A Survey of Prosthodontics Techniques Applied by Dental Practitioners in Sulaimani City

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ABSTRACT

Background: Prosthodontic services have changed markedly due to an introduction of new materials, techniques and treatment options. The aim of this study were to identify the type of materials and the methods used by dental practitioners in their clinics to construct conventional complete dentures and to specify the type and design for removable partial dentures (RPDs); and to then compare them with those taught in dental schools.

Materials and methods: A total of 153 dental practitioners in Sulaimani city completed a written questionnaire. The questionnaire included 19 questions regarding complete and RPDs fabrication.

Results: Most of the practitioners provide complete dentures (81.6%) and RPDs (95.3%) in their clinics. Polyvinyl siloxane 38.4% and irreversible hydrocolloid 37.6% impression materials were most commonly used to make the preliminary and zinc oxide eugenol 52% for final impressions. The majority of participants did not disinfect their impressions (73.9%). In order to establish the vertical and centric relations, different methods were used. Many practitioners depend on dental technicians to determine the post-dum area (42.4%) and all of them faced different problems during fabrication of the complete denture. Acrylic RPDs were the main type of RPDs provided (89.7%), followed by flexible partial dentures (70.5%). The minority constructed cast metal RPDs (18.4%).

Conclusions: Private practitioners did not perform most of the techniques nor use the procedures or materials that are being taught in dental schools. There is a need for continuing dental education programs for improving their clinical skills. Moreover reassessing of the prosthodontic curriculum of the related dental schools is required.

Keywords: complete denture, RPDs, impression, prosthodontics techniques, curriculum. (J Bagh Coll Dentistry 2016; 28(3):22-29).

INTRODUCTION

Despite advances in preventive dentistry, edentulism is still a major public health problem worldwide [1].The prevalence of edentulism varies widely across regions and countries [2], as well as over time and with respect to age differences [3]. Age, educational level and socioeconomic status playing a vital role in toothlessness and denture demand [4].

Tooth loss constitutes a final common pathway for most dental diseases and conditions. It can lead to substantial impact on quality of life [3]. Naturally, to prevent some of these decrements in oral health-related quality of life, dentists frequently recommend removable or fixed prosthetic treatment [5].

Complete edentulism is mainly treated by conventional complete dentures. However, for a partially edentulous patient most clinicians choose removable partial dentures (RPDs) to restore lost residual ridge. Thus dentists are able to achieve appropriate esthetics, increase masticatory efficiency, and improve phonetics, which would not be possible to achieve with dental implants or fixed partial dentures [6].

Over the past few years, prosthodontic services have changed markedly due to an introduction of new materials, techniques and treatment options [7].

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The delivery of prosthodontics services by dental institutions is influenced by many factors: social and demographic characters, perceived need for care by patients, symptoms and esthetic concerns [8]. Most dental schools include complete and RPDs in their curriculum, however they required a minimum number of cases in order to enable graduates to develop certain clinical skills [9-11]. Each dental school has its own educational philosophy regarding prosthodontics techniques. That said, dental school graduates may at times not fully comply with the techniques taught at university and instead attempt to pursue shortcut procedures [12,13].

According to the prosthodontics curriculum of Sulaimani School of Dentistry, prosthodontics modules start early in the second year, concentrated on theoretical and laboratory teaching of a complete denture. During the third year, cast metal RPDs-teaching takes place. Clinical prosthodontic work is put into practicein the fourthand fifth academic years, alongside theoretical instruction for rehabilitation alternative prosthesis and dental implants. Complete dentures and acrylic RPDs are clinical requirements for graduation, reline and rebase in addition to repair cases. Cast metal RPD, immediate and over denture are not included in students' final grade. Dental implant treatments are not within the clinical practice of undergraduates.

Regarding the materials and methods used in Sulaimani School of Dentistry, the traditional

final impression technique that includes preliminary and final impression is the technique recommended for constructing a set of complete dentures. The impression compound is used for the preliminary impression and zinc oxide (in a border-molded close fit custom acrylic tray) used for the final impression. No face bow is used to transfer the position of the maxillary arch and jaws relation is recorded with wax occlusion rims. Semi adjustable articulators, without registration of any eccentric records, are used for casts' articulation. Polyvinyl siloxane (PVS) impression materials are used in indicated cases like the presence of severe undercut.

This study was undertaken to gather data on current prosthodontic practice activities (types of materials and techniques) performed by dentists in Sulaimani; thus providing an opportunity to identify some of the existing trends used in complete and RPD services. In addition, it attempts to recognise the problems encountered by dental practitioners in various prosthodontics treatments. Moreover, this study aims to compare dental school curriculums and techniques with the clinical practices of their students. The data could direct and support tutors in designing effective education courses and prosthodontic curriculums.

MATERIALS AND METHODS

A questionnaire pro forma was planned to determine the type of prosthodontic techniques and materials used in dental practice in Sulaimani city, Iraq. The questionnaire included 15 questions concerning complete dentures and 4 questions related to partial dentures. The pro-formas were delivered and collected through personal visits to 153 dental practitioners. The study was approved by the Medical Ethics Committee, School of Dentistry, University of Sulaimani.

For complete denture treatment, respondents were asked to specify the following: the materials used for preliminary and final impressions, custom tray spacer and materials, vertical and centric relation records, disinfection of impression, main problems in fabrication of complete dentures, and post care instructions. While for partial denture treatment, respondents were asked to declare the following: types of partial denture provided, an instruction to the technician regarding surveying, framework design, and clasps position.

Raw data was tabulated in Microsoft Excel and descriptive analysis (frequency and percentages) was estimated.

RESULTS

The current status for prosthodontic practice in various dental clinics in Sulaimani city indicates that most of the participating dentists were working in private clinics (75.1%), while (16.3%) are working in private centres and (8.5%) are working in government health centres (specialised and non-specialised) (Table 1). Details about graduating classes and specialties of respondents are listed in table 2.

Most practitioners (81.6%) provide complete dentures in their clinics (22.2% of them did not routinely provide this service), while (18.4%) of practitioners did not provide this service at all. For RPDs construction, 84.9% frequently provide the service and the minority of practitioners (4.5%) did not perform this service in their clinics (Table 3).

Regarding the impression materials used to fabricate preliminary and final impressions for complete dentures, 33 of 125 dentists (26.4%) who constructed complete dentures in their clinics used more than one type of material. Dentists preference for preliminary impression material was for a combination of heavy body and light body of PVS, irreversible hydrocolloid and impression compound (38.4%, 37.6% and 32.8% respectively), followed by heavy body material which was used only by 20.8% of dentists. A minority of participants used impression compound with irreversible hydrocolloid wash for making a preliminary impression (8.8%) (Table 4). While forfinal impression materials, the majority of dentists (52%) used zinc oxide impression materials (40% with tracing and 12% without tracing border molding). The second most common material used was a combination of heavy body and light body of PVS (24%). The use of light body material alone constituted (25.6 %) (with and without border molding). A minority of practitioners used irreversible hydrocolloid as final impression material (9.6%) (with and without border molding). Finally, of the 125 practitioners who fabricated complete dentures, 12% considered their preliminary impression as final (Table 4).

Regarding impression trays, most respondents preferred close fit custom tray. The results indicate that 110 participants (88%) routinely used custom trays for complete denture cases. 84% of them used custom tray constructed from auto polymerizing acrylic resin, the remaining practitioners (11.8%) used light-curing resin, and only 0.9% used shellac (Table 5). Unexpectedly, 62.4% of those who constructed complete dentures did not use fox bite to determine occlusal plan.

Table 1: Practice type among Sulaimani dentists (n=153).

Practice Type		Number	%
Private Clinic		115	75.1
Private Center		25	16.33
Health Centre	Specialized	8	5.22
	Non-Specialized	5	3.26

Table 2: Graduation years and specialty of participants

Graduation years	Number	%	Bachelor of Dental Surgery	Specialty	
				Prosthodontist	Others
1970-1979	7	4.5	----------	1 (0.6%)	6 (3.9%)
1980-1989	17	11.1	2 (1.3%)	7 (4.5%)	8 (5.2%)
1990-1999	45	29.4	9 (5.8%)	15 (9.8%)	21 (13.7%)
2000-2009	69	45.09	30 (19.6%)	5 (3.2%)	34 (20.2%)
2010-2014	15	9.8	14 (9.1%)	----------	1 (0.6%)

Table 3: Conventional complete and partial denture construction among participants

	Providing the service			Non Providing the service
	Total	Frequently providing the service	Uncommonly providing the service	
Complete denture	125 (81.6%)	91 (59.4%)	34 (22.2%)	28 (18.4%)
Partial denture	146 (95.3%)	130 (84.9%)	16 (10.4%)	7 (4.5%)

Table 4: Types of Preliminary and Final impression materials used for complete denture

			Number	%
Preliminary Impression	Impression compound		41	32.8
	Irreversible hydrocolloid		47	37.6
	Impression compound+ Irreversible hydrocolloid		11	8.8
	Polyvinyl siloxane Heavy body		26	20.8
	Polyvinyl siloxane Heavy body+ Light body		48	38.4
Final Impression	Zinc oxide eugenol	With tracing	50	40
		Without tracing	15	12
	Irreversible hydrocolloid	With tracing	9	7.2
		Without tracing	3	2.4
	Impression compound with Irreversible hydrocolloid wash		1	0.8
	Polyvinyl siloxane Light body	With tracing	17	13.6
		Without tracing	15	12
	Polyvinyl siloxane Heavy body+ Light body		30	24
	No final impression, depend on the preliminary		15	12

Table 5: Types and materials of custom tray used to register final impression for complete denture.

Close fit custom tray	110 (88%)	Material of custom tray	Acrylic	84.5%
			Light cure	11.8%
Custom tray with spacer	27 (24.5%)		Shellac	0.9%

The response to questions concerning impression water rinsing and disinfection revealed that 72 dentists (49.4%) wash the impressions with water, 43 of them (59.7%) followed this with disinfectant. The most frequent disinfectant material used was alcohol (73.6%). Conversely, 73.9% of the participants did not disinfect their impression before dispatching to their technicians (Table 6).

Table 6: Impression water rinsing and disinfection

	No	Yes		
Water rinsing	74 (50.6%)	72 (49.4)	**Water rinsing alone**	29 (40.2%)
			Water rinsing followed by disinfection	43 (59.7%)
Disinfectant	108 (73.9)	38 (26.1)	**Type of disinfectant**	Bleaching 4 (10.5%)
				Alcohol 28 (73.6%)
				Glutimid 5 (13.1%)
				Others * 1 (2.6)%

*** Amonia compound disinfectant.**

In order to establish the occlusal vertical dimension, 42 respondents (33.6%) used two methods to determined occlusal vertical dimension, while 27 (21.6%) used more than two methods (3-4 methods). The extra-oral measurements constituted (73.9%), followed by aesthetic (51.2%), phonetic (40%) and swallowing (27.2%). One prosthodontist reported that when available, he used patients' previous records (Table 7).

The centric relation registration by positioning techniques performed by clinicians (bimanual and figure-thumb chin manipulation) showed the lowest percentage (16%), followed by positioning techniques performed by the patients (tongue raised and placed in the posterior part of the palate) 24%. The majority of respondents depended on both techniques (60%) (Table 7).

For post-dum position determination, the majority of dentists (53.6%) used a combination method (AH method, a blow from the nose, fovea palatine method). While 42.4% of them relied on their technicians to determine the post-dum area. Only 4 % of them used physiologic method (fluid wax technique) (Table 7).

The percentages reported for the problems faced during and after the construction of complete dentures were as follows; repeated post insertion adjustment visits (43.2%), poor laboratory work (34.4%) and poor retention (37.6%). 30.4% of dental practitioners faced problems in registering jaw relation records. 22.4% of dentists found complete denture construction to be a time-consuming clinical procedure. A minority of the participants (2.4%) related the problems to patients' attitudes and difficulty in determining the post-dum area (Table 7).

Table 7: Methods of registration vertical dimension, centric relation records and post-dum area in addition to the main problems in fabrication of complete dentures

		Number	%
Registering vertical dimension	**Extra oral measurements**	87	69.6
	Aesthetic	64	51.2
	Phonetics	50	40
	Swallowing	34	27.2
	Previous patient's records	1	0.8
Registering centric relation	**Clinician**	20	16
	Patients	30	24
	Both	75	60
Registering post-dum area	**Combination**	67	53.6
	Technician	53	42.4
	Physiologic method	5	4
Problems in fabrication of complete dentures	**Jaw relation**	38	30.4
	Retention	47	37.6
	Time consuming	28	22.4
	Poor laboratory work	43	34.4
	Frequent post insertion adjustment	54	43.2
	Others*	3	2.4
*** Patient's attitude and difficulty in determining the post-dum area.**			

For RPDs construction, 131 respondents (89.7%) provided acrylic partial dentures for their patients in their clinics, followed by flexible partial dentures (103, 70.5%). The minority constructed cast metal partial dentures (27, 18.4%) (Table 8).

From the data, it seems that dentists give instructions to their technicians about the design of partial dentures rather than surveying instructions. 74.6% gave instruction to their technicians regarding partial denture design and clasps position, while only 36.9% gave instruction for cast surveying (Table 8).

Finally, the majority of dental practitioners give post care instruction of removable appliances verbally (96.5%).

Table 8: Types of removable partial dentures constructed and the dentist's instruction regarding RPDs design given to the technicians.

		Number (%)
Types of RPD*	**Acrylic RPD**	131 (89.7%)
	Flexible RPD	103 (70.5%)
	Metal RPD	27 (18.4%)
Dentists instruction regarding:	**Design of RPD**	109 (74.6%)
	Cast surveying	54 (36.9%)

***RPD: Removable Partial Denture**

DISCUSSION

Although the sample size in this study is limited, the variant structure (different graduation year, different specialties, and different clinical sectors) of participants seems to adequately represent Sulaimani's dentists.

Sulaimani dentists continue to provide considerable numbers of conventional complete and RPDs within their clinical practice. Most respondents constructed RPDs, however the formal is less frequent. The preference in construction of RPDs may be due to patient satisfaction with RPD retention and comfort over than those wearing complete denture, particularly the mandibular denture [14].

Many studies indicate that impression compound is the material of choice for making a preliminary impression [12,15]. Others found that irreversible hydrocolloid was the preferred preliminary impressions material [9,12]. However, the findings of this study show that a third of the practitioners used impression compound for their preliminary impressions; which is similar to the results reported by Gambhir et al [13]. On the other hand, irreversible hydrocolloid and a combination of heavy and light bodies of PVS impression materials were most commonly used as preliminary impression materials among Sulaimani dentists, over a third respectively.

The majority of prosthodontics organisations believe that for a successful complete denture outcome to be achieved, it is necessary to make two impressions; preliminary and final [16,17]. Furthermore, it is difficult to find reliable data on the prevalence of a one-step impression procedure [16]. Although in a study done by Kawai et al [18] it was found that the traditional final impression technique (a two-step procedure) resulted in the same patient satisfaction and denture quality as the simplified impression technique (one step procedure). In this study, the majority of participants preferred both preliminary and final impressions as part of complete denture therapy. Furthermore, only 12% of the practitioners followed single impression technique compared to 15% of a previous study done by Gambhir et al [13].

Regarding the materials used for final impression, zinc oxide and PVS impression materials were the preferred final impression materials, withirreversible hydrocolloid constituting a small percentage. This is markedly different from those used in a previous study, in which they reported irreversible hydrocolloid to be the preferred final impression material, followed by zinc oxide and PVS [12]. The current results indicated that more than a third of participants still follow what they were taught in their undergraduate study regarding the final impression material of choice (zinc oxide impression materials with border molding). However, there is a movement toward the use of PVS as final impression materials.

The majority of participants make the final impression using a custom tray and this matches the results obtained from a survey conducted in the UK [19]. Most participants adopted a closed custom fit tray. Although, several studies have suggested for better impression results, the use of adequate spacer over the entire denture bearing area with vertical tissue stops [17, 20].

The new materials of constructing custom trays are still not commonly available for Sulaimani dentists. The material of choice was auto polymerizing acrylic resin. The minority used a light-curing resin. This finding is dissimilar to that published in a study done in the USA [21],

in which the majority of practitioners used light polymerized resin (60%).

Determining the occlusal plane using fox bite is important for ideal teeth arrangement in order to achieve esthetics and phonetics [22]. But the majority of participants in this study did not use fox bite. This in turn may adversely affect patients satisfaction regarding their complete denture esthetic and occlusion. So further surveying of Sulaimani dental institutions may provide a more accurate picture of complete denture patient's satisfaction.

The fact that the majority of respondent did not routinely disinfect impressions before pouring the cast or dispatching to a dental laboratory was a cause for concern. Of greater concern was the apparent failure of many respondents to identify the appropriate method of disinfection, with more than third opting only to rinse impressions in water. This is fewer than the number found by Hyde and McCord [12] in a survey conducted in the UK to identify current clinical practices followed by general dental practitioners.

The assessment of occlusal vertical dimension will become more reliable if several methods are used simultaneously [23]. More than half of participants depend on 2 to 4 different methods to register vertical dimension. Extra oral and esthetic were the most common methods. Various registration methods for centric relation have been described in the literature, but there is no consensus on which is the best [24]. A large percentage of participants used two methods; positioning techniques performed by both the clinicians and patients, which is similar to other dental schools [11]. Sulaimani dentists tried to follow the right procedures for registering the vertical and centric relations as they realised that most complete denture problems arise from errors in these measurements.

It has been reported by various authors that the best way to record the posterior palatal seal area is by using a combination of methods [25,26]. Just over half of participants followed more than one method in determining the post-dum area. The remaining participants completely relied on the dental technician to localize and prepare the post-dam. However, this is still fewer than the numbers found in another study conducted in the UK [27]. Again unlike other previous studies [28,29], the minority of participants followed the physiologic method.

There were many problems quoted by the practitioners during and after the fabrication of complete dentures. Most of the problems directly related to the prosthodontics technique used, for example problems regarding retention and jaw relation records. Issues were raised regarding the proficiency of practitioners at certain techniques which resulted in complaining at frequent post insertion adjustments, considered complete denture service a time-consuming procedure, as well as feeling technicians work was inadequate [13].

Several factors could help determine whether a cast metal framework or acrylic resin RPD is constructed. The expense of the service, capabilities of dental laboratory support, location and extent of missing teeth in addition to prosthodontics education may play a role in selection the type of RPDs [30]. Although dental students spend a significant amount of time studying the cast metal RPDs, this type of treatment was not in the participants repertoire. It has been demonstrated that the majority of participants provide acrylic and flexible partial dentures far more regularly than cast metal framework. This finding matched previous studies [31, 32]. Acrylic RPDs continue to be used with great frequency [33]. Moreover, newer types of flexible acrylic or vinyl RPDs have received much attention from Sulaimani practitioners. This type of RPDs began to be used in clinical services over the past decade [30]. Although much research has been conducted to test the properties of these materials [34,35] there has been no recent peer-reviewed comparison of the prevalence of these different RPD framework materials. Thus, further studies are needed to fill this gap.

It isreported that surveying of the diagnostic cast is mandatory for fabricating cast metal partial dentures [36]. But only one third of the practitioners in this study instructed their technicians to do this surveying, similar to the findings of Gambhir et al [13]. Those dentists who instructed their technicians in surveying and construction of RPDs other than cast metal, may need to localise teeth undercuts and retentive areas that help in designing the RPDs framework. However, the majority of respondents were giving instruction on RPDs design to technicians.

Verbal instructions given to the patient by the dentist is a crucial step post denture insertion. However written information has been shown to improve patient knowledge, adherence and therapeutic outcomes. It is also highly effective in achieving improved clinical outcomes and compliance [37,38]. Unfortunately, the minority of participants supplied their patients with written as well as verbal post care instructions.

It is important to conduct general surveys analysing and comparing the current prosthodontics curriculum of different dental schools in the country, in order to gauge the

general trend in the teaching techniques of prosthodontics. These studies could also specify the prosthodontics materials and techniques followed by dentists graduating from different dental schools.

There is some disconnection between the undergraduate prosthodontic curriculum and the general prosthodontics practice in different dental clinics. The majority of the practitioners try to follow short cut procedures, and many of them lack the knowledge regarding prosthodontic materials and techniques.

Thus, it is crucial to establish continuing dental education programs, teaching and training courses in complete and RPDs prosthodontics and to clarify the importance of basic techniques and new materials. In addition, the undergraduate teaching curriculum may need to be revised and improved to include tracking the continuous development in prosthodontics techniques and materials. This revision could overcome any weakness or deficiency in prosthodontics knowledge demonstrated in the results of studies like this.

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