

Factors associated with insufficient removable partial denture design instructions

Czynniki warunkujące niepełny przepływ informacji między lekarzem stomatologiem a technikiem podczas projektowania ruchomych częściowych uzupełnień protetycznych

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Abstract

Background. The design of removable partial denture (RPD) has an important role in the health of dental and periodontal tissues. Dentists are responsible for the design since designing it requires mechanical and biological considerations. There is lack of literature focusing on the behavior of dentists in Turkey concerning the design of RPDs.

Objectives. This study aimed to assess the capability of dentists to transfer RPD design information to dental laboratories, and to determine the factors playing a role in the designing or transferring the design information.

Material and methods. A questionnaire was distributed to 25 dental laboratories in all geographical regions of Turkey. Design instructions of RPD provided by dentists using a prescription form, phone call and internet were examined. Clinic type, communication method, way of showing design information, and specialization in prosthodontics were recorded to investigate their association with design information. The data was analyzed with descriptive statistics and χ^2 test.

Results. Approximately 2/3 of the dentists did not mention any design information in the instructions. Laboratory prescription form was the most frequently used communication method. Design features were mostly indicated in diagrams. The ratio of indicating design information was higher among prosthodontists. Over a half of the dentists who mentioned design information in their instructions were from private dental clinics. The dentists who preferred both writing and drawing for showing design specifications had the highest ratio of showing rest type, clasp location and rest location in their instructions.

Conclusions. The majority of dentists do not mention any design information. Expertise in prosthodontics and type of dental institution affect the content of the design information. Showing design features in more than 1 way seems to increase the amount of design items. Training dentists in aspects of RPD design and evaluating the circumstances of clinics is essential.

Key words: removable partial denture, denture design, dental laboratory

Słowa kluczowe: ruchome częściowe uzupełnienie protetyczne, projekt protezy, laboratorium dentystyczne

Removable partial denture (RPD) is a comparatively economical and noninvasive option for prosthetic rehabilitation of partial edentulism.¹ The design of RPD has an important role in the health of dental and periodontal tissues and the stability of the denture.²⁻⁴ Designing an RPD necessitates mechanical and biological considerations, and requires clinical examination. Because of this concern, dentists are responsible for the RPD design as an ethical obligation.⁵⁻⁸ A proper transfer of design information to the dental laboratory provides increased professional quality assurance in an RPD service.⁵

Successful transfer of information regarding the details of prostheses to the dental technician plays an essential role in maintaining high quality of the prostheses.^{1,5} Methods of communication between dentist and technician are: authorization form,⁸⁻¹⁰ telephone call,^{8,9} e-mail,⁹ web-based communication,^{10,11} and text messaging.⁹ A growing body of literature has examined communication between the dentist and laboratory for fixed partial dentures and RPDs. Most of these studies have focused on the choice of impression trays and materials^{1,7,12-14} as well as quality of the written prescriptions.^{1,7,8,12-20} The studies that investigated the quality of the written prescriptions considered the following items: personal data of the patients,¹⁷⁻²⁰ submission and completion date,^{16-18,20} fee,²⁰ shade of teeth,¹⁶⁻²⁰ material selection for prostheses,¹⁶⁻¹⁸ design information,^{7,8,13,16,17,19,20} and quality of the prescription (assessed as clear, a guide, poor, or none).^{1,7,12-17}

According to the results of these investigations, the quality of the written prescriptions was often reported as poor^{1,7,13,14,17,19} and design of the prostheses was often delegated to the technician.^{1,7,8,13-17,19,20}

Most studies about the communication concerned the quality of prescriptions. However, there is still a need for discussion on probable factors that may be responsible for delegating the design to the technician. Also, there is a lack of research addressing information on RPD design given by dentists in Turkey.

The first aim of this study was to investigate to what extent dentists in Turkey provide the dental technicians with adequate design information. The second aim was to determine whether there is a correlation between some conditions (professional training, type of dental institution, communication method, way of indicating design features) and adequacy of design information. A structured questionnaire on RPD design was developed for this study.

Material and methods

The target population of the study was identified as all members of dental technician unions or associations located in the 5 most populous cities in each of 7 geographical regions of Turkey (Aegean, Black Sea, Central Anatolia, Eastern Anatolia, Marmara, Mediterranean, and

Southeastern Anatolia). In Turkey, the dental technician associations and unions are independent institutions located in different cities. However, not all cities have such an institution. The laboratories located in the cities which do not have such an institution as well as the laboratories who did not fabricate RPDs were excluded from the study. Finally, the number of laboratories included in the study was 1 in the Aegean region, 2 in the Black Sea region, 3 in Central Anatolia, 1 in Eastern Anatolia, 2 in the Marmara region, and 2 in the Mediterranean region.

A pilot questionnaire was developed by the author to determine the adequacy of communication between dentists and dental laboratories in Turkey for RPD design and to examine probable factors affecting the adequacy of such communication. The pilot questionnaire was delivered to 7 dental laboratories, each located in a different geographical region, via e-mail. One-hundred seventeen pilot questionnaires were returned. A 6-item final questionnaire was designed to clarify the quantity and quality of design instructions from various categories of dentists and delivered to the target population with an invitation letter (Fig. 1).

Item No.	Please answer the questions below for each cast removable partial denture case
1	Where did you receive the instructions from? dental office () private dental clinic () state dental clinic ()
2	Who did send the instructions? general dentist () prosthodontist ()
3	Was there any design information? yes () no ()
If the answer is "no", terminate the questionnaire.	
4	How did you receive the instructions? phone call () internet (mail/web site) () laboratory prescription form ()
If the answer is "phone call", terminate the questionnaire.	
5	What was the format of design information written () drawing (cast/paper) () written and drawing () diagram ()
6	Which one(s) of the following were indicated? type of major connector () type of clasps () location of clasps () type of rests () location of rests ()

Fig. 1. Questionnaire

Communication methods between dentists and dental technicians, including prescription forms, phone calls and internet messages, were examined. However, instructions from the dentist to the technician by phone call is not a reliable way of communicating, because oral instructions are liable to be subjectively interpreted. Consequently, such instructions were regarded as “no instructions” in the statistical analyses.

The survey was carried out within a time window of 2 months. The collected data was analyzed with descriptive statistics and then with χ^2 test (SPSS v. 20 software; IBM Corp., Armonk, USA). Values of $p < 0.05$ were considered statistically significant.

Results

Eleven laboratories refused to participate in the study. Inconsistent responses from 2 laboratories were excluded. A total of 747 questionnaires were received from 25 laboratories from 8 cities (response rate = 66%). Distribution of responses according to cities and geographical regions is shown in Table 1.

The majority of RPD orders were from state dental clinics (60.8%) and general dentists (83%). Only 37.5% of the dentists gave design instructions to the dental technicians as they were sending a master model or impression to the laboratory for RPD metal substructure casting. Filling a prescription form (85.7%) was the most frequently preferred communication method to communicate with the technician and a diagram was the most preferred choice to indicate the design features (47.1%). The type of clasp was the most common specification among design details (67.8%) (Table 2).

Whereas 57.5% of the prosthodontists specified design information, only 33.4% of the general practitioners did so (Fig. 1). This difference was statistically significant ($p < 0.001$).

Dentists from private dental clinics (56.9%) were more likely to send RPD design information to a dental laboratory compared to dentists from dental offices (34.9%) and state dental clinics (36.3%) ($p = 0.006$) (Fig. 2).

Table 1. Distribution of survey responses

Geographical region	City	Number of responses	Number of laboratories
Aegean	İzmir	65	4
Black Sea	Ordu	78	3
	Zonguldak	282	5
Central Anatolia	Ankara	229	6
	Eskişehir	18	1
Eastern Anatolia	Elazığ	33	2
Marmara	Istanbul	22	2
Mediterranean	Mersin	20	2
Total		747	25

Table 2. Distribution of answers to the questionnaire

Questions	Answers	n	%
Institution	dental office	235	31.5
	private dental clinic	58	7.8
	state dental clinic	454	60.8
Dental practitioner	general dentist	620	83
	prosthodontist	127	17
Design information	available	280	37.5
	not available	467	62.5
Communication method	phone call	25	8.9
	internet (mail/web site)	15	5.4
	prescription form	240	85.7
Format of design information	written	53	20.8
	drawing	47	18.4
	written and drawing	35	13.7
	diagram	120	47.1
Design specifications	type of major connector	120	52.9
	type of clasps	173	67.8
	location of clasps	94	36.9
	type of rests	42	16.5
	location of rests	96	37.6

n – number of responses.

No significant correlation was identified between the method of providing design information and specification of the major connector ($p = 0.174$) and clasp type ($p = 0.124$). The correlation between the method of providing design information and specifying rest type, clasp location and rest location was statistically significant ($p < 0.001$ for rest type; $p = 0.002$ for clasp location;

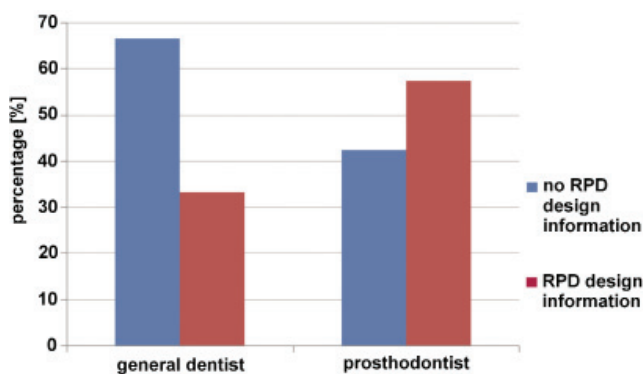


Fig. 1. Relationship between RPD design information and expertise

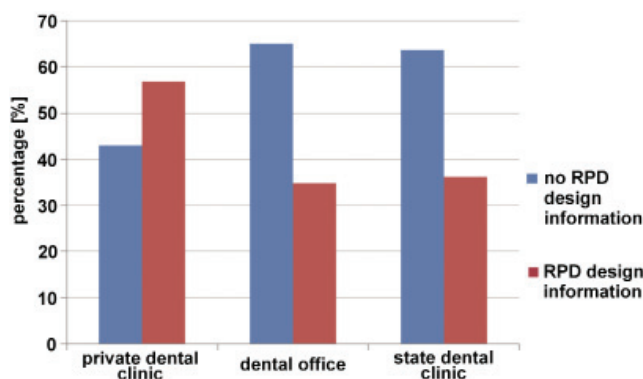


Fig. 2. Relationship between RPD design information and the type of clinic

$p < 0.001$ for rest location). The prescription forms which included both written statements and drawn instructions had a higher ratio of data about rest type (48.6%), clasp position (62.9%) and rest position (71.4%).

Discussion

Clear communication between the dentist and dental laboratory is an essential component of proper and high-quality prosthetic rehabilitation.⁵ The present results indicate that the most common communication method between the dentist and the dental technician was a laboratory prescription form (85.7%). This result is similar to the findings by Haj-Ali et al. in the United Arab Emirates.⁸ The role of RPD design in the success of the denture is an accepted fact.^{2,21,22} The results of this study showed that 62.5% of the dentists offered no design information when they sent a master model or impression to the laboratory for RPD fabrication. This result is higher than the findings of Kilfeather et al. (54%, England, Ireland and Wales), Radhi et al. (57%, Bahrain) and Pun et al. (42%, Wisconsin, USA).^{1,13,23} In contrast, Haj-Ali et al. reported that 89.5% of laboratory prescriptions in the United Arab Emirates rarely or never provided design information.⁸ Lynch and Allen attributed inadequate design instructions to deficiencies in the vocational training of dentists.⁷ A similar conclusion may be drawn as a result of this study because of the positive correlation found between specialization in prosthodontics and design instructions. Higher professional education seems to have positive effects on dentists' awareness of the importance of RPD design information sent to the dental technicians. In view of the fact that the percentage of prosthodontists was only 17%, the ratio of providing design information would be higher if more prosthodontists had contributed to the survey.

Most studies have determined the quality of RPD design instructions according to the scores given by technicians as "clear, a guide, poor, none".^{1,7,12-17} This kind of scoring may lead the technician to decide in a subjective manner. In the current study, to reduce the subjectivity of the technician, a question about RPD design elements was included. Details regarding type of the major connector was found in 52.9% of the instructions, which is lower than reported by Kilfeather et al. (62%) and Sui et al. (88%).^{1,19} In this study, detailed information about type of clasp was present in 67.8% of the instructions and location of clasp was found in 36.9%. Sui et al. reported that 90% of the instructions included clasp design.¹⁹ Kilfeather et al. reported that 39% of direct retainers were described in the prescriptions.¹ In this study, only 16.5% of the instructions showed type of rest and 37.6% of the instructions showed location of rest. Radhi et al. found that the percentage of the prescriptions regarding denture base, clasp design, rest design, and connector was 43% with 4 variables, 43% with 3 variables, 14% with 2 variables, and 43% with 1 variable.¹³

Dentists who work in private dental clinics more frequently gave design specifications than dentists who work in dental offices and state dental clinics. Further data collection is required to determine exactly how the type of clinic affects such information. One explanation why the design was not communicated to the dental technician might be excessive workload, causing the dentist to refrain from taking the necessary time to do so. Conditions of dental institutions may also lead lower percentages of details regarding major connector and clasp than similar studies mentioned above.

The ways dentists convey the design information to dental technicians was another issue examined in this research. The annotation document, which included both written statements and drawn instructions, had a higher ratio of data about rest type, clasp position and rest position. This could be attributed to the fact that more than 1 way of communicating was used, which might have motivated the dentist to give more details. However, in these documents, lack of specification of other RPD design features is still questionable. The results regarding the effect of the type of clinic and the way the design information was conveyed raises the question whether the problem is incompetence in designing the RPD or inadequacy in transferring design information. Further studies are needed to recognize the difference between the incapability of the dentist of making an appropriate RPD design and his/her incapability of transferring the design information to a laboratory even when he/she has adequate knowledge.

In this study, the results from the 8 cities were not analyzed separately. Further research may be undertaken including analyses of data for each city and comparison of the results among different localizations. However, dentists who work in a village/city lacking an RPD producing laboratory may post casts and instructions to other cities. This might influence the results.

Since a laboratory prescription form was the preferred communication method (85.7%), the relevance between quantity of design specifications provided by dentists and the contents of present laboratory prescription forms can be researched in another study. Elaborating the contents of the form may encourage dentists to give more details about RPD design. Also, a diagram was the preferred choice to indicate the design features (47.1%). Improved diagrams with more details may enable dentists to show more design features.

Conclusions

This study evaluated instructions for 747 RPDs made at 25 dental laboratories in 8 cities located in different regions of Turkey. More than a half of the dentists did not provide any design information. More prosthodontists than general dentists provided design information. The type of dental institution where the dentist works seems to have an effect on providing design information to the

laboratory. Written and drawn design information is associated with better design specifications. This research can serve as a basis for future studies examining the determinants of poor RPD design information.

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