

# Discuss Before Fabricating: Communicating the Realities of Partial Denture Therapy.

## Part II: Clinical Outcomes

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### A b s t r a c t

*The premise of this review is that patients' satisfaction (and hence compliance) with partial denture therapy may be better if they are more fully informed about the limitations of the prosthesis they are to receive. Neither the dentist nor the patient should assume that all of their respective expectations will be mutually understood and inherently met. By discussing patient-centred issues and predictable clinical outcomes, both dentist and patient will be better prepared to determine whether a removable prosthesis is appropriate. Searches of the Cochrane Collaboration and MEDLINE databases were conducted to identify issues pertaining to patient compliance in wearing cast removable partial dentures. In addition to the 2 most frequent patient concerns, esthetics and mastication, discussed in the first article of this series, additional aspects of concern to the dentist and the patient when considering a removable partial denture include overeruption, post-insertion care, comfort, longevity of the prosthesis, effect on speech and biologic consequences are discussed here.*

**MeSH Key Words:** denture, partial, removable; prosthodontics; treatment outcomes

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More than a quarter of all removable partial dentures (RPDs) fabricated are deemed unsuccessful,<sup>1</sup> where failure is defined as refusal or inability to wear the denture. Because of this failure rate many practitioners choose not to provide this treatment and prefer to refer these patients. Others provide alternative modalities such as implants. However, in many clinical situations a partial denture remains the only restorative option because of anatomic defects or because the patient is psychologically or financially unable to accept an implant.

The 2 most frequent patient concerns, esthetics and mastication, were discussed in the first article of this series. This article outlines additional aspects of concern to the dentist and the patient when considering an RPD, specifically overeruption, adjustment to the denture, comfort, longevity of the device and biologic cost (periodontal disease, dental caries, residual ridge resorption or mucosal reactions).

### Materials and Methods

Searches of the Cochrane Collaboration and MEDLINE databases were conducted between January and April 2002 for any English-language article available since 1966 describing studies in which partial dentures were fabricated according to the prosthodontic principles, concepts and practices of the Academy of Prosthodontics.<sup>2</sup> As well, bibliographies of articles published before 1966 were hand-searched for pertinent articles. The objective was to identify systematic reviews with or without meta-analysis, randomized controlled trials (RCTs), clinically controlled trials (CCTs), or randomized clinical trials or other types of articles on the topic of cast RPDs that reported any of the following clinical outcomes: overeruption, adjustment to the prosthesis, comfort, speech, longevity and biologic cost of wearing an RPD, including increased risk of periodontal disease, caries, residual ridge resorption and mucosal reactions.

## Results

No systematic reviews or meta-analyses on cast RPDs have yet been published, although the Cochrane Collaboration has accepted protocols on partial edentulism. Only a few RCTs and CCTs on this topic are available.

## Discussion

### Overeruption

Patients are frequently counselled that if a lost tooth is not replaced prosthetically, the opposing tooth may erupt beyond the occlusal plane, a problem known as supraeruption or overeruption.<sup>3,4</sup> Eighty-five percent of dentists surveyed in Sweden believed that overeruption would occur after loss of an opposing tooth, despite limited knowledge of the outcome, and 53% believed that some treatment should be performed immediately or within a specified period after tooth extraction.<sup>5</sup>

Overeruption consists of 2 phases. The first phase is active eruption, during which the tooth erupts out of its socket while the periodontium remains stable. The second phase is growth of the periodontium, whereby the periodontal tissues, including the alveolar bone, grow in an occlusal direction.<sup>6</sup> The consequences of overeruption are occlusal derangement and periodontal damage. The consequences of overeruption, for which rehabilitation is often extremely difficult, may lead to a pessimistic bias among restorative dentists and hence overreporting of the prevalence of overeruption.

Most of the information on this topic is found in the orthodontic literature. Compagnon and Woda<sup>6</sup> reported that during the period when the antagonist tooth was missing, the cusps beyond the occlusal plane underwent continuous movement. Two other studies<sup>7,8</sup> in which teeth were missing for 5 years or longer found the opposite: not all molars without antagonists overerupted. More specifically, 18% of patients showed no signs of overeruption, 58% displayed overeruption of less than 2 mm, and 24% showed moderate to severe overeruption, with the risk of overeruption being lower when the teeth are lost later in life.<sup>8</sup>

Molar rotation is more frequent in the maxilla, and tipping more common in the mandible. Smith<sup>9</sup> stated that the literature regarding overeruption of lower second molars in cases of extraction of the upper second molar is conflicting and has not been scientifically evaluated. In his CCT, he found that overeruption of lower second permanent molars did occur in cases where the upper second permanent molars had been extracted and that eruption was confined to the distal aspect of these molars. The more distal the position of the upper first molar, the lesser the degree of overeruption of the mesial aspect of the lower second permanent molar. Maintenance of the occlusal plane, in case more maxillary teeth are lost and a removable

prosthesis is required in the future, becomes an important clinical issue and could present another argument against elective extraction of asymptomatic third molars, whether erupted or impacted.

### Adjustment to the Denture

Berry and Mahood<sup>10</sup> concluded that wearing a prosthesis is a skill that must be learned, that incentive must play a part in wearing an RPD, and that denture-wearing may involve learning at a subconscious rather than a conscious level. Zarb and MacKay<sup>11</sup> cautioned that with a removable prosthesis the patient always has the option of removing the device, which can hinder the rate at which adjustment takes place. They also cautioned that some patients simply cannot tolerate anything foreign in their mouths. The challenge is to recognize these patients before treatment, as their likelihood of success will be low. Although the astute clinician will have determined the patient's tolerance of gagging during the examination of the tongue and throat area, discussion with patients should include at least one question about tolerance of gagging.

### Comfort

Witter and others<sup>12</sup> defined oral comfort in patients who had lost posterior teeth (i.e., who had shortened dental arches) using the following criteria: absence of signs and symptoms of craniomandibular dysfunction (CMD), unimpaired chewing ability and appreciation of the appearance of the dentition in relation to absent posterior teeth. They concluded that a shortened dental arch consisting of 3 to 5 occlusal units is not a risk factor for CMD and can provide sufficient long-term oral comfort and furthermore that a mandibular Class I RPD will not prevent CMD and will not improve oral comfort. However, wearing an RPD may give rise to complaints related to impaired esthetics and oral comfort.<sup>13</sup>

Comfort is frequently combined with the more general outcome "patient satisfaction." Frank and others<sup>14</sup> defined satisfaction as a composite of 15 items including fit, speech, chewing difficulty and appearance. They found that the most common sources of dissatisfaction in their patient population were lack of fit, the RPD had caused a problem with the natural teeth or the RPD needed adjustment. One of the goals of their study was to determine the extent to which the prostheses met Academy of Prosthodontics principles, concepts and practices in prosthodontics<sup>12</sup> and the relationship between patient satisfaction and how well the dentures met these more objective criteria. They found that patient satisfaction was not statistically related to the clinical acceptability of the prosthesis.

In summary, even though a prosthesis is fabricated conscientiously and properly, there is no assurance that the patient will be comfortable while wearing it or satisfied with the therapy.

## Speech

Speech problems associated with RPDs have been reported only rarely. However, when they do occur their impact is substantial and completely separate from masticatory and esthetic factors.<sup>15</sup> Frank and others<sup>14</sup> reported that 17.9% of patients were dissatisfied with speech. Patients with communication problems had an average of 18.5 teeth.<sup>16</sup>

Campbell<sup>17</sup> used fully dentate dentists as subjects for his study, in which frameworks were cast and then worn by the dentists. Although all subjects initially reported some alterations in speech, improvements occurred with wear. Sounds made with the sides of the tongue in the maxillary bicuspid region are affected by plating in this area. Variations in mandibular major connector design showed little effect on speech patterns. Speech adaptation is one of the more rapid adjustments made by denture patients.

## Longevity

The expectation that patients will get 8–10 years of wear from a cast RPD is reasonable.<sup>18</sup> In a 10-year evaluation of RPDs,<sup>19</sup> in which abutment retreatment was used as the criterion of failure, 40% of RPDs survived 5 years and more than 20% survived 10 years. The metal frame had fractured in 10% to 20% after 5 years and in 27% to 44% after 10 years. Cases of distal extension required more adjustments of the denture base than did tooth-supported base RPDs.

## Biologic Cost of Prosthodontic Intervention

In their classic article, Zarb and MacKay<sup>11</sup> stated that “using a fixed or a removable prosthesis does not of itself cause dento-gingival disease. However, the risk appears to be higher in patients who do use a prosthesis of either type than those who do not.... The main disadvantages of removable partial dentures are the risks of local damage to the remaining teeth and their supporting structures, and of resorption of the alveolar process bearing the partial denture.” This is the “biologic cost” of wearing a removable prosthesis. The components of this “cost” are described below.

## Periodontal Disease

Kapur and others<sup>20</sup> found no evidence of deleterious effects on the periodontal health of abutment teeth during 60 months with either of 2 RPD designs. Similar results were reported by the other RCT<sup>21</sup> and the CCT<sup>22</sup> on this topic. The authors of these studies felt justified in stating that there was almost no progression of periodontal disease in their study populations. From these studies, there is insufficient evidence to show an association between properly designed RPDs and increased risk of periodontal

disease. Unfortunately, the subjects were not stratified according to smoking status in any of the 3 studies cited here.

Zarb and MacKay<sup>11</sup> advised that patients who would not be deemed periodontically “suitable” for fixed prosthetics should also be considered unsuitable for removable prosthetics. They added that a good prognosis can be anticipated only for patients whose full cooperation can be expected and achieved.

## Dental Caries

Four randomized clinical trials concerning the association between RPDs and caries have been published. Kapur and others<sup>20</sup> compared the incidence of caries between 2 RPD designs and found no significant difference.

Bergman and others<sup>22</sup> reported a rate of caries development very similar to the rate observed by Budtz-Jorgensen and Isidor.<sup>23</sup> The caries rate was 6 times higher for the RPD

group than that observed in the control group during the 5-year observational period.<sup>22,23</sup>

Most recently, Jepson and others<sup>24</sup> found a significantly greater incidence of new and recurrent carious lesions in patients using RPDs. Multivariate modelling identified treatment group as a significant risk factor for caries.

Unfortunately, none of these studies stratified or identified patients on the

basis of caries risk. The significance of such stratification is that fabrication of a definitive prosthesis for a patient at high risk of caries would ideally be delayed until the risk had been reduced.<sup>25</sup> Because this is not always clinically practical, consideration should be given to a more frequent recall schedule after prosthesis placement with increased emphasis on plaque maintenance, dietary counselling and various modes of caries prevention. In addition, design modifications aimed at reducing plaque accumulation have been recommended,<sup>26</sup> most notably use of a major connector that does not contact the teeth.

## Residual Ridge Resorption

Residual ridge resorption occurs after tooth extraction and continues throughout life.<sup>27</sup> Although no dominant causative factor has been found,<sup>28</sup> there does appear to be a relationship between local mechanical stress generated by removable prostheses and increased rate of residual ridge resorption.<sup>28</sup> Being female and various systemic factors, particularly asthma and associated corticosteroid use, are of greater importance than oral and denture factors.<sup>29</sup> Because of continual loss of residual bone, routine recall examinations are required after the insertion of dentures to determine the need for relining to maintain comfort and maximum efficiency of the denture.

*Speech problems associated with RPDs have been reported only rarely, but when they do occur their impact is substantial.*

### Mucosal Reactions

The information here has been extrapolated from reports of treatment with complete dentures<sup>30</sup> because many of the same clinical outcomes occur in partially edentulous patients. Inflammatory tissue reactions include traumatic ulcers, denture stomatitis, irritation hyperplasia, flabby ridges and burning mouth syndrome.

The patient should be advised that recall appointments for elimination of traumatic ulcers may be necessary for a certain period after delivery of the RPD.

Denture stomatitis has a multifactorial background. In particular, it is important that dentures are removed at night. Irritation hyperplasia occurs as a result of chronic irritation related to overextended or ill-fitting dentures.

Flabby ridges result from residual ridge resorption and are more common in the anterior regions of both arches.

Burning mouth syndrome occurs in dentate, partially edentulous and completely edentulous people. It also has a multifactorial background but is more prevalent in middle-aged people than younger subjects and occurs more often in women than in men.<sup>30</sup>

### Conclusions

All of the literature examined, from the earliest to the most recent, stressed the importance of continual care for any patient who has received an RPD, including vigilance for periodontal problems, ridge resorption and mucosal reactions, as well as special vigilance for carious lesions. As with all dental care, treatment with an RPD is a continuing process and requires careful attention to the specific needs of the patient.

Concerns arise when many patients do not comply with a given treatment modality, as is the case with RPDs.<sup>1</sup> The premise of this article was that discussion of outcomes with the patient before initiation of fabrication of cast RPDs will ensure that he or she understands and even expects the limitations of the prosthesis. Improved compliance would be a favourable result of these pretreatment discussions. ♦

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