

**TITLE: Metal versus Plastic Partial Dentures for Patients with Periodontal Disease: A Review of the Clinical Effectiveness and Safety**

**DATE:** 8 April 2015

**CONTEXT AND POLICY ISSUES**

The structures and tissues (periodontium) that surround and support the teeth, the gums, the periodontal ligaments, and the alveolar bones of the jaw, are susceptible both to disease and to injury from the body's inflammatory defense mechanisms.<sup>1,2</sup> Periodontal disease is one of the major causes of loss of teeth, along with caries (cavities) and trauma. The Oral Health component of the 2007-2009 Canadian Health Measures Survey found that 16% of Canadian adults had moderate periodontal disease, and 4% had severe disease, according to clinical measurements of changes in the gum and ligaments.<sup>3</sup> These measures of physical damage, however, do not directly detect active periodontal disease. When loss of tooth attachment was measured by the extent to which the periodontal ligament has retreated from its usual position in healthy young adults, 6% of adults with teeth have loss of attachment severe enough to put them at risk of losing one or more teeth.<sup>3</sup> Another 6% of adults had no natural teeth remaining.<sup>3</sup> These proportions increase by age. Loss of teeth has functional, nutritional and social consequences for the patient, and affects quality of life.<sup>3</sup> Associations between periodontal disease and cardiovascular disease or perinatal outcomes have been explored but are so far unproven.<sup>1,2</sup>

Treatment for periodontal disease involves the establishment of a dental hygiene regimen, with mechanical removal of plaque and calculus, and, in severe cases, topical antiseptics, systemic antibiotics and/or oral surgery.<sup>1,2</sup> Chewing ability can be restored using any or a combination of strategies, including fixed or partial dentures, or implants. Numerous designs for appliances and biocompatible materials have been developed. For removable partial dentures, metal frames are thought preferable, but they may not be suitable for patients with periodontal disease, where progressive changes to the mouth, including tooth loss, may lead to the need for further modifications of the appliance. Acrylic (plastic) dentures are more readily modified than metal.

This report reviews the clinical effectiveness and safety of acrylic removable partial dentures compared with metal removable partial dentures in patients with periodontal disease.

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## RESEARCH QUESTIONS

1. What is the clinical effectiveness and safety of metal partial dentures for patients with periodontal disease?
2. What is the clinical effectiveness and safety of plastic partial dentures for patients with periodontal disease?
3. What is the comparative clinical effectiveness and safety of metal versus plastic partial dentures for patients with periodontal disease?

## KEY FINDINGS

We did not identify any studies as providing the information needed to compare metal and plastic (acrylic) dentures in patients with periodontal disease. There were no randomized clinical trials, and observational studies tended not to report periodontal status and/or denture material. Therefore, the question of the clinical comparability of metal versus plastic partial dentures cannot be answered at this time.

## METHODS

### Literature Search Methods

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2015, Issue 3), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2005 and March 11, 2015.

### Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text articles was based on the inclusion criteria presented in Table 1.

<b>Table 1: Selection Criteria</b>	
<b>Population</b>	Patients with periodontal disease requiring partial dentures
<b>Intervention</b>	Q1: Partial dentures made of metal Q2: Partial dentures made of plastic (acrylic) Q3: Partial dentures made of metal
<b>Comparator</b>	Q1+Q2: Any comparator or no comparator Q3: Partial dentures made of plastic (acrylic)
<b>Outcomes</b>	Q1: Clinical effectiveness, clinical harm Q2: Comparative clinical effectiveness
<b>Study Designs</b>	HTA, systematic review/meta-analysis, randomized controlled trials, and non-randomized studies

## **Exclusion Criteria**

Articles were excluded if they did not meet the selection criteria outlined in Table 1, they were duplicate publications, or were published prior to 2005. Articles were also excluded if they exclusively concerned bridges, implants or fixed partial dentures.

## **Critical Appraisal of Individual Studies**

Critical appraisal was not done, as no studies were identified as meeting the inclusion criteria.

## **SUMMARY OF EVIDENCE**

### **Quantity of Research Available**

A total of 417 citations were identified in the literature search. Following screening of titles and abstracts, 385 citations were excluded and 32 potentially relevant reports from the electronic search were retrieved for full-text review. Four potentially relevant publications were retrieved from the grey literature search. None of these publications met the inclusion criteria. The majority were excluded because they did not provide detail on baseline periodontal disease status of the patients and/or the material used in the dentures. Appendix 1 describes the PRISMA flowchart of the study selection.

References of potential interest are discussed in Appendix 2.

### **Summary of Study Characteristics**

No studies were identified as meeting the inclusion criteria for any of the three questions.

### **Summary of Critical Appraisal**

No studies were identified as meeting the inclusion criteria for any of the three questions.

### **Summary of Findings**

No studies were identified as meeting the inclusion criteria for any of the three questions.

### **Limitations**

No studies were identified as meeting the inclusion criteria for any of the three questions.

## **CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING**

We did not identify any studies as providing the information needed to compare metal and plastic (acrylic) partial dentures in patients with periodontal disease. A randomized clinical trial comparing cobalt-chromium with thermoplastic removable partial dentures in older adults has been registered, but its current status is unknown.<sup>4</sup> Overall, randomized studies of removable partial dentures were few, and tended to restrict inclusion to patients with successfully treated periodontal disease. Non-randomized studies did not report the periodontal disease status of the patients, or if they did, omitted the material used in constructing the dentures. The question

of the clinical comparability of metal versus plastic partial dentures, therefore, cannot be answered at this time.

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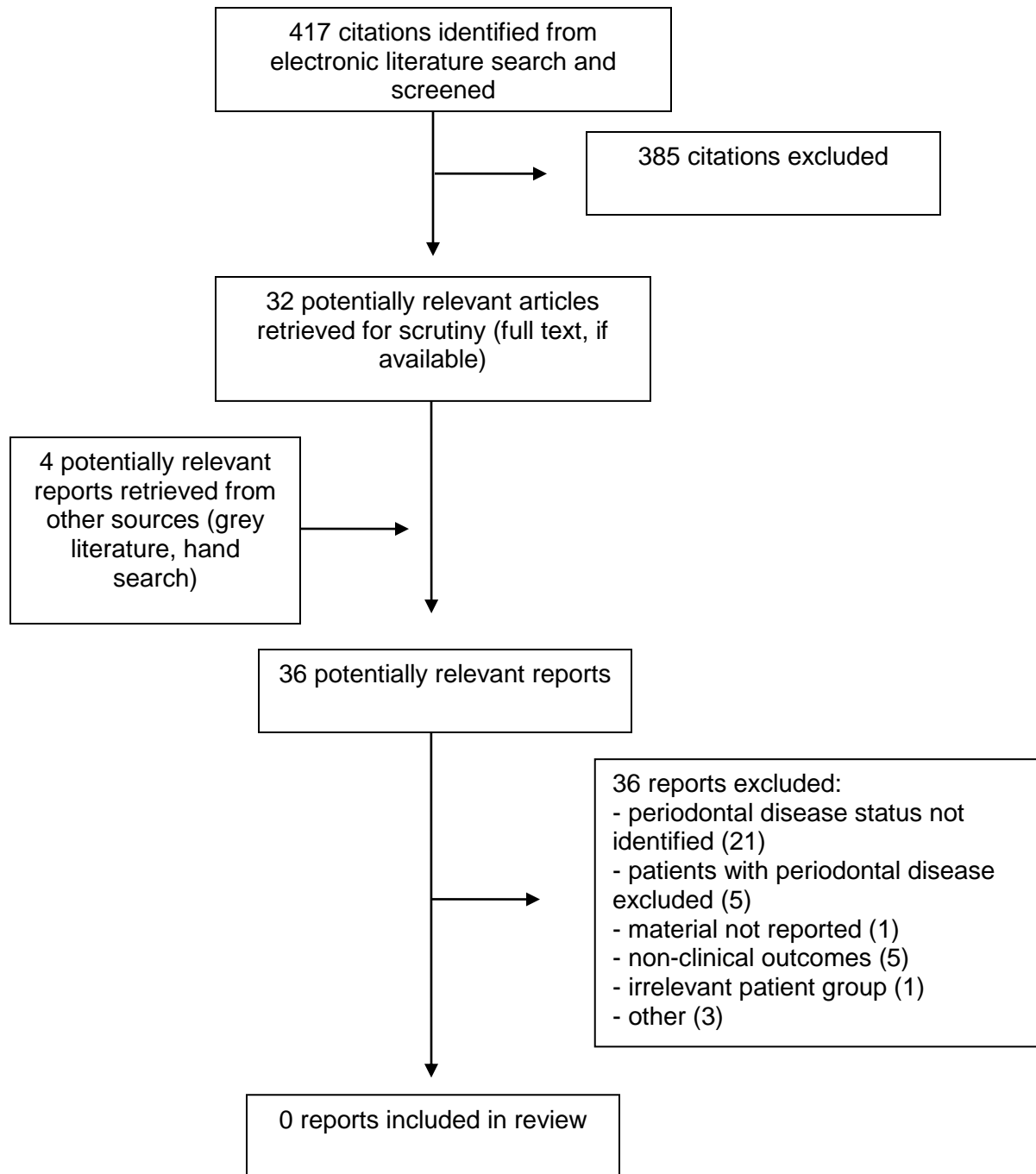
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## REFERENCES

1. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. Lancet. 2005 Nov 19;366(9499):1809-20.
2. Wilder RS, Moretti AJ. Gingivitis and periodontitis in adults: classification and dental treatment. 2014 Aug 19 [cited 2015 Mar 31]. In: UpToDate [Internet]. Waltham (MA): UpToDate; c2005 - . Available from: <http://www.uptodate.com> Subscription required.
3. Health Canada. Report on the findings of the oral health component of the Canadian Health Measures Survey 2007-2009 [Internet]. Ottawa: Minister of Health; 2010. [cited 2015 Mar 25]. Available from: <http://www.fptdwg.ca/assets/PDF/CHMS/CHMS-E-tech.pdf>
4. ClinicalTrials.gov [Internet]. Bethesda (MD): National Library of Medicine (US); 2000 Feb 29 -. Identifier NCT01816425, Comparison between cobalt-chromium partial dentures and thermoplastic partial dentures (flex); 2013 Feb 20 [cited 2015 Mar 26]. Available from: <https://www.clinicaltrials.gov/ct2/show/NCT01816425>

APPENDIX 1: Selection of Included Studies



**APPENDIX 2: Additional References of Potential Interest**

*Studies excluded because they did not report periodontal disease subgroup or status*

1. Abt E, Carr AB, Worthington HV. Interventions for replacing missing teeth: partially absent dentition. *Cochrane Database Syst Rev.* 2012 Feb 15;2:CD003814.

A 2012 Cochrane review on “Interventions for replacing missing teeth: partially absent dentition”, which selected randomized clinical trials with clinical outcomes, identified five trials that evaluated removable partial dentures. Of these, one trial of 38 patients published in 2000 compared different materials (titanium framework versus cobalt-chromium framework, with an acrylic base). The reviewers considered this trial to be at high risk of bias because of unclear information on randomization and allocation concealment and high loss to follow-up. In addition, some patients received multiple dentures, and it was unclear whether the analysis accounted for clustering. The Cochrane reviewers concluded there was insufficient data to reach conclusions regarding materials. The planned subgroup analyses for the review included one of congenital versus acquired absence of teeth (which would have included periodontal disease), but they did not have enough data to carry it out.

2. Emami E, Taraf H, de Grandmont P, Gauthier G, de Koninck L, Lamarche C, et al. The association of denture stomatitis and partial removable dental prostheses: a systematic review. *Int J Prosthodont.* 2012 Mar-Apr;25(2):113-9.

A 2012 systematic review on the association between denture stomatitis and partial removable dentures found one 2001 non-randomized study comparing metal to acrylic dentures. The study reported that acrylic resin and mucosal partial dentures was significantly related to denture stomatitis. The reviewers did not report any conclusions regarding materials.

3. Walter MH, Hannak W, Kern M, Mundt T, Gernet W, Weber A, et al. The randomized shortened dental arch study: tooth loss over five years. *Clin Oral Investig.* 2013 Apr;17(3):877-86.
4. Walter MH, Marre B, Vach K, Strub J, Mundt T, Stark H, et al. Management of shortened dental arches and periodontal health: 5-year results of a randomised trial. *J Oral Rehabil.* 2014 Jul;41(7):515-22.
5. Luthardt RG, Marre B, Heinecke A, Gerss J, Aggstaller H, Busche E, et al. The Randomized Shortened Dental Arch study (RaSDA): design and protocol. *Trials* [Internet]. 2010 Feb 19 [cited 2015 Mar 31];11:15. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2843681>

The Shortened Dental Arch study was a randomized trial that recruited patients with healthy gums or successfully treated periodontal disease who had complete molar loss in one jaw. Patients were randomized to restoration to a shortened dental arch (complete premolar dentition) by implants and fixed bridges, or to restoration to full dentition with a metal removable partial denture. Study follow-up on 132 patients has reached 5 years, with results reported on tooth loss and periodontal outcomes. Thirty-eight patients experienced further tooth loss, with no significant differences between

study groups. Reasons given for extraction were endodontic, caries, fracture, and periodontal disease. Pocket depth and bleeding on probing were assessed for inclusion into a multivariate model, but neither they nor any of the other baseline covariates were significantly associated. In a separate paper, periodontal outcomes were assessed by the plaque index according to Silness and Løe, vertical clinical attachment loss, probing pocket depth and bleeding with probing. The results suggested slightly poorer outcomes with the removable partial denture as opposed to the shortened dental arch alone, but the differences were small.

*Studies excluded because they did not report material for denture construction*

6. Müller S, Eickholz P, Reitmeir P, Eger T. Long-term tooth loss in periodontally compromised but treated patients according to the type of prosthodontic treatment. A retrospective study. *J Oral Rehabil.* 2013 May;40(5):358-67.

A retrospective non-randomized study of long-term tooth loss in a military cohort who had been successfully treated but were periodontally compromised compared fixed partial dentures, removable partial dentures and no prosthodontic treatment. The average observation period was  $9.7 \pm 4.1$  years. Removable partial dentures and aggressive periodontitis were associated with higher risk of overall tooth loss, but not with loss of abutment teeth. Material for denture construction was not reported.