Comparison of Patient Satisfaction Between Conventional and Digital Removable Partial Dentures

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Research Proposal

Abstract

Removable partial dentures (RPDs) remain a valid and widely used approach for the rehabilitation of partially edentulous patients. Recent advances in digital technologies using additive manufacturing (3D-printing), subtractive manufacturing (milling), and the development of new materials such as polyetheretherketone (PEEK) are currently used for the construction of RPDs. This study aims to compare patient satisfaction between conventional cast Co–Cr, 3D-printed Co–Cr, and PEEK RPDs using a within-subject randomized crossover clinical design. Each participant will use each RPD type for one month, with a one-week washout period after each type. Patient satisfaction will be assessed using the Visual Analogue Grade (VAG) scale, and the Oral Health Related Quality of Life (OHRQoL) will be evaluated using Oral Health Impact Profile OHIP-14 questionnaire. Data will be analyzed using repeated-measures ANOVA or the Friedman test. The null hypothesis of the study that digital techniques will outperform the conventional fabrication method.

Introduction

Removable partial dentures (RPDs) continue to be a treatment modality for partially edentulous patients especially in distal extension and reduced dentition cases. Traditionally, Cobalt–Chromium (Co–Cr) frameworks fabricated using the conventional Lost-Wax Technique (LWT) have been the standard method of fabrication due to its known advantages such as: their strength, rigidity, thermal conductivity, and biocompatibility. However, cast frameworks may present drawbacks such as: inaccuracies, poor esthetics, and metal taste. Advances in digital technology have introduced 3D-printed Co–Cr frameworks, which offer enhanced accuracy and reproducibility. Additionally, PEEK has emerged as a promising nonmetallic alternative characterized by its lightweight, favorable mechanical properties, and esthetics.

However, there is limited evidence comparing patient satisfaction and OHRQoL among patients wearing these three types of RPDs under identical clinical conditions.

Aim of the Study

To compare patient satisfaction among conventional cast Co–Cr, 3D-printed Co–Cr, and PEEK RPDs, and the impact of these denture fabrication techniques on the OHRQoL.

Materials and Methods

The study was approved by the Ethics Committee of the Faculty of Dentistry, King Abdulaziz University. All treatment procedures were discussed in details with the selected patients. There were no risks at all, and patients could benefit from having all the three types of prostheses with no fees. Written informed consent were obtained from all

participants before inclusion. Participants had the right to withdraw at any stage without any consequences.

Study Design

A within-subject randomized crossover clinical trial was conducted at the Faculty of Dentistry, King Abdulaziz University.

Each participant received three RPDs (conventional cast Co–Cr, 3D-printed Co–Cr, and PEEK) fabricated to the same RPD design. Every patient used each denture type for one month, with a one-week washout period between each trial phase.

Sample size:

Sample size calculation was based upon detecting a moderate effect size ($f = 0.25$) using repeated measures ANOVA test. Using 80% power and $\alpha = 0.05$, the minimum estimated sample size was 28 participants. Sample size was increased to a total of 34 participants to compensate for drop-out. Sample size calculation was performed using G*Power Version 3.1.9.2.

Inclusion and Exclusion Criteria

Participants are partially edentulous patients having mandibular Kennedy Class I arches with the last abutment is the first or the second premolars bilaterally. Participants should have good oral hygiene, healthy mucosa, and absence of systemic diseases or medications that could affect the oral tissues. Exclusion criteria include periodontal disease, poor compliance, or history of temporomandibular disorders.

Randomization and Sequence Allocation

The sequence of RPD type allocation was randomized using a computer-generated randomization list (using random.org website). Patients received the three prostheses in different sequences to minimize order effects.

Outcome Measures

Patient satisfaction was assessed using the Visual Analogue Grade (VAG) scale (0–100 mm) and the OHRQoL was measured using OHIP-14 questionnaire. The VAG patient satisfaction domains such as: comfort, esthetics, speech, and mastication, while OHIP-14 consists of 7 domains each include 2 questions. Finally, each patient have chosen the most preferred denture after the completion of all the treatment phases.

1-Visual Analogue Grade (VAG) scale (0–100 mm), higher score indicates a better outcome

Domain	Description (summary)
Retention	How well the denture stays in place during function.
Stability	Movement of the denture during chewing or speaking.
Comfort	Overall feeling of comfort while wearing the denture.
Aesthetics	Appearance and natural look of the denture.
Speech	Ease and clarity of speaking with the denture.
Mastication	Ability to chew different types of food effectively.
Ease of Cleaning	How easy it is to clean and maintain the denture.
Overall Satisfaction	General satisfaction with the denture experience.

2-Oral Health Related Quality of Life using OHIP-14 :At the end of each denture use (after one month)

Responses are rated on a 5 point Likert scale 0=never 1= hardly ever 2=occasionally 3=fairly often 4=very often, higher scores indicate a worse oral health quality of life

Domain	Question

Functional Limitation	1. Have you had trouble pronouncing any words because of problems with your teeth, mouth, or dentures? 2. Have you felt that your sense of taste has worsened because of problems with your teeth, mouth, or dentures?
Physical Pain	3. Have you had painful aching in your mouth? 4. Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth, or dentures?
Psychological Discomfort	5. Have you been self-conscious because of your teeth, mouth, or dentures? 6. Have you felt tense because of problems with your teeth, mouth, or dentures?
Physical Disability	7. Has your diet been unsatisfactory because of problems with your teeth, mouth, or dentures? 8. Have you had to interrupt meals because of problems with your teeth, mouth, or dentures?
Psychological Disability	9. Have you found it difficult to relax because of problems with your teeth, mouth, or dentures? 10. Have you been a bit embarrassed because of problems with your teeth, mouth, or dentures?
Social Disability	11. Have you been a bit irritable with other people because of problems with your teeth, mouth, or dentures? 12. Have you had difficulty doing your usual jobs because of problems with your teeth, mouth, or dentures?
Handicap	13. Have you felt that life in general was less satisfying because of problems with

	your teeth, mouth, or dentures? 14. Have you been totally unable to function because of problems with your teeth, mouth, or dentures?

3-Overall patient preference

After using all the three dentures, by the end of the 3rd phase

Single forced choice question at the end of the three phases:

Which denture did you prefer overall?

- Conventional cast Co-Cr
- 3D- printed Co-Cr
- PEEK

Statistical Analysis

Data will be analyzed using SPSS software. Descriptive statistics will summarize mean and standard deviation for each variable. Normality will be checked using the Shapiro–Wilk test. Depending on data distribution, repeated-measures ANOVA or Friedman tests will be used. The significance level will be set at $p < 0.05$.

References

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