

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

Srinivasan Jayaraman

Department of Prosthodontics, Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth University, Pillayarkuppam, Puducherry, India

Abstract

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 under taken 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.

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

Address for correspondence:

Dr. Srinivasan Jayaraman, Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth University, Pillayarkuppam, Puducherry, India.

E-mail: Srinirajee@yahoo.co.in

Received: 22th April, 2015, Accepted: 29th April, 2015

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 situation.^[1] 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

Access this article online	
Quick Response Code:	Website: www.j-ips.org
	DOI: 10.4103/0972-4052.157055

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	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 for all variables	Unclear risk of bias	
Hosman-1990 [1]	Minor connector impact on distal extension-tilting, functional and sanitary 1-study	25	19 weeks cross-over	Abutment tooth migration, clasp deformation, alveolar bone height, and patient satisfaction	No statistical significance was found	Excluded from analysis	
Comparing different material	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 from one trial
Comparing different fabrication techniques	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
Frank-2004 [1]							

RPD: Removable partial denture, CI: Confidence interval

situation, the selection of treatment for the patients must be based on evidence which reflects the needs and preferences of the patients.

There is no outcome-based clinical practice guidelines for partially edentulous patients from systematic review and meta-analysis 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 research question - "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."^[2] This question assumes significance as the incidence of tooth loss varies demographically and the risk factors for tooth loss has increased which may lead to increased partial edentulous condition.^[3]

REVIEW METHODOLOGY

All Cochrane systematic review methodology for interventional studies follow the Cochrane handbook for systematic reviews of interventions.^[4] 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 the jaws were included, and studies with surrogate end points were excluded. The type of intervention evaluated for removable partial denture prosthesis with tooth and tooth tissue supported comparing different design, material, and fabrication technique. In tooth supported fixed partial denture intervention compared different designs and materials. The treatment of shortened dental arch compared removable partial denture versus fixed partial denture and in implant supported prosthesis fixed partial denture versus tooth-implant supported fixed partial denture. The outcome measures recorded were: (1) Longevity/survival, complication and treatment failures as related to biological and mechanical complications, cumulative survival of the patient, time to re-treatment. (2) Functional/Physiological outcomes measuring prosthesis retention, satisfaction with functioning operator evaluation of the function. (3) Psychological measures involving patients satisfaction, social activity, quality of life using prevalidated questionnaire. (4) Economical impact of direct treatment, maintenance, and indirect treatment cost. The recorded data available at the following time points were taken into consideration, within 2 years, 2-5 years and more than 5 years after treatment.

The search was done in Medline, Embase and Central, Cochrane trial register till March 18, 2011 and was also hand searched for relevant publications. Two independent reviewers screened and selected the article and when in doubt it was arbitrated by a third person. The risk of bias assessment was done for within studies and across studies and stated from the extracted data. The measurement of treatment effect for dichotomous

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 risk of bias	Single trial hence insufficient evidence to support one design
	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 risk of bias	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 rate, 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
	Bessing-1990 [1]	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 risk of bias	
	Vetrans-CSP147-[1]	Crown and FPD made with gold to 4 other alloys	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	Unclear risk of 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	90% for titanium and 100% for cast gold for survival and for maintenance visit-no significant difference	Unclear risk of bias	Two trial revealed no significant difference for gold when compared to titanium-weak evidence
	Vigolo-2006 [1]	Gold alloy versus titanium implant abutment crowns	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	Unclear risk of bias	There is weak evidence from the three trials that zirconia is better than others
	Zembic-2009 [1]	Zirconia versus titanium single crown implant abutments	22	3 years split mouth trial	Marginal bone loss and complications	In marginal bone loss and fracture-no significance difference	Unclear risk of bias	
	Larsson-2007 [1]	Denzir zirconia and in ceram zirconia	9	1-year parallel group	Failure-ceramic chipping	Denzir more ceramic chipping but not clinically significant	Unclear risk of bias	
Cement	Kern-1996 [1]	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	Success rate	94% for ceramic abutment and 100% for titanium abutment-no statistical analysis performed	Unclear risk of bias	Two trials-weak evidence

Contd...

Table 2: Contd...

Name and number of studies []	Independent variable	Sample size	Follow-up	Dependent variable	Outcomes at 95% CI	Risk of bias	Evidence
Andersson-2001 [2]	Ceramic alumina abutment and titanium metal abutment	75	3 years both parallel group and split mouth	Success rate	93% for ceramic abutment and 100% for titanium abutment-no statistical analysis performed	High risk of bias	

FPD: Fixed partial denture, CI: Confidence interval

Table 3: Intervention for shortened dental arches and available evidence

Name and number of studies []	Independent variable	Sample size	Follow-up	Dependent variable	Outcomes at 95% CI	Risk of bias	Evidence	
Treatment for shortened dental arch-FPD versus RPD	Ludwig-2006 [1]	Missing molar tooth versus RPD treatment	31	1-3 years parallel group	Prosthesis survival, dental caries, -OHIP	No difference was seen in incidence free survival of both groups. Attrition 9.7%	High risk of bias	There is weak evidence from one trial to support one group
	Thompson-2007 [1]	Distal extension cantilever versus RPD	60	5 years parallel group	Prosthesis survival, dental caries, patient satisfaction and nutritional intake	Caries-RPD patients had more than FPD with risk ratio of 0.43% (0.21-0.87) no statistical significance in prosthesis survival and patient satisfaction and	Unclear risk of bias	

RPD: Removable partial denture, FPD: Fixed partial denture, OHIP: Oral health impact profile, CI: Confidence interval

Table 4: Intervention with implant versus tooth/implant supported 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	
Fixed dental prosthesis implant versus implant-tooth supported	Gunne-1991	Implant versus implant-tooth supported FPD	23	10 years split mouth	Success rate, alveolar bone loss	80% for implant and 85% for implant tooth FPD prosthesis	Unclear risk of bias	Weak evidence from single study

FPD: Fixed partial denture, CI: Confidence interval

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.^[5-7] 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.

REFERENCES

1. Jokstad A. The evidence-based approach to prosthodontic practice and research. *Int J Prosthodont* 2007;20:376-7.
2. Abt E, Carr AB, Worthington HV. Interventions for replacing missing teeth: Partially absent dentition. *Cochrane Database Syst Rev* 2012;2:CD003814.
3. Müller F, Naharro M, Carlsson GE. What are the prevalence and incidence of tooth loss in the adult and elderly population in Europe? *Clin Oral Implants Res* 2007;18 Suppl 3:2-14.
4. Higgins JPT, Green S editors. *Cochrane handbook for systematic reviews of interventions*. Version 5.1.0. The Cochrane collaboration, 2011. Available from: www.cochrane-handbook.org. [Last updated on Mar 2011].
5. Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Evidence based medicine: What it is and what it isn't. *BMJ* 1996;312:71-2.
6. McGivney GP. Evidence-based dentistry article series. *J Prosthet Dent* 2000;83:11-2.
7. Carr AB, McGivney GP. Users' guides to the dental literature: How to get started. *J Prosthet Dent* 2000;83:13-20.

How to cite this article: Jayaraman S. Intervention for replacing missing teeth: Partially absent dentition-Evidence summary of Cochrane review. *J Indian Prosthodont Soc* 2015;15:65-9.

Source of Support: Nil, **Conflict of Interest:** None.