Intervention for replacing missing teeth: Partially absent dentition—Evidence summary of Cochrane review

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INTRODUCTION

Treating partially edentulous patients with fixed or removable prosthesis is a routine procedure done for the past few decades by general dentist and prosthodontists. The two most common irreversible microbial diseases that result in tooth loss are the dental caries and the periodontal disease. Local risk factors like oral hygiene and diet vary among the individuals and have a great impact on the disease progress. The loss of teeth is a chronic problem and has a strong sociodemographic association. Currently, there is a lack of evidence to support specific and standardized treatment for various partially edentulous situations. This Cochrane review covers the entire gambit of treatment for the partially edentulous condition from conventional fixed and removable prosthesis, implant prosthesis that are fixed or removable, and telescopic crown excluding the minimal preparation etched retained prosthesis. When multiple treatment options are available for treating partially edentulous conditions, the need to provide higher level of evidence for common conditions like partial edentulousness is critical. The included studies are basically not from our population too, hence the urgency to address this critical issue.

Key Words: Cochrane review, evidence summary, partially absent dentition

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Cochrane reviews are systematic reviews with meta analysis published by the Cochrane collaboration, in the Cochrane Database of Systematic Reviews (CDSR). These reviews provide the clinicians with the highest level of evidence as they use a highly structured and transparent systematic review model to address a specific research question.

The management of partially absent dentition is routinely undertaken by general dentist and Prosthodontist but clinical practice guidelines based on evidence to this common problem is yet to be summarized. This Cochrane systematic review aims to address the effect of different prosthesis for the treatment of partially absent dentition in the terms of, Long-term success, function, morbidity, and patient satisfaction. All randomized controlled trials were searched till March 18, 2011, based on the inclusion and exclusion criteria, 21 trials were included and 32 trials were excluded and, it was critically appraised using the Cochrane methodology for interventions. The summary of evidence from the study concludes that there is insufficient evidence to state the effectiveness of removable and fixed prosthesis in partially edentulous subjects in the following four outcomes. There were insufficient trials to perform a meta-analysis and sensitivity analysis. This evidence-based summary emphasizes and reinforces the need to reassess the quality of research currently pursued in our profession, to address the need to provide higher level of evidence for common conditions like partial edentulousness. The included studies are basically not from our population too, hence the urgency to address this critical issue.
Table 1: Intervention with removable prosthesis and available evidence

| Name and number of studies | Independent variable | Sample size | Follow-up | Dependent variable | Outcomes at 95% CI | Risk of bias | Evidence |
|----------------------------|----------------------|-------------|-----------|--------------------|--------------------|-------------|----------|
| Comparing different designs of RPDs | Kapur-2005 [1] | Different direct retainers-I bar and circumferential clasp | 134 | 5 year parallel group | Success rate, caries, mobility | Success rate of 76% for I-bar and 71.3% for C-clasp no statistical significance in the two clasp design and hazard ratio of 0.58 CI-95% (0.25-1.35) | Unclear risk of bias | From the three trials addressing three different clinical question in designing of RPD there is no evidence to support one design is better than another |
| Akaltan-2005 [1] | Major connector-lingual bar versus plate | 36 | 2.5 years parallel group | Mobility of tooth | Increase in tooth mobility for lingual bar by 1.99 mean difference (0.62-3.36) compared to plate statistically significant-no clinical significance | Unclear risk of bias | |
| Hosman-1990 [1] | Minor connector impact on distal extension-titling, functional and sanitary 1-study | 25 | 19 weeks cross-over | Abutment tooth migration, clasps and deformations, alveolar bone height, and patient satisfaction | No statistical significance was found for all variables | Excluded from analysis | |
| Comparing different material | Au 2000-[1] | Titanium with cobalt-chromium | 18 and 23 | 2 years parallel group | Fracture of framework | 47% of titanium framework fractured against 14% of cobalt-chromium with risk ratio of 3.32 (1.19–9.23) | High risk of bias | There is insufficient evidence to support one material is better than another |
| Comparing different fabrication techniques | Frank-2004 [1] | Altered cast versus one piece cast RPDs | | | Mobility of abutment | Altered cast showed increased mobility | Unclear risk of bias | Insufficient evidence from a single trial |

RPD: Removable partial denture, CI: Confidence interval

The systematic review methodology for interventional studies follow the Cochrane systematic review guidelines published in the literature, so far. This Cochrane systematic review aims to provide informed clinical decision making for the patients and focus on the objective to address the following search terms: Partially edentulous patients from systematic review and meta-analysis published in the literature. There is no outcome-based clinical practice guidelines for partially edentulous patients from systematic review and meta-analysis published in the literature. The inclusion criteria for the studies considered in the review was randomized controlled trials treating patients with partial loss of teeth in one or both jaws. There are no outcome-based clinical practice guidelines for partially edentulous patients from systematic review and meta-analysis published in the literature. For the patients and focus on the objective to address the following search terms: Partially edentulous patients from systematic review and meta-analysis published in the literature. There is no outcome-based clinical practice guidelines for partially edentulous patients from systematic review and meta-analysis published in the literature. The inclusion criteria for the studies considered in the review was randomized controlled trials treating patients with partial loss of teeth in one or both jaws. There are no outcome-based clinical practice guidelines for partially edentulous patients from systematic review and meta-analysis published in the literature.
### Table 2: Intervention with fixed prosthesis and available evidence

| Name and number of studies | Independent variable | Sample size | Follow-up | Dependent variable | Outcomes at 95% CI | Risk of bias | Evidence |
|----------------------------|----------------------|-------------|-----------|-------------------|--------------------|-------------|----------|
| Different designs—different types of retention (Vigolo-2004 [1]) | Screw versus cement retained | 12 | 4 years split mouth | Alveolar bone level, mechanical failures | Alveolar bone showed no significant difference | Unclear | Single trial hence insufficient evidence to support one design |
| Different designs—different types of connectors (Block-2002 [1]) | Rigid versus nonrigid connectors in tooth–implant fixed partial prosthesis | 42 | 5 years split mouth design | Prosthesis survival, crestal bone loss | No statistical difference in survival, crystal bone loss, and patient satisfaction. Intrusion occurred with 44% of the FPDs with rigid and 66% with nonrigid connectors and high maintenance visits | Unclear | Single trial hence insufficient evidence to support one design |
| Different materials—high gold with other materials (Walter-1999 [1]) | Titanium versus high gold | 6 years parallel group | Survival, marginal integrity | 84% for titanium and 98% for gold. Statistically significant-60% attrition rate | High risk of bias | In the three trials no evidence to support high gold was better or worse than other alloys |
| | Single crown and bridges | 3 years split mouth trial | Many surrogate outcomes, and marginal integrity | All the alloys within acceptable range, no difference in marginal integrity | Unclear | Bias |
| | Crown and FPD made with gold to 4 other alloys (Vetrans-CSP147-[1]) | 147 | 10 years study-split mouth | Survival, cost and metallic taste | Ceramal alloy showed poor results with a odds ratio of 3.5 (91.4–8.7) three others show no statistical significance 90% for titanium and 100% for cast gold for survival and for maintenance visit-no significant difference | Unclear | Bias |
| Different materials—gold framework with gold alloy (Jemt-2003 [1]) | Laser welded titanium to cast gold framework | 21 | 5 years split mouth | Survival, maintenance visit | Unsuccessful results with a odds ratio of 2.0 (95% CI 0.12–33.5) | Unclear | Two trial revealed no significant difference for gold when compared to titanium—weak evidence |
| | Gold alloy versus titanium implant abutment crowns (Vigolo-2006 [1]) | 20 | 4 years split mouth | Success rate, prosthetic complications, and marginal bone loss | 100% success no difference in marginal bone loss and complication | Unclear | Risk of bias |
| Different materials—zirconia with other materials (Sailer-2009 [1]) | Zirconia versus metal framework | 59 | 3 years parallel group | Survival rate and complications | 100% success no significance difference in porcelain fracture and mean survival time | Unsuccessful results with a odds ratio of 2.0 (95% CI 0.12–33.5) | Insufficient evidence to support one design |
| | Zirconia versus titanium single crown implant abutments (Zembic-2009 [1]) | 22 | 3 years split mouth trial | Marginal bone loss and complications | In marginal bone loss and fracture-no significance difference | Unsuccessful results with a odds ratio of 2.0 (95% CI 0.12–33.5) | Risk of bias |
| | Denzir zirconia and in ceram zirconia (Larsson-2007 [1]) | 9 | 1-year parallel group | Failure-ceramic chipping | Denzir more ceramic chipping but not clinically significant | Unsuccessful results with a odds ratio of 2.0 (95% CI 0.12–33.5) | Risk of bias |
| | Glass ionomer cement versus zinc phosphate | 60 | 1.4 years split mouth | Postoperative hypersensitivity, vitality prosthesis retention and caries | Due to very high attrition rate | High risk of bias | One trial—weak evidence |
| | Abutment (Andersson-2003 [2]) | Ceramic alumina abutment and titanium metal abutment | 32 | 5 years both parallel group and split mouth | 94% for ceramic abutment and 100% for titanium abutment-no statistical analysis performed | Unsuccessful results with a odds ratio of 2.0 (95% CI 0.12–33.5) | Two trials—weak evidence |

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*Contd...*
data was risk ratio and mean difference for continuous data at 95% confidence interval using random effect models. The treatment effect of split-mouth and parallel group was planned to combine using generic inverse variance.

Based on the inclusion and exclusion criteria 21 trials were included and 32 trials were excluded. The 21 included studies were divided into four categories: removable prosthesis (5 studies), fixed prosthesis (13 studies), shortened dental arch (3 studies) and implant versus implant/tooth supported prosthesis (1 study). 18 trials compared within the prosthesis and only three compared one type of prosthesis with the other.

**THE CRITICAL APPRAISAL OF 21 TRIALS FOR BEST EVIDENCE [TABLES 1-4]**

The risk of bias summary states that the majority of the studies had the unclear risk of bias and five studies have a high risk of bias. There was insufficient trials to perform a meta-analysis. There was insufficient trials to do subgroup analysis and sensitivity analysis.

The review was not able to achieve its objective to assess the effect of different prosthesis for the treatment of partially absent dentition in the terms of the following outcomes: Long-term success, function, morbidity, and patient satisfaction due to few randomized control trial addressed comparison between prosthesis, most trial compared materials, design, method of fabrication or specific design, and significant heterogeneity was found between intervention and outcomes.

**SUMMARY OF EVIDENCE**

The summary of evidence from the study states that there is insufficient evidence to state the effectiveness of removable and fixed prosthesis in partially edentulous subjects in the following four outcomes. The intervention to treat shortened dental arch also has weak evidence to support one treatment method is better than the other. In the implant versus the implant/tooth fixed prosthesis, there is only one trial present providing weak evidence. This Cochrane review falls short of its objective due to lack of randomized controlled trial to address comparison between prosthesis, for particular partially edentulous conditions.
WHAT’S THE WAY AHEAD

To standardize the treatment of partially edentulous subjects, there is a need to design trials comparing different types of prosthesis used for partially dentate individuals. In most instances, a second or third study could not confirm the results of the first study to get pooled estimates. Very few studies have longer follow-ups than 10 years to fully estimate, comfort, satisfaction success, and survival rate of each prosthesis. The evidence-based practice involves a combination of best evidence, operators skill, and patients’ needs and preferences. The currently available evidence are based on review of prospective cohort studies and retrospective studies which have a high risk of bias and confounding factors. Until more rigorous randomized trials are done with relevant interventions and outcomes, weak evidence from nonrandomized and analytical studies support evidence for treatment decisions tree which may not be the ideal approach in treating patients.

This evidence-based summary emphasizes and reinforces the need to reassess the quality of research currently pursued in our profession, to address the need to provide higher level of evidence for conditions like partial edentulousness. This Cochrane review has asked a very pertinent research question but the answers to this questions are very inconclusive due to the lack of high quality randomized controlled trials which needs to be addressed, to improve the quality of care for our patient.

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