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The Assessment of Different Levels of Dental Participants on Designing a Removable Partial Denture

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Abstract

A systematic approach to removable partial denture design is difficult and requires thought planning. The correct design must be based upon accepted mechanical and biological principles. This is an experimental study for drawing partial denture design for selected cases on papers by different levels of participants and compares these designs with a standard design taken mainly from a text book "McCracken's Removable partial prosthodontics". The results of this study shown that the highest percentage of acceptable design for the total of three selected components (major connector, rest and retainers) was 67.91% made by Prosthodontists followed by 49.16 made by students, 29.58% made by general dental practitioners and finally the lowest percentage was 23.33 that made by dental technicians .Also there are great variations seen in different designs, some of them were far away from the principles of removable partial denture design, that lead to put in mind for more focusing on studying removable partial denture design in dental schools.

Key words: RPD, design, participants

Introduction

The design of the removable partial denture (RPD) is the main responsibility of the dentist considering technician opinions and respecting past experience of the patient. Dentist do the final decision for the type of treatment according to the biological, mechanical, physical and radiographical findings on which he builds his idea on[1].

No single design philosophy can be considered "correct "over all others. Variations are possible as long as the diagnostic information and good mechanical principles from the basis of the design. In a specific case the same operator may do different acceptable designs [1&2].

Proper application of principles of RPD design permits supporting abutments and mucosa to withstand during functional forces on RPD.When designing RPD the masticatory forces should be within the physiological limit of supporting structures in order to contribute for the preservation of remaining teeth, bone and mucosa by maintaining teeth positions in correct jaw relations [1-4].

The prognosis of the patient's treatment depends on a satisfactory treatment plan, a proper execution of the treatment plan, a well-constructed RPD which is properly fit to the mouth, and adequate maintenance of the teeth, soft and hard tissues and

prostheses by the patient and dentist.[1, 4-6]

Many studies reported that many dental practitioners had poor information's worldwide on designing RPD due to their limited experiences in metallic partial dentures, for that reason, they accept the design that made by dental technicians for their cases.Although technicians are not responsible for doing such design due to their deficient clinical, biological information's of patients. Also they received the majority of casts for fabrication of RPD without mouth preparations, lack designs and design prescriptions [1, 5-9].

In this study,an experimental designs are used to evaluate experience in putting designs.Participants from different levels were selected randomly including prosthodontists, dentists general practioners, last year dental students and dental technicians. Those to put acceptable designs for selected eight different cases on papers including three components of RPD,which are major connector, type and position of retainers and rest positions on abutment teeth.

Materials and method

A total of 40 participants comprising of prosthodontists (P), general dental practitioners(GDP), final year dental students (S) and dental technicians (DT) were selected and subdivided into 10 participants for each group.

Eight selected pictures diagram for partially edentulous casts of different Kennedy classifications (fig.1 a- h) .All cases assumed to be fitted for a metallic RPD given to participants and requested to draw a suitable design for these specific cases.

Because of the subjectivity of RPD designing, the ideal design was drawn before giving the cases to participants

and considered as a control design and was mainly taken from the most acceptable reference textbook in removable partial dentures in the majority of dental schools in the word which is"McCracken's Removable partial prosthodontics". That was mentioned in table (1) & fig.2 (a-h).

Results

A total of forty different designs for each case (total 320 diagrams) done by dental participants were received.Data were collected for three selected components that mentioned before (type of major connector, type and location of direct retainers and rest positions on abutment teeth). These data was evaluated and categorized into three levels according to acceptability of design or correction needed. Giving level (1) if the selected criteria was correct and acceptable clinically and mechanically even if it is differ from the control design but it must be cover the principles of RPD design, level(2) if these selected criteria need corrections and level (3) if these criteria was not accepted.Descriptive inferential statistics were carried out using Chi square test to investigate the association between groups of participants and the different three levels of designing acceptability.

Tables 2,4 and 6 show number and percentage of different groups of participants and level of acceptability in sequence for major connector, direct retainers and rests.

Tables 3,5 and 7 show (Z) proportion test to investigate the differences between each two groups of participants in the different three levels of acceptability of design in sequence for major connector, direct retainers and rests.

While table 8 shows the number and percentage for the total readings

for each participants and level of acceptability, and table 9 shows the (Z) proportion test for the total readings for each participants and level of acceptability.

Discussion

In this study high variations in design of RPD frames for identical cases are seen when different level dental participants draw the design. These variations could be related to some causes, such as the economic and scientific blockage sanction imposed for our country that limits the progress of knowledge. Dentistry is one of these fields that put a huge gap in the last thirty five years, limiting updated contacting with the word as well as, countable dental laboratories that construct a definitive scientific metallic partial dentures present in Iraq leading to decrease metallic dentures work, and compensate that work with unscientific that is considered permanent treatment for partially edentulous patients such as temporary acrylic partial dentures, that leads to decrease the number of cases treated with metallic partial dentures by dentists and prosthodontists which effecting on their experience in putting such designs for partially edentulous patients.

In this study, it was seen that the highest percentage for correct design that fulfills the scientific requirements for basics of RPD design regarding to major connector, retainers and rests was made by (P) which was 67.91% and this is logical and agrees with other studies [5& 12]. This result is due to their experience in putting designs although there are designs made by (p) need corrections 27.08%, and few unacceptable designs were seen (5% in total) that agree with previous study[12] showing little consensus of thought regarding principles of designing RPD.

In our study, it was seen that (GDP) were unaware their designing due to lack of experience practicing the metallic RPD treatment, and due to the lack of experience dealing with metallic RPD forced them to depend on dental technician. Regarding the three mentioned components (GDP) show 29.58% for the acceptable design and these results agree with Mahmood study [1] that leading to put more focusing on teaching RPD design in undergraduate studies. The results obtained from (S) was 49.16% and considered very acceptable due to their fresh contacting the basics of RPD including partial denture design. The acceptable designs obtained from (DT) was in percentage 23.33% and considered unacceptable when considering biological and mechanical requirements due to their work on a cast and have not any information on remaining teeth and supporting tissues that influence the design and their results were agree with other results [1,5,7,12].

The differences between each two groups regarding the levels of acceptability (1,2,3) show in (Z) proportion test, that found there were differences between the selected different types of participants on the right decision for selecting acceptable design of major connector, retainers and rest location on abutment teeth, the differences between the correct decision comparing between (P) & (GDP,DT) were highly significant in the three criteria while between (P)& (S) was comparing from non significant to a highly significant. While there was a highly difference between (GDP) and (S) groups that shown students designs was more acceptable than general dental practioners and no differences was

found between (GDP) and (DT) groups.

Also in this study found that unacceptable designs for major connector was put by all participants by using a unilateral partial denture (Nesbit). Although this type of treatment provides none of the properties important in the design and concepts of removable partial dentures such as cross arch stabilization, bracing and resistance to displacement from functional forces. It is dangerous and many articles describing the aspiration of such prosthesis [10,11].

It is concluded from the study that experience may have a significant role on production of designs that help for preservation of oral structures and improve mastication. the higher the percentage of the acceptable designs was made by (P), large designs were miss the principles of partial denture design, The majority of GDP far away from the basics of design due to their depending on the technician's design which is very poor due to its lack to clinical background of the patients information, The design that put by fifth year dental students was considered acceptable due to their fresh contact for the principles of RPD work including the design.

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Table 1: Standard designs for the eight cases.

Case	Standard design
a-	Anterioposterior MC, mesial rests &gingivally approaching clasps on 4&13 and rests on the other side of fulcrum line either on 5&12 or 6&11 or both .
b-	Anterioposterior MC, distal rests and gingivally or occlusally approaching clasps on 5,12& and clasping on molars as secondary abutments to increase retention, stability and as indirect retention.
c-	Palatal strap or Anterioposterior MC, cingulum rest and gingivally or occlusally approaching clasps on 11, and occlusally approaching clasp on 15, other side clasping on 2&5 with mesial rest and 5 with distal rest.
d-	Anterioposterior MC, mesial rest and gingivally approaching clasp on 4, and clasping on 12 with distal rest &15 with mesial rest.
e-	Lingual bar MC, mesial rests &gingivally approaching clasps on 20&29 and mesial rests on 21& 28.
f-	Lingual bar MC, mesial rests &gingivally approaching clasp on 20, clasping on 31 with mesial rest and rest on 28 for indirect retention.
g-	Lingual plate MC, distal rest on 21 withgingivally approaching clasp, also incisal rest on 27 with gingivally approaching clasp,clasping on 17&31 with mesial rests.
h-	Lingual bar MC, distal rest on 21 and occlusallyapproaching clasp,mesial rest and occlusally approaching clasp on 18 and double aker clasp on 29&30.

Table 2.Number and percentage of participants regarding levels of acceptability for major connector:

Group	No.	Case	1		2		3	
			No.	%	No.	%	No.	%
G1 (P)	10	80	49	61.25	29	36.25	2	2.5
G2 (GDP)	10	80	26	32.5	36	45	18	22.5
G3 (S)	10	80	34	42.5	34	42.5	12	15
G4 (DT)	10	80	20	25	38	47.5	22	27.5

Chi square X^2 =32.78, df=6, p= 0.000   HS

Table 3. Z- proportion test between groups regarding levels of acceptability for major connector:

Groups	1	2	3
1-2	3.64 **	1.12	3.82 **
1-3	2.37*	0.80	2.79 **
1-4	4.62 **	1.44	4.42 **
2-3	1.30	0.31	1.21
2-4	1.04	0.31	0.77
3-4	2.34*	0.63	1.93

* Significant,   ** Highly significant.

Table 4.Number and percentage of participants regarding levels of acceptability for direct retainer:

Group	No.	Case	1		2		3	
			No.	%	No.	%	No.	%
G1 (P)	10	80	55	68.75	16	20	9	11.25
G2 (GDP)	10	80	23	28.75	23	28.75	34	42.5
G3 (S)	10	80	45	56.25	24	30	11	13.75
G4 (DT)	10	80	16	20	32	40	32	40

Chi square X^2 =59.12   df=6   p= 0.000

Table 5. Z- proportion test between groups regarding levels of acceptability for direct retainers:

Groups	1	2	3
1-2	5.06 **	1.28	4.45 **
1-3	1.63	1.46	0.47
1-4	6.20 **	2.76 **	4.16 **
2-3	3.51 **	0.17	4. 04 **
2-4	1.28	1.49	0.32
3-4	4.72 **	1.32	3.74 **

* Significant   ** Highly significant.

Table 6.Number and percentage of participants regarding levels of acceptability for rests.

Group	No.	Case	1		2		3	
			No.	%	No.	%	No.	%
G1 (P)	10	80	59	73.75	20	25	1	1.25
G2 (GDP)	10	80	22	27.5	31	38.75	27	33.75
G3 (S)	10	80	39	48.75	28	35	13	16.25
G4 (DT)	10	80	20	25	38	47.5	22	27.5

Chi square X^2 =58.68, df=6, p= 0.000   HS

Table 7. Z- proportion test between groups regarding levels of acceptability for rests:

Groups	1	2	3
1-2	5.84 **	1.86	5.40 **
1-3	3.24 **	1.38	3.35 **
1-4	6.16 **	2.96 **	4.73 **
2-3	2.76 **	0.49	2.55*
2-4	0.35	1.11	0.85
3-4	3.11 **	1.60	1.72

* Significant, ** Highly significant.

Table 8. Number and percentage of total readings for each participants and levels of acceptability.

Group	No.	Case	1		2		3	
			No.	%	No.	%	No.	%
G1 (P)	10	240	163	67.91	65	27.08	12	5
G2 (GDP)	10	240	71	29.58	90	37.5	79	32.91
G3 (S)	10	240	118	49.16	86	35.83	36	15
G4 (DT)	10	240	56	23.33	108	45	76	31.66

Chi square X^2 =142.47, df=6, p= 0.000   HS

Table 9. Z- proportion test for total readings for each participants and levels of acceptability:

Groups	1	2	3
1-2	8.40**	2.44*	7.80**
1-3	4.16**	2.01*	3.65**
1-4	9.80**	4.08**	7.54**
2-3	4.39**	0.37	4.59**
2-4	1.55	1.66	0.29
3-4	5.88**	2.04*	4.31**

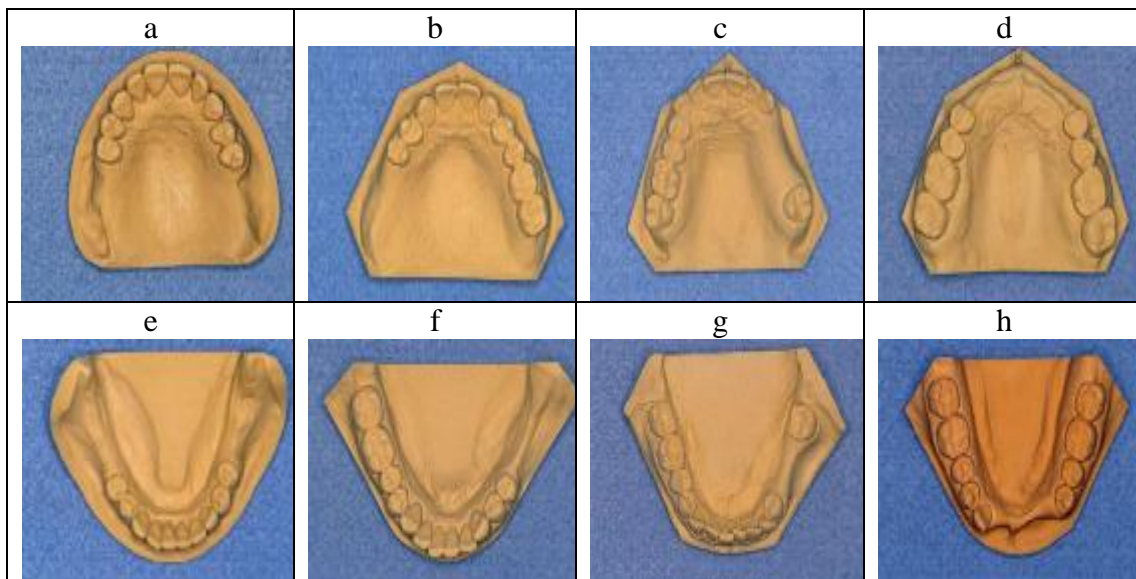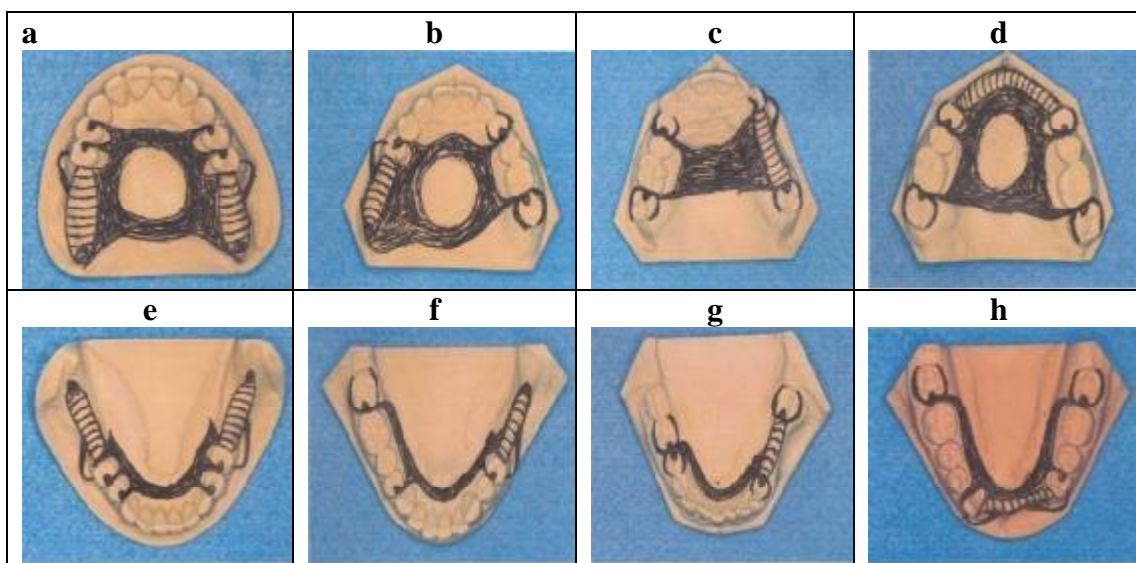* Significant, ** Highly significant.

Fig.1(a-h): Selected study cases

Fig.2(a-h): Standard designs for cases of study.