



Association of fit of partial denture metal framework with various framework design features using alginate as a final impression material: A prospective clinical study

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INTRODUCTION

Achieving clinically acceptable cobalt-chromium (Co-Cr) framework fit is a key requirement in the treatment of patients with conventional partial removable dental prostheses (PRDP). Several clinical and laboratory factors can affect the fit of PRDP Co-Cr frameworks, including impression material, impression tray type, partially edentulous arch configuration, framework design, impression pouring technique and framework fabrication method, although conclusive evidence confirming the role that these factors play is lacking. A recent Cochrane-based systematic review (SR) found no final impression material or technique to have a clear advantage over others for making PRDPs, mainly due to a lack of quality evidence. Recent cohort studies, analyzing the differences between definitive impression materials and techniques, demonstrated that clinicians failed to detect a difference between the fit of PRDPs made with alginate with those made with addition silicone impression material. Given that there is currently no definitive evidence that alginate is either better or worse than other impression materials for the construction of PRDP Co-Cr frameworks, the primary objective of this prospective clinical study was to report the incidence of re-makes when alginate is used as the impression material.

METHODS & MATERIAL

147 partially dentate patients were provided with Co-Cr PRDPs, in single or both arches, by undergraduate dental students. Final impressions were made with alginate in metal stock trays. At metal framework try-in, clinical examinations were carried out by two prosthodontists and relevant information noted with regard to proper fit. The relationship between three PRDP design features and number of frameworks that needed to be made in each case to achieve satisfactory fit was determined using factorial analysis of variance (ANOVA) ($\alpha = 0.05$).

	Maxillary arch (%)	Mandibular arch (%)	Total (%)
Major connector			
Palatal plate	11 (14)	-	11 (7)
Palatal strap	16 (20)	-	16 (9)
U-shaped connector	16 (20)	-	16 (9)
A-P strap	37 (46)	-	37 (21)
Lingual plate	-	27 (29)	27 (16)
Lingual bar	-	66 (71)	66 (38)
No. of guide plates			
≤2	16 (20)	38 (41)	54 (31)
3-4	45 (56)	39 (42)	84 (49)
>4	19 (24)	16(17)	35 (20)
No. of rests			
2	3 (4)	5 (5)	8 (5)
3-4	41 (51)	53 (57)	94 (54)
>4	36 (45)	35 (38)	71 (41)
Total	80 (100)	93 (100)	173 (100)

Table 1. Table 1. Distribution of partial removable dental prostheses design characteristics (n = 173).

RESULTS

86% (148) of the 173 frameworks fabricated were found to be clinically satisfactory at the first try-in visit (with or without any chairside adjustment). The remaining 14% (25) required new impressions for re-fabrication and passed at the second attempt. None of the examined design features were significantly associated with the number of construction attempts needed, for all 173 arches, or when maxillary and mandibular arches were considered independently ($p > 0.05$).

Variables of Interest	df	Sum of squares	Mean square	F	Sig. (p)
Maxillary arch					
MC	3	0.366	0.122	1.300	0.283
GPs	2	0.559	0.280	2.979	0.059
Rests	2	0.170	0.085	0.906	0.410
MC * GPs	5	0.884	0.177	1.884	0.111
MC * Rests	3	0.074	0.025	0.263	0.852
GPs * Rests	2	0.437	0.218	2.327	0.107
Mandibular arch					
MC	1	0.018	0.018	0.137	0.712
GPs	2	0.078	0.039	0.297	0.743
Rests	2	0.549	0.274	2.106	0.128
MC * GPs	2	0.188	0.094	0.721	0.489
MC * Rests	1	0.082	0.082	0.626	0.431
GPs * Rests	2	0.073	0.037	0.282	0.755

Table 3. Analysis of the association of major connector design, and numbers of guide plates and of rests with the number of frameworks fabricated (Univariate ANOVA for maxillary and mandibular arches).

Variables of Interest	df	Sum of squares	Mean square	F	Sig. (p)
MC	5	0.256	0.051	0.445	0.816
GPs	2	0.701	0.351	3.047	0.051
Rests	2	0.339	0.169	1.471	0.233
MC * GPs	9	1.579	0.175	1.525	0.145
MC * Rests	6	0.157	0.026	0.228	0.967
GPs * Rests	2	0.397	0.199	1.727	0.182
MC * GPs * Rests	1	0.550	0.138	1.196	0.315

Table 2. Table 2. Analysis of the association of major connector design, and numbers of guide plates and of rests with the number of frameworks fabricated (Univariate ANOVA for maxillary and mandibular arches combined).

CONCLUSION

- PRDP design features were not associated with the level of accuracy of fit achieved.
- Alginate in metal stock trays seems to be acceptable for final impressions of all types of Co-Cr PRDP designs with just 1 in 7 castings not fitting after chairside adjustment.

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