

## Shortened Dental Arch Concept: Investigation of the quality of written prescription by dentists to dental technicians in Jeddah, Saudi Arabia.

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**Abstract: Background & aim:** The aim of this study was to review and evaluate the quality of communication, instructions and prosthodontic prescription given to profitable and governmental dental laboratories by general dentists, restorative dentists and prosthodontists for shortened dental arch cases treated in Jeddah, Saudi Arabia. **Methods:** Over the period of six months, a cross-sectional survey with self-designed-structured questionnaires was conducted. A survey of the main five governmental and private dental laboratories was carried out. 200 questionnaires were filled by an interview and case discussion with each dental lab technician who received a case for shortened dental arch (SDA). **Results:** A sample size of 200 male dental technicians were interviewed. 91% of them were not Saudi. In addition, 25.5% had an experience for more than 25 year. 67.5% of the dental technicians were working in private laboratories. Most of the cases received (76%) were for lower arch. The most treatment option that were selected by dentists were the Co-Cr RPD 86.5%. The majority of the cobalt chromium RPD cases (64.2%) had instruction form without mentioning the clasp material. The most common major connector selected for the lower arch cases 55.5% was lingual bar and a U-shaped major connector in the upper. **Conclusions:** It would appear from the results of this survey that amid the different restorative treatment choices for SDA, Co-Cr RPDs are the most common. The prescribing dentist's signature, clasps' material and date the prosthetic work required were the most frequently absent sections of information. Recommendations for improved communication, clear, complete and signed prosthodontics laboratory form of better patient service.

[Manal R Alammari. **Shortened Dental Arch Concept: Investigation of the quality of written prescription by dentist to dental technicians in Jeddah, Saudi Arabia.** *Life Sci J* 2016;13(8):1-7]. ISSN: 1097-8135 (Print) / ISSN: 2372-613X (Online). <http://www.lifesciencesite.com>. 1. doi:[10.7537/marslsj130816.01](https://doi.org/10.7537/marslsj130816.01).

**Keywords:** shortened dental arch, partial denture, Co-Cr RPDs, prescription's quality, dental technicians.

### 1. Introduction

Effective communication is vital in the delivery of quality dental prosthesis<sup>1,2</sup>. It is important that the dentist and dental technician cooperate well as a team by having a detailed understanding of each other's roles and instructions with regard to dental prosthesis fabrication<sup>3-6</sup>.

Communication between dentists and dental technicians is dependent on proper prosthetic prescriptions<sup>2,7</sup>. Prosthetic prescriptions are considered to be the groundwork for prosthesis fabrication; consequently, important information need be transferred clearly and efficiently between the two specialists<sup>2,8,9</sup>.

Leith *et al.* established that the dentist is eventually "responsible for the end product, and as such, requires an understanding of the fabrication requirements, including material selection and design."<sup>4</sup>

Clinician thus has the main obligation to transfer clear, complete and precise prosthetic prescriptions to the dental technician.<sup>10,11</sup>

The dental technician responsibility is to construct oral prostheses in accordance with instructions specified by the dentist.<sup>4,12,13</sup>

Dental technicians defined as "registered dental professionals who make dental devices including dentures, crowns, and bridges to a prescription from a dentist or clinical dental technician."<sup>14</sup> If these directions are not followed or are not flawless, an improper prosthesis could be produced, which has the possibility to cause tissue damage to the patient.<sup>1,2,12</sup>

If the impressions and or the models are insufficient or the instructions are vague, it is the dental technician's duty to communicate with the dentist to clarify the issues.<sup>2,13,15</sup>

Properly completed and well written instructions on properly organized prosthetic laboratory prescriptions contribute to high standards end product of the dental prostheses. Likewise, it will reduce the likelihood of delays.<sup>2,18</sup> Moreover, it can be used as a method for auditing the quality and type of work done.<sup>19</sup>

The shortened dental arch (SDA) has been described as a minimum of four occlusal units which provide functional satisfaction to older adults with sufficient adaptive capacity<sup>[19]</sup>. It is a problem based treatment approach that meets the functional, biological, social and psychological needs of the older dental patients to an acceptable level and potentially reduces costs of treatment.<sup>20-24</sup> Older individuals with

a reduced dentition of four intact premolars and one occluding pair of molars have adequate masticatory function. In addition, they are able to maintain satisfactory levels of occlusal stability.<sup>25,26</sup>

Also, there are still situations where restoring the SDA should be considered, where loss of posterior teeth makes, for example, aesthetic complications, occlusal instability, or chewing problems.<sup>[27,28]</sup>

The traditional method of replacing posterior missing teeth has been with partial removable dental prostheses (PRDPs). Although patients with perceived impaired function have reported benefits from PRDPs,<sup>29</sup> optimal oral hygiene is required to preserve the remaining dentition.<sup>30</sup>

The aim of this study was, to review and evaluate the quality of communication, instructions and prosthodontic prescription given to profitable and governmental dental laboratories by general dentists, restorative dentists and prosthodontists in Jeddah, Saudi Arabia by interviewing dental technicians from both governmental and private laboratories.

## 2. Material and Methods

The Research Ethics committee at King Abdulaziz Dental Hospital approved this study. A special data collection form was developed and validated through a pilot study. The pilot study comprised of five dental technicians and its aim was to evaluate the clarity and the feasibility of the questions.

The study conducted over the period of six months starting from January 2016. A survey of the five main governmental and private dental laboratories was carried out. The laboratories were located over the four directions of the city of Jeddah (north, south, east and west), in order to cover the whole city. Two of the laboratories undertake only National Health Service, and three of them undertake both national and private work. All the five dental laboratories were visited frequently (at least twice a month).

In each visit, dental casts with SDAs, which have all the anterior teeth in addition to 2 to 4 premolars (sound or restored), were examined. Dentists' prescriptions were reviewed and a special data collection form was completed. Cases which were planned to be treated with immediate partial dentures were excluded, because this is considered a temporary treatment. Cases prescribed for cobalt-chromium based RPDs were examined only after the trial insertion stage and subsequent to fabrication of the metal framework. Similarly, where the acrylic-resin based RPDs were prescribed, these were checked after the trial insertion stage.

The questionnaire has four section. First section started with questions regarding some information

about the dental technician, gender, nationality, age group, years of experience and laboratory type (commercial or governmental). Second section had information about the case type and dentition. Additionally, information about the length of SDA, opposing dentition and finally the treatment option requested. It could be either cantilever fixed bridge (conventional or resin bonded), or implant supported prosthesis, or acrylic resin based partial denture, cobalt-chromium (Co-Cr) based removable partial denture each of them has its own check list gathered from both the dentists prescription and the working cast for each case.

## Statistical Methodology

This study was analyzed using IBM SPSS version 22. A simple descriptive statistics was used to define the characteristics of the study variables through a form of counts and percentages for the categorical and nominal variables while continuous variables are presented by mean and standard deviations. To establish a relationship between categorical variables, this study used chi-square test. While comparing two group means and more than two groups, an independent *t*-test and One-way ANOVA was used, with Least Significant Difference (LSD) as a post hoc test, respectively was used. These tests were done with the assumption of normal distribution.

## 3. Results

The questionnaire applied on 200 SDA cases among five laboratories that receive cases from all-over the city of Jeddah. 100% were male dental technicians (DTs). 91% of the cases were done by Non-Saudi (DTs), while Saudi (DTs) prepared only 9% of the cases. Most of them in the age group of 21 to 30 years of age. 67.5% were working in Private with different years of experience as shown in Figure 1. The entire study sample characteristics are listed in Table 1.

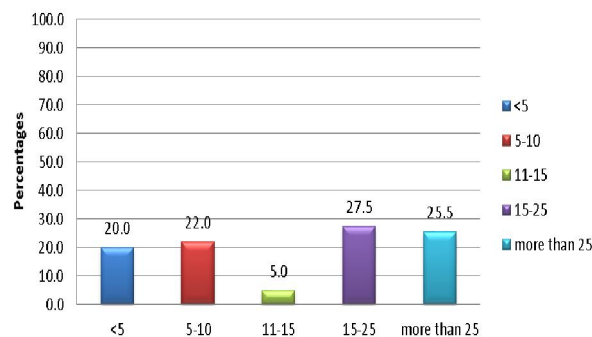


Figure 1: Dental technicians' years of experience.

**Table 1: Characteristics of the Study Sample.**

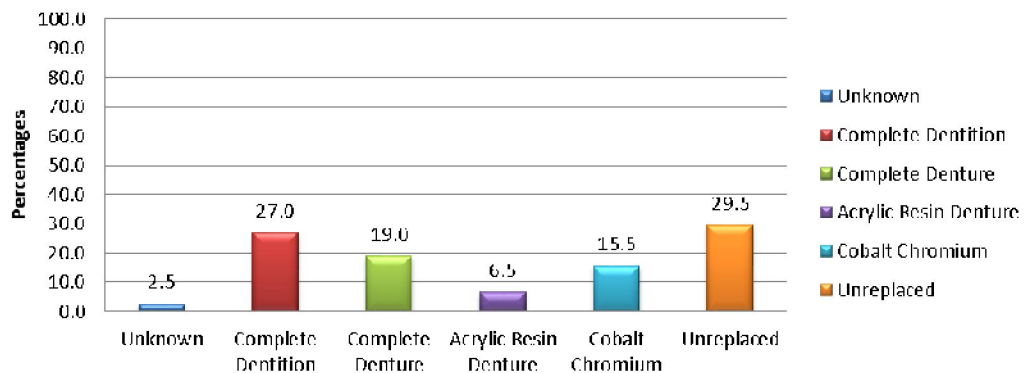
Demographics		Count	%
<b>Total</b>		200	<b>100.0</b>
<b>Gender</b>	Male	200	<b>100.0</b>
<b>Nationality</b>	Saudi	18	<b>9.0</b>
	Non-Saudi	182	<b>91.0</b>
<b>Age</b>	10-20	1	<b>.5</b>
	21-30	67	<b>33.5</b>
	31-40	26	<b>13.0</b>
	41-50	54	<b>27.0</b>
	>50	52	<b>26.0</b>
<b>Years of Experience</b>	<5	40	<b>20.0</b>
	5-10	44	<b>22.0</b>
	11-15	10	<b>5.0</b>
	15-25	55	<b>27.5</b>
	more than 25	51	<b>25.5</b>
<b>Lab Name</b>	Al-Falak	50	<b>25.0</b>
	KAUFD	50	<b>25.0</b>
	Motamaiyzoon	50	<b>25.0</b>
	Al-Nada	35	<b>17.5</b>
	Thaghr	15	<b>7.5</b>
<b>Lab Type</b>	Governmental	65	<b>32.5</b>
	Private	135	<b>67.5</b>

Most of the cases (76%) were for lower arch. 46% of those cases extended from the second premolar to second premolar on the other side of the dental arch as shown in Table 2.

**Table 2: Characteristics of the SDA cases.**

Variables		Count	%
<b>Total</b>		200	<b>100.0</b>
<b>Type of Cast</b>	Upper	48	<b>24.0</b>
	Lower	152	<b>76.0</b>
<b>Shortened dental arch length</b>	4-4	54	<b>27.0</b>
	5-5	92	<b>46.0</b>
	4-5	54	<b>27.0</b>

In most of the SDA cases that has been evaluated, the opposing arch where in un-replaced reduced dentition status (59 cases "i.e. 29.5%), though 54 (27%) of the cases had an opposing arch with complete dentition as shown in Figure 2.



**Figure 2: Type of the opposing dentition.**

The most treatment option that selected and instructed by dentists were the Co-Cr RPD 86.5% of the cases. The rest of the cases which was 27 replaced by acrylic RPD (92.6% they requested clasps). The cantilever bridge and implants were not seen during the period of the study.

Regarding the 173 cobalt chromium cases, only 10 (5.8%) of them were sent without any dentist's design instruction or request. Most of the cobalt chromium cases (163 cases 94.2%) had a drawing showing the design by the dentist in the request form. The shape of the major connector, type of the rest,

position of the rest, and places of indirect retention were written in the instruction form of 163 (94.2%) of the cases. The majority of the cobalt chromium RPD cases (64.2%) had instruction form without any mentions of the clasp material, while it was written in (35.8%) of the cases as shown in Table 3. Moreover, it has been found that the dentist's signature 41% of the prosthodontic Laboratory prescriptions as well as the date on which the prosthetic work requires 39% of the prosthodontic Laboratory prescriptions were the most commonly missing points.

**Table 3: Dentist's Checklist for (Co-Cr) cases.**

Check list of the dentist's prescription		Count	%
<b>Total</b>		173	<b>100.0</b>
<b>Instructions/request to the lab to design</b>	No	10	<b>5.8</b>
	Yes	163	<b>94.2</b>
<b>Diagram</b>	Yes	163	<b>94.2</b>
	No	10	<b>5.8</b>
<b>Drawing on the cast</b>	Yes	94	<b>54.3</b>
	No	79	<b>45.7</b>
<b>Shape of major connector</b>	Yes	163	<b>94.2</b>
	No	10	<b>5.8</b>
<b>Type of clasps (gingivally or occlusally approaching)</b>	Yes	162	<b>93.6</b>
	No	11	<b>6.4</b>
<b>Position of clasps</b>	Yes	162	<b>93.6</b>
	No	11	<b>6.4</b>
<b>Material of clasp construction</b>	Yes	62	<b>35.8</b>
	No	111	<b>64.2</b>
<b>Type of rests</b>	Yes	163	<b>94.2</b>
	No	10	<b>5.8</b>
<b>Position of rests</b>	Yes	163	<b>94.2</b>
	No	10	<b>5.8</b>
<b>Indirect retention</b>	Yes	163	<b>94.2</b>
	No	10	<b>5.8</b>

The majority of the lower arch cases 55.5% had lingual bar as major connector. The lingual plate was chosen in 21% of lower arch cases while 74.6% were not applicable to find out the instruction. Regarding the upper arch cases, the major connector was U-shaped or horseshoe in 12% cases as shown in Table 4.

**Table 4: Type of major connectors in the study sample.**

Cobalt Chromium Denture		Count	%
<b>Total</b>		173	<b>100.0</b>
<b>Type of upper major connector</b>	N/A	129	<b>74.6</b>
	Palatal Plate	8	<b>4.6</b>
	U Shaped	20	<b>11.6</b>
	Palatal Bar	12	<b>6.9</b>
	Palatal Strap	4	<b>2.3</b>
<b>Type of lower major connector</b>	N/A	39	<b>22.5</b>
	Lingual Plate	36	<b>20.8</b>
	Lingual Bar	96	<b>55.5</b>
	Sublingual bar	1	<b>0.6</b>
	Lingual Bar and Continuous clasp	1	<b>0.6</b>

The type of clasps that planned in the premolars of the cobalt chromium cases was occlusally approaching in 71.7% of the cases, gingivally approaching in 26%, cast clasp in 2 cases and wrought wire in 1 case.

The type of the rests that has been placed on the most posterior premolar abutments was mesial in 151 (87.3%) of the cases, distal in 21 (12.1%) of the cases, and mesial and distal in one case (0.6%).

The type of the rests that has been placed on the incisor teeth was cingulum in 87 (50.3%) of the cases, onlay in 15 (8.7%) of the cases, and not indicated in 71 (41%) of the cases.

#### 4. Discussion

Prosthodontics is a specialty that requires a collaboration between the dentist and dental technician in order to produce intraoral prostheses with satisfactory fit, function and aesthetics.<sup>31-33</sup>. Correct communication between the two professions is vital.

A number of studies<sup>34-38</sup> from diverse countries of the world have stressed problems and confirmed the need for better communication approaches between dentists and dental technicians, throughout the fabrication stages of prosthodontic dental appliances.

In this study, 91% of the dental technicians were non-Saudi and 100% were male, this is the first time to report these points and there is no comparable results. It could be because of many factors; the salary level of the skilled dental laboratory technician is not high by today's financial values, and the training facilities for dental laboratory technicians are sadly insufficient, long working hours and stressful working environment with many deadlines.

Furthermore, results showed that the main method of communication between dentists and dental laboratories technicians is still the written prescription only. This is in agreement with recent survey<sup>34</sup>. A number of studies<sup>1,34,36,39</sup> have documented the lack of proper teaching to dental undergraduates students regarding correct communication between dentists and technicians, and the lack of knowledge regarding dental prosthesis fabrication laboratory steps at the time of qualification as the main factors for the recurrent problems.

There are greater opportunities for inter-professional education (IPE) and collaboration between the professions. IPE precisely emphasizes on students' learning<sup>21</sup> Therefore, the addition of IPE in relation to prosthetic prescriptions is one way dental students can improve the skill to effectively communicate with the dental technician during the preclinical and clinical years and when practicing.<sup>1,7,8</sup>

Employing qualified dental technicians to instruct dental students also establishes the significance of IPE in dental curricula. A number of

papers<sup>31,36,40</sup> have recommended that dental school curricula should highlight the teaching of both the technical stages of laboratory fabrication as well as proper dentist-technician communication in order to ensure high quality team working later on. In their career; this has been recognized at Griffith University in Australia<sup>41</sup> with the introduction of inter-professional education between students of dentistry, dental technology and dental hygienists. The implementation of similar modification in the curricula of Saudi dental schools would be recommended. For now, organizing more continues education seminars and workshops could help to reduce the effect of this issue on the quality and the efficiency of the prosthetic work produced.

Officially, the prescribing dentist's signature must be on the prosthetic prescription to impart responsibility of oral prosthesis fabrication.<sup>41,42</sup>

Most of the cases (76%) were for lower arch. 46% of those cases extended from the second premolar to second premolar on the other side of the dental arch which is similar to what has been found in recent study<sup>43</sup>. The most treatment option that were selected and instructed by dentists were the Co-Cr RPD 86.5% of the cases more to what has been found by Nassaniet *al.* in a study conducted in 2010 in the UK, in which 67.2% of the cases were restored by co-cr based removable partial dentures (RPD).

#### Conclusion

The cobalt chromium RPD was the most popular treatment option for dentists. The free-end saddle removable partial denture can be considered a simple, relatively conservative, and comparatively inexpensive treatment option for the shortened dental arch. Either restoring the SDA by an implant-supported prosthesis or cantilevered fixed bridges seem to be uncommon treatment option.

Due to changes in the dental school curriculum of prosthodontic e.g. exposure time available for teaching removable prosthodontics to undergraduate dental students, course content A review is required to reevaluate and possibly to domodifications in Dental school curriculum in Jeddah.

Results showed that the prescribing dentist's signature, clasps' material and date on which the prosthodontic work required were the most frequently absent pieces of information from the laboratory prescription form.

The dental technician may decline work until all the related information provided from the dentist. The importance of correctly completing prosthodontic laboratory prescription needs to be emphasized at the beginning and throughout dental students' education, because incorrect use of the prescription will leave the decision making to dental technician and might has an



impact on the prosthesis provided to patients and accordingly, it might affect the dental health.

### Acknowledgement

The author appreciate the participants for their efforts in responding to this survey and laboratory managers who facilitate visits and valuable assistance to collect data.

The author declares that she has no conflict of interest with respect to the submitted work.

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8/1/2016