular disorders (TMD)
- Prophylactic aspects (TMD, tooth wear, tooth migration)
- Alternative treatment options
- Contraindications

### *Literature Analysis*

The literature analysis was organized in several rounds in a manner similar to the Delphi principle:

- Round 1: literature search according to the strategy described
- Round 2: identification of the literature to be included in the evaluation in a workshop held in Giessen, Germany, in May 2002
- Round 3: circulation of a preliminary draft paper and inclusion of additional new published literature
- Round 4: circulation of the draft and inclusion of additional literature
- Round 5: approval of the final paper

The databases were first searched in April 2002; additional searches followed during rounds 4 and 5 (May and October 2003).

## Results

### *Masticatory Function*

The key determinants of masticatory performance are the number of functional tooth units and the bite force (Table 2). An age-related decrease of masticatory performance is associated with tooth loss, a decline of muscle mass and density of the masticatory muscles, and frailty.[4–6] However, patients' subjective assessment of chewing is influenced more by age than dental and prosthodontic status.[7]

Masticatory performance improves after prosthodontic treatment independent of the design and type (FPD/RPD) of the denture.[8,9] However, unless the patient has fewer than three occluding pairs of posterior teeth, there seems to be no sociofunctional benefit to be gained from replacing missing posterior teeth.[10]

### *Nutritional Status*

Nutritional deficiency is common in older adults.[11] The impaired masticatory function associated with tooth loss may lead to a deficient and unbalanced diet,[12,13] malnutrition, and even compromised general health. However, other factors, such as systemic health, socioeconomic status, and dietary habits, will also influence dietary selection (Table 2). Although masticatory performance generally increases after prosthodontic treatment, food selection remains unchanged irrespective of the prosthesis design.

**Table 2** Evidence-Based Statements Drawn from Literature Review

| Statement | Supporting studies | Cumulated N* |
|---|---|---|
| **Masticatory function** | | |
| Masticatory performance is determined by number of occlusal units and bite force | 38–40 | 644 |
| Chewing performance is affected by tooth loss and muscle status | 4–6,39–42 | 11,305 |
| Masticatory performance improves after prosthodontic treatment | 8,9,43–46 | 568 |
| **Nutritional status** | | |
| Impaired masticatory function compromises general health | 11,12,30,47–49 | 3,617 |
| Impaired masticatory function influences food selection | 50,51 | 735 |
| Socioeconomic factors and general health influence food selection | 52,53 | > 166 |
| Prosthodontic treatment does not influence dietary intake | 8,39,54–56 | 793 |
| **Quality of life and patient satisfaction** | | |
| RPD patients are more dissatisfied with their oral conditions than those with FPDs or natural teeth | 16,18,19,57–59 | 8,100 |
| Many RPDs are not used | 22,60–63 | 629 |
| RPDs cause inconvenience | 22,61,64,65 | 321 |
| **Interactions between RPDs and oral structures** | | |
| There is an association between the use of RPDs and caries and periodontal disease | 33,66–75 | 8,137 |
| If plaque control is achieved in appropriately designed RPDs, the risks for caries and periodontitis are not increased | 36,76–80 | 3,394 |
| There is an association between ill-fitting RPDs and bone resorption | 22,81 | 227 |
| **TMD** | | |
| Absence of molar support is not an etiologic factor for TMD | 20–22,66,82,83 | 1,419 |
| **Prophylactic aspects** | | |
| Unrestored shortened dental arches are occlusally stable | 84,85 | 851 |

*Total sample size of referenced studies where available; > = total sample size not available.
RPD = removable partial denture; FPD = fixed partial denture; TMD = temporomandibular disorders.

While a correlation between dental and nutritional status is evident, it remains unclear what the dependent and independent variables are. This observation is aggravated by patients' tendency to overestimate their nutritional status and masticatory performance.[14] Most patients consider themselves to be adequately nourished and tend to assess their dentures more favorably than a qualified prosthodontist would.[15]

### *Quality of Life and Patient Satisfaction*

A significant proportion of prescribed RPDs are not used. In this context, it must be clearly recognized that practical problems with RPDs (food retention, pressure spots, etc) are common and may be the reason so many patients stop wearing their RPDs (Table 2). Patient satisfaction increases when the RPD adds a significant number of occlusal units to the dentition.[17] However, the improved perceived function gained by an RPD replacing only a few teeth does not compensate for the discomfort of wearing the RPD. There is a reported superiority of FPDs with respect to patient satisfaction, but this does not in all aspects clearly favor FPDs over RPDs.[18,19]

### *Interactions Between RPDs and Oral Structures*

The use of RPDs is associated with an increased risk of caries and periodontitis, although there is no evidence that RPDs per se cause damage. With appropriate design and adequate plaque control, long-term clinical service RPDs have no detrimental effects on the periodontium or abutment teeth. Caries, however, can be a particular problem in elderly persons. There is strong evidence of an association between the use of RPDs and root surface caries (Table 2).

### *TMD*

Some studies suggest a correlation between missing molars and TMD[20]; however, there is almost no evidence that TMD symptoms are associated with a shortened dental arch (SDA).[21] Consequently, the replacement of missing posterior teeth by an RPD cannot be claimed to prevent the development of TMD (Table 2). In addition, poorly maintained RPDs may be associated with parafunctional jaw movements in the long term.[22]

### *Prophylactic Aspects*

A continuously used, well-fitting RPD can be expected to stabilize the occlusion and prevent tooth movement. However, occlusal stability in dentitions with unrestored SDAs is much higher than what has been traditionally assumed (Table 2). In this regard, no significant differences between SDA and RPD patients have been reported.

### *Alternative Treatment Options*

Implant-supported prostheses are nearly always an alternative treatment choice for partially edentulous cases; therefore, this option has not been included in the present analysis. When only a few teeth are missing and the patient has no functional complaint, an SDA concept should be considered.[23] If the abutment teeth need crowning, attachment-retained (eg, precision attachment or telescopic) RPDs or cantilever FPDs may be suggested for better longevity and oral comfort.[24] If the teeth are sound, an acrylic resin–bonded FPD or resin-bonded adhesive attachment retaining the RPD is also an option.[25,26] Whenever possible, fixed restorations should be considered as a first choice, as they demonstrate better survival.

### *Contraindications*

Definitive contraindications to the use of RPDs have not been reported. Nevertheless, diseases such as diabetes and dry mouth may restrict RPD treatment because of the inability of the mucosa to withstand mechanical trauma. Esthetic considerations and aspects of comfort may also be contraindications.[19,27] There is only weak evidence that an allergy to specific metals in the casting alloy also contraindicates an RPD.[28]

## Discussion

There appears to be a clear connection between oral and dental health status and the well-being of a patient, and numerous studies suggest that nutritional inadequacies may be related to dental status.[29,30] However, the quality of supportive scientific evidence is not compelling. Nevertheless, it seems prudent to assert that adequate dental and prosthodontic status is an important contributory variable to a person's general health and—especially in industrialized countries—well-being and is significantly linked to socioeconomic status.[31] Adequate prosthodontic rehabilitation clearly appears to increase chewing ability[8,9] and enhance an edentulous patient's ability to select an appropriate diet; however, supporting evidence for a similar effect in the partially dentate is weak.

Given the evidence that oral comfort is more effectively achieved using fixed rather than removable restorations, an RPD is not the treatment of choice in an SDA when esthetics is not effected.[32] The use of an RPD to replace only a few teeth where the improvement in oral function and/or esthetics is only marginal must therefore be questioned.[32] The beneficial effects of an RPD on patient satisfaction are counteracted by the oral discomfort inevitably induced by the prosthesis itself, especially when only a small number of teeth are missing. As the number of teeth to be replaced increases, the indication for the use of an RPD becomes stronger.

Treatment with RPDs is noninvasive to the remaining dentition's structure, but RPDs can increase the risk of caries, periodontitis, and residual ridge reduction, particularly in distal and extension areas. The specific risk of root caries when RPDs are used in elderly persons where the risk for inadequate oral hygiene is high and regular professional maintenance programs may be difficult suggests that RPD prescriptions should be avoided. In such patients, an SDA approach is a well-precedented treatment option.[33]

In the management of patients with a diagnosed TMD, a distinction should be made between those reporting problems and pain and others without any complaints. If in the former group restoration of molar support is advisable, an RPD is the preferred treatment option given its advantage of reversibility.

A patient's financial status and third-party health care funding systems appear to strongly influence the choice of different prosthodontic treatment options, a rather difficult comparison at an international level. In general, inadequate fiscal resources generally favor the RPD, but other economic aspects have to be considered as well: In highly industrialized countries, an RPD is often regarded as a low-cost treatment option; however, in many other countries, even the simplest dental restoration may prove unaffordable. It is clear that systems of health care provision strongly influence the indications not only for RPDs, but for all types of restorations. Nevertheless, a correctly designed "hygienic" RPD[34] offers a comparatively low cost and noninvasive alternative to other highly sophisticated treatment options, although maintenance costs will increase in the long term to reflect both a shorter longevity of RPDs[35,36] and the potential increased long-term treatment need. It is probably unlikely that the additional necessary expense will exceed the total initial and maintenance costs of more sophisticated restorations.

The pragmatic choice between different treatment options is based on both professional and subjective evaluations. Additional considerations include specifics regarding the burden of illness present, time for treatment, operator skills, patient perceptions, expected longevity, and, of course, expense. However, objective evaluations of most of these aspects are not available.[37]

## Conclusions

A detailed analysis of the literature failed to provide highly evidence-based indications for RPD treatment. Nevertheless, a lower level of evidence provided the following guidelines:

- Application of an SDA concept tends to preclude the indication for an RPD.
- The RPD is associated with an increased risk of caries and, to a lesser extent, periodontal disease, especially in the long term and in patients with poor oral health maintenance.
- Prophylactic oral health treatment with an RPD is questionable.
- The presence of sound abutment teeth in a well-maintained mouth strengthens the indication for a RPD.
- If provision of a conventional FPD is not possible because of extensive loss of teeth and implant treatment is not realistic, the clasp-retained RPD is a valid alternative.
- The application of optimal biologically related design principles may reduce RPD-related risks.
- The risk of low patient acceptance of an RPD must be considered.
- Economic considerations are strong indications for RPD treatment.

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*Literature Abstract*

## An in vitro evaluation of the reliability and validity of an electronic pantograph by testing with five different articulators

There have been a lot of efforts to transform the actual jaw movements on the articulators to recreate a patient's occlusion. The electronic mandibular tracing device may make the clinical procedure both simple and convenient. The purpose of this project was to evaluate the reliability and validity of the Cadiax Compact in calculating condylar settings for five different articulators: Denar D5A, Denar Mark II, Whip Mix 8500, Hanau Modular, and Panadent PCH. The Cadiax Compact sensors and styli were mounted to each articulator with custom-made mounting device that included a C-shaped aluminum plate, a round brass cross bar, and two adjustable side arms. At 3-, 5-, and 10-mm condylotrack distance, the condylar settings, including horizontal condylar inclination (HCI), immediate mandibular lateral translation (IMLT), progressive mandibular lateral translation (PMLT), top wall, and rear wall, were investigated. Thirty trials were performed for each condylar determinant preset. The standard deviation was calculated for evaluation of reliability and validity. Analysis of variance and Tukey's HSD test were used for statistical analysis ($\alpha = .05$). The reliability readings for the condylar setting at the 10-mm condylotrack distance were most consistent as compared to those at distances of 3 mm and 5 mm. The Denar Mark II had the smallest deviations from the preset values. The authors concluded that the Cadiax Compact is both reliable and valid for the articulators tested.

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**Reprints:** Dr Carl F. Driscoll, Rm 3D08, Baltimore College of Dental Surgery, 666 W Baltimore St, Baltimore, MD 21201. e-mail: cfd001@dental.umaryland.edu—*Eunghwan Kim, Lincoln, NE*