

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

## Part I: Patient Expectations

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### A b s t r a c t

*During planning for treatment involving cast removable partial dentures (RPDs), it is important to remember that the 2 major reasons why patients seek this treatment are to improve esthetics and to improve mastication. Treatment that is considered unsuccessful may not necessarily represent poor execution of procedures, but rather may not have fulfilled the patient's expectations with regard to these 2 goals.*

*Searches of the Cochrane Collaboration and MEDLINE databases were conducted to identify issues pertaining to patient compliance in wearing cast RPDs. Compliance was better when the patient's chief concern was replacement of anterior teeth. The success of RPDs for replacement of teeth missing from other areas depended on the patient's perception of the value of such replacement.*

*Maximum masticatory efficiency is equivalent for people functioning from second premolar to second premolar and those wearing partial dentures. Many clinicians believe that the prescription of partial dentures which replace teeth missing distally to the second premolars represents overtreatment.*

**MeSH Key Words:** denture, partial, removable; patient satisfaction; prosthodontics

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Many dentists and their patients are disappointed after delivery of cast removable partial dentures (RPDs) because the patient refuses or is unable to wear the denture and the treatment is therefore deemed unsuccessful. Rates of unsuccessful treatment for clasp-retained cast RPDs range from 3% to 40% (mean 26%).<sup>1</sup> When so many patients do not comply with treatment, it is instructive to reflect on why and how the treatment is performed.

Appropriate, comprehensive treatment planning should precede all but emergency treatment.<sup>2</sup> Eliciting the patient's chief complaint, as well as his or her expectations of treatment, is pivotal to treatment planning. The case presentation provides the ideal venue for the practitioner to discuss the patient's expectations and to outline both favourable and unfavourable short- and long-term outcomes. By providing this information, the practitioner ensures that

the patient is fully informed before giving consent and that he or she understands the associated benefits and risks.

In this, the first of a 2-part series about counselling before fabrication and delivery of RPDs, the goals of improved esthetics and mastication are addressed. Treatment outcomes are addressed in the second article.

### Materials and Methods

Searches of the Cochrane Collaboration and MEDLINE databases were conducted between January and April 2002 for articles about cast RPDs available in the databases since 1966. As well, bibliographies of articles published before 1966 were handsearched for pertinent articles.

The initial search objective was to identify a published standard of care for cast RPDs. Once this standard was identified, only studies that used the standard were included in the literature review. The second search objective was to identify systematic reviews with or without

meta-analysis,<sup>3</sup> individual randomized controlled trials (RCTs), clinically controlled trials (CCTs), randomized clinical trials and other studies dealing with esthetics and mastication. Only studies published in English were included.

## Results

The standard of care identified for the diagnosis, fabrication, placement and care of cast RPDs was "Principles, concepts, and practices in prosthodontics" produced by the Academy of Prosthodontics.<sup>4</sup> This standard states that prostheses should be designed and fabricated according to the following principles: thorough examination of the patient; survey of preliminary casts followed by mouth preparations, which include prepared guiding planes, rest seats and contour reductions; prescription of a metal framework with rigid major connectors and relief of the mandibular major connector when placed over soft tissues; retentive elements that incorporate stress relief; and altered cast impression procedures for the distal extension bases. This excellent reference is an additional reminder that "the decision to replace teeth with a carefully planned RPD requires a biologic appreciation of the consequences of tooth loss and of the potentially destructive impact of dentures."<sup>5</sup>

A systematic review poses a clinical question, collates standardized evidence from several RCTs and weighs the evidence to reach a final conclusion. No systematic reviews dealing with RPDs have been published to date, mostly because there have been few RCTs on this treatment modality. Similarly, no meta-analyses have been published because of lack of standardization of data in those few RCTs that have been published.

Very few RCTs or CCTs have been performed in dentistry. A hand search of 3,631 articles in 3 peer-reviewed journals over the 10-year span 1988 to 1997 yielded only 62 trials for all dental topics.<sup>6</sup> Of these, there were only 3 in which a clasp-retained cast partial denture was either the experimental intervention or the control.<sup>7-9</sup> This article reviewed both RCTs and CCTs because at this point in time, they represent the best available evidence in the literature. The Cochrane Collaborative Group,<sup>10</sup> a worldwide evidence-based group that reviews the benefits or effects of medical interventions, lists 4 RCTs published before 1988 and 6 since 1997 on various topics related to RPDs. The Cochrane Oral Health Group allows CCTs to be used for their systematic reviews. One long-term study of this type has examined RPDs.<sup>11</sup>

## Discussion

When planning treatment with partial dentures, as with all modalities of health care, the patient's chief complaint must be identified, addressed and satisfied. Correlation of the chief complaint or complaints with clinical findings should lead to accurate diagnosis. Treatment objectives can then be formulated to resolve the recognized problems.<sup>12</sup>

Donovan and others<sup>13</sup> noted that "although the advent of successful osseointegration has dramatically reduced the need for removable prostheses, there are still many patients who for health, anatomic, psychological, or financial reasons are not candidates for implants." Agerberg and Carlsson<sup>14</sup> reported that cosmetics was the primary reason for prosthodontic treatment expressed by patients, with improved mastication being the second most common reason.

## Esthetics

The demand for replacement of missing teeth is strongly related to the position of the missing teeth. Replacement of missing posterior teeth, and cosmetic dental treatment in general, depends on the perception of the patient. Even in countries with highly developed dental care systems, open spaces in the premolar and molar regions are well accepted by people of all ages.<sup>15</sup> However, "where anterior teeth are missing, the importance of restoring the spaces is self-evident and reinforced by the large impact on satisfaction with esthetics where there are any unrestored spaces."<sup>16</sup> Even when the patient considers the prosthesis unsatisfactory, he or she is more likely to wear the device if it replaces missing anterior teeth.<sup>17</sup> The prospect of a good esthetic result frequently motivates the patient to wear a new denture,<sup>18</sup> and esthetics can be more important than function for many individuals.<sup>14,19</sup>

Treatment decisions should be made after discussion between the patient and the practitioner, in which the patient's chief complaint, behaviour, social environment and personality are considered. Information about the patient's expectations relating to appearance may make the difference between compliance and noncompliance: therefore, the treatment decision for any replacement as well as clinical decisions about tooth shade, shape and arrangement, clasp and flange display, and major connector design (e.g., full palatal coverage) must all be discussed. Oosterhaven and others<sup>20</sup> suggested the importance of using a mirror during such discussions, so that patients' inaccurate perceptions of their teeth can be detected. Demonstration of clasps by means of photographs and models is encouraged, along with discussion of clasp placement subsequent to surveying. In their randomized clinical trial, Kapur and others<sup>21</sup> found that the 2 principal designs for distal extension partial dentures — the RPI concept (rest, proximal plate and I bar) and circumferential design — did not differ in terms of success rates, maintenance care and effects on abutment teeth. Attention to the symmetry of clasp assemblies, particularly in the maxillary arch, is important for esthetic reasons. Encouraging patients to bring trusted friends or relatives on the day of wax try-in to provide subjective input may be a valuable adjunct for approval of the esthetic result and subsequent acceptance of the denture.

## **Mastication**

A desire to enhance chewing ability is the second most frequent reason given for seeking dental treatment.<sup>22</sup> Masticatory efficiency of the dentition can be determined by an objective and repeatable laboratory test<sup>23</sup> that measures the amount of grinding for a predetermined number of strokes. Masticatory ability is the subjective assessment of chewing capacity, as determined by questionnaire or interview.<sup>24</sup> The act of mastication is one of the most important physiological determinants governing food intake. If people feel they can chew efficiently, then their food intake is not restricted by texture or hardness. An intact masticatory apparatus can exert a positive effect on nutrition by permitting a wide selection of food items, whereas compromised dentition can have a detrimental effect by promoting adverse shifts in food ingestion patterns.<sup>25</sup> Walls and others<sup>26</sup> demonstrated the association between tooth loss and diminished food selection, which in turn influenced dietary adequacy, nutritional status and general health status.

What factor has the greatest influence on chewing performance? Some authors believe that oral function is determined by the number of teeth, others believe that the number of occluding pairs is the main determinant, and a third group argues that the amount of occluding surface is the main factor.

How many occluding teeth, beyond the 6 maxillary and 6 mandibular anterior teeth, are needed to ensure that all oral functions can be performed? Witter and others<sup>15</sup> found that, within their study population, the group with no eating problems had, on average, 21.1 functioning teeth. Steele and others<sup>16</sup> tried to find some minimal clinical criteria that maximized the likelihood of satisfaction and problem-free function. Using a threshold model, they found that having 21 or more teeth without a denture and having 2 or more posterior contacts were important contributors to problem-free eating. The consensus is that a minimum of about 20 teeth are needed, and the World Health Organization has used this in one of its definitions of oral health.<sup>16</sup>

A patient with a shortened dental arch (SDA) is missing at least some teeth starting posteriorly.<sup>27</sup> Some researchers believe that if a patient with SDA already has adequate masticatory functioning from second premolar to second premolar, no advantage will be gained by placing a prosthesis.<sup>15</sup> Is there a similar minimal consensus figure for occlusal units or pairs of opposing posterior teeth?

The term "occlusal unit" has been used to describe an occluding pair of premolars, whereby an occluding pair of

molars is equivalent to 2 occluding pairs of premolars. Van Waas and others<sup>28</sup> found that the greater the number of occlusal units replaced on the partial denture, the more satisfied the subjects. Stated another way, patients with fewer pairs of opposing teeth experienced more value from the prosthesis. Leake and others<sup>29</sup> proposed a turning point from adequate to insufficient function at 3 functional units. Kayser<sup>30</sup> stated that to satisfy functional and social demands, the suggested minimum number of teeth is about 20 or 6 esthetic (anterior) and 4 premolar occlusal units in each jaw or in the second premolar to second premolar occlusion.

Other authors proposed a compromise of a minimum number of teeth combined with a minimum number of functioning occlusal units as necessary for masticatory function. Agerberg and Carlsson,<sup>14</sup> Hildebrandt<sup>31</sup> and Helkimo and others<sup>32</sup> reported that people with 20 well-distributed teeth seemed to have a satisfactory chewing ability. However, what is more important is the distribution of the antagonistic pairs of teeth in the oral cavity. Ramfjord<sup>33</sup> warned practitioners that they were overtreating if they were replacing only molars and that the patient's functional and esthetic requirements would be adequately met

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if anterior teeth and premolars were retained.

The third proposed variable influencing masticatory function is surface area. A larger occlusal area may increase the chance of improved comminution or grinding of food. In a classic article from 1965, Lambrecht<sup>34</sup> found that removing 1 mm of the lingual surface of maxillary denture teeth and 1 mm of the buccal surface of mandibular denture teeth in complete dentures resulted in loss of masticatory performance with all test foods for all patients. Yurkstas<sup>35</sup> stated that the ability to chew cannot be predicted solely on the basis of the number of missing teeth; however, if the occlusal contact area is known, it is possible to predict masticatory performance with relative certainty. The clinical practicality of this knowledge is that when setting posterior teeth, given the choice of using 2 premolars and 1 molar or 1 premolar and 2 molars, use of the teeth with larger surface area (i.e., the 2 molars) is preferable.

How much improvement in chewing efficiency can be expected after delivery of an RPD? Kapur and others<sup>36</sup> reported that functional efficiency reached nearly 60% that of a person with a complete dentition, comparable to that of a typical person with 22 to 26 teeth.<sup>37</sup> These major functional improvements occurred within 16 weeks after insertion of the RPD, with further small gains noted during the next 12 months.<sup>36</sup>

Wearing a partial denture can therefore improve masticatory efficacy, but will the diet improve? Most investigators agree that it does not.

Krall and others<sup>38</sup> were the only investigators to state that the presence of RPDs is an important predictor of nutritional intake and that replacement of missing teeth could help people maintain a healthy diet. Other investigators have reported that partial tooth loss results in altered food acceptability, just as edentulism is associated with poor diet and compromised nutrition and tooth loss may cause dietary change.<sup>39</sup> Wayler and others<sup>40</sup> reported that "once a critical number of teeth are absent, there are significant changes to the perceptual processes that underlie food acceptability and these dietary changes can self-impose certain dietary restrictions that may compromise [patients'] nutritional status." Similarly, Gunne<sup>41</sup> stated that mandibular bilateral free-end RPDs influenced masticatory efficiency and subjective experience of masticatory performance but did not seem to have any decisive effect on dietary intake. Moynihan and others<sup>42</sup> also reported that prosthetic rehabilitation of the severely shortened dental arch did not result in dietary improvement. In the Veterans Administration RCT<sup>43</sup> dietary intake did not change after treatment, even though patients were better able to chew their food to smaller particle size in less time and perceived that function had improved. The authors of the study went on to state that "it would be prudent for clinicians to recognize that the placement of a RPD or FPD [fixed partial denture] may or may not resolve the problem of malnourishment in a patient with chewing deficiencies. Such assurances should not be given either to patients or referring physicians." They added that changing long-standing dietary habits in older people is difficult but should be addressed.

Moynihan and others<sup>42</sup> suggested that the probable reason for failure of prosthetic rehabilitation to improve diet is that chewing ability is only one component of food choice. In the absence of dietary intervention, patients may be unaware of the need to change their diet, and those requiring dental prostheses should therefore receive tailored dietary advice that accounts for all the factors influencing individual food choice.

Masticatory ability is related to factors other than just function. Thus, subjects who can still masticate and are satisfied with the appearance of their teeth do not need to undergo any treatment, even though objective tests would demonstrate impairment of their masticatory function.<sup>19</sup> In other words, treatment with an RPD should be cautiously considered and fully discussed when patients do not report any problems, even though objective tests would suggest diminished function.

## Conclusions

Patients seek treatment with cast RPDs for the purpose of improving appearance and masticatory function. It has been suggested that compliance improves when the prosthesis meets the esthetic requirements of the patient, but these requirements can be determined only through discussion with the patient.

Maximum masticatory efficiency with an RPD is approximately 60% that of a patient with full dentition (i.e., a person with 22 to 26 intact teeth). Placing a partial denture merely to replace molars is contraindicated. Unfortunately, food choices and diet do not improve simply because masticatory efficiency has been enhanced through an RPD. ♦

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