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Evaluation of the Practice Differences Between Dentists in Fixed Prosthesis Procedures

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Abstract

Background: Fixed prostheses are widely used in the rehabilitation of missing teeth. The success of these restorations depends on various factors, including impression techniques, gingival retraction, interocclusal records, and temporary prosthesis fabrication. This study aimed to evaluate the knowledge, attitudes, and practice variations among dentists in Türkiye regarding fixed prosthesis procedures.

Methods: This study was conducted via an online survey. The questionnaire consisted of 14 questions covering demographic characteristics and fixed prosthodontic procedures, including gingival retraction, impression materials, interocclusal records, and temporary prosthesis fabrication. Statistical analyses were performed using IBM SPSS (IBM SPSS Corp.; Armonk, NY, USA, Version 23.0), with a significance level of $P < .05$.

Results: A total of 152 dentists participated, of whom 61.8% were female and 38.2% were male. Gender did not significantly influence material or technique selection ($P > .05$), whereas educational background and professional experience significantly affected the choice of impression materials ($P < .05$). Condensation silicone was the most preferred impression material (54.6%), and wax was the most frequently used interocclusal record material (75.8%). Additionally, 94.7% of dentists fabricated temporary prostheses, with the indirect technique being the most preferred.

Conclusion: Significant variations were observed in material and technique selection, particularly based on education and experience. While younger dentists showed a higher preference for modern materials, experienced practitioners relied more on conventional techniques.

Keywords: Clinical practices, fixed prosthesis, gingival retraction, impression materials, interocclusal recording material, provisional prosthesis

What is already known on this topic?

- *Fixed prostheses require various procedural steps, including gingival retraction, impression techniques, interocclusal records, and temporary prosthesis fabrication. The choice of materials and techniques can vary based on the dentist's clinical experience, educational background, and access to new technologies. Digital impression systems are becoming more popular, but traditional methods are still widely used due to cost and accessibility factors.*

What this study adds on this topic?

- *This study provides data on the variations in clinical practice among dentists in Türkiye regarding fixed prosthodontic procedures. Significant differences were observed in the selection of impression materials and techniques, particularly between general dentists and specialists. The findings highlight the need for further research on the impact of digitalization in fixed prosthodontics and how training programs can address practice differences.*

INTRODUCTION

The restoration of tooth loss and related deficiencies plays a key role in maintaining the function of the stomatognathic system. Fixed prostheses are the most preferred method for the rehabilitation of missing teeth.[1] The success of fixed prostheses does not only depend on the knowledge and skills of the clinician, but also on the materials and application methods used, which are of great importance.[2] The construction of fixed prostheses consists of many different stages such as tooth preparation, soft tissue

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management, impression techniques, temporary prosthesis construction, passive fit of the framework, occlusion, and cementation.[1]

In the literature, the sulcular width at the margin level is reported to be approximately 0.2 mm. When the sulcular width is narrower, the impression material may tear during removal, leading to inaccuracies in recording the preparation margin.[3] Therefore, gingival retraction is a very important stage in the fabrication of fixed prostheses. Various gingival retraction techniques, including mechanical, chemical-mechanical, and surgical methods, have been developed to enhance the accuracy of impressions.[4] Among various techniques, the chemico-mechanical method is most commonly employed in fixed prosthodontics. This involves soaking a retraction cord in a chemical agent, which enhances the tissue displacement more effectively than a plain cord. Alternative gingival displacement techniques include surgical retraction methods such as rotary curettage with a torpedo-shaped diamond bur in cases of healthy gingiva or the use of electrosurgery. However, electrosurgical approaches are contraindicated in patients with cardiac pacemakers. More recently, laser-assisted gingival retraction has emerged as a favorable option, offering advantages such as minimal bleeding and reduced risk of gingival recession.[5]

Impression materials and techniques are critical factors that directly impact the long-term success of prostheses. The literature indicates that elastomeric impression materials, especially polyvinyl siloxane, are better than others in terms of dimensional stability and detail reproduction. However, hydrocolloid materials remain widely preferred in some cases due to their cost-effectiveness and ease of use. The choice of impression material depends on several factors such as material properties, advantages, disadvantages, and cost-effectiveness.[6]

The production of indirect restorations must be precise to ensure harmony with the existing stomatognathic system. A correct and stable occlusal record is essential, as any inaccuracies during the recording process may necessitate extensive intraoral adjustments, potentially compromising both aesthetics and mechanical durability.[7]

Temporary prostheses are an indispensable component of fixed prosthodontic treatment until the final prosthesis is placed. These prostheses fulfill requirements such as pulp protection, maintenance of periodontal health, prevention of tipping of abutment and adjacent teeth, and evaluation of maxillomandibular relationships. Additionally, temporary prostheses contribute to improving the patient's psychological well-being and allow for a better assessment of the treatment outcome and its limitations.[8]

The introduction of computer-aided design (CAD) and computer-aided manufacturing (CAM) technologies in the 1980s marked a significant turning point in restorative dentistry, enabling the accurate production of inlays, onlays, crowns, bridges, and implants.[9] In the early 2000s, this innovation was followed by the development of digital impression systems, designed to overcome many of the limitations inherent to conventional impression methods.[10] Since their introduction, digital impressions have gained widespread acceptance due to their ability to enhance workflow efficiency and improve clinical precision in both treatment and prosthesis fabrication.[11] However, despite these advantages, intraoral scanners still present challenges when capturing detailed images in posterior areas, largely due to their larger size compared to traditional trays, which can make it difficult to reach distal regions.[12] Nevertheless, existing literature supports that digital impression methods yield improved occlusal contact accuracy and provide better overall clinical outcomes when compared to traditional techniques.[13] As digital dentistry continues to advance, digital impressions have become a central component in the modernization of clinical workflows and enhancement of patient care. From diagnosis to treatment planning and execution, the integration of digital tools—such as intraoral scanning and 3D printing—has contributed to greater accuracy, reduced human error, and faster, more individualized treatment processes. Additionally, this digital transition has improved communication between clinicians and dental laboratories, decreased turnaround times, and led to more predictable and higher-quality prosthetic outcomes.[14]

The techniques and materials preferred by dentists in the fabrication of fixed prostheses may vary based on multiple factors. Despite significant advancements in digital dentistry in recent years, many clinicians still prefer conventional dental practices.

This study aims to evaluate the knowledge, attitudes, and clinical practices of dentists with varying demographic characteristics during different stages of fixed prosthesis fabrication. To the best of knowledge, it is the first to evaluate variations in clinical decision-making among dentists in Türkiye, thereby contributing valuable insights to the limited body of literature on how demographic factors influence treatment protocols. Considering the diverse clinical settings, educational backgrounds, and access to technological resources across different regions of Türkiye, evaluating these practice differences is essential to understand national trends and identify areas for improvement or standardization.

MATERIAL AND METHODS

This study was conducted as an online survey between November 5, 2021, and December 5, 2021, to evaluate the procedural steps involved in the fabrication of tooth-supported fixed prostheses. The survey's link was distributed online to dentists. It was conducted in accordance with the Principles of the Declaration of Helsinki and was approved by the İstanbul Yeni Yüzyıl University Non-Interventional Clinical

Research Ethics Committee (Date: 05.10.2021; Approval no: 2021/10-714). Written informed consent was obtained from the participants who agreed to take part in the study.

The survey consists of 2 parts and contains a total of 14 questions. The first section collected demographic information such as gender, years of professional experience, educational background, and area of specialization. In the second part, various clinical stages of fixed prostheses, such as the frequency of application of gingival retraction, materials used in impression and interocclusal recording, production techniques, and frequency of temporary dentures, were evaluated. The questionnaire consisted of multiple-choice questions designed to assess participants' preferences and practices. In some items, a 4-point Likert scale (Never, Occasionally, Often, Always) was used to evaluate the frequency of specific clinical behaviors, such as gingival retraction or temporary prosthesis fabrication. No specific exclusion criteria were applied in the participant selection process. The survey was open to all dentists who voluntarily agreed to participate and completed the questionnaire. Statistical analysis was performed using IBM SPSS software (IBM SPSS Corp.; Armonk, NY, USA, Version 23.0). Descriptive statistics, including arithmetic mean ± standard deviation, frequency distributions, and percentages, were performed. The chi-square test was used to compare categorical variables, with a statistical significance level of $P < .05$.

RESULTS

A total of 152 dentists, 94 female (61.8%) and 58 male (38.2%), participated in the study. Among the participants, 44.1% had been working in the dentistry profession for 1-5 years, while 13.8% had more than 20 years of professional experience. Additionally, 70.4% of dentists have a bachelor's degree, 29.6% are specialists, and 11.8% are prosthodontists (Table 1).

Table 1. Demographic Structure of Sample

Demographic Characteristics		n (%)	*P*
Gender	Female	94 (61.8)	**<.05***
	Male	58 (38.2)	
Years of professional experience	1-5 years	67 (44.1)	**<.05***
	6-10 years	48 (31.6)	
	11-20 years	16 (10.5)	
	More than 20 years	21 (13.8)	
Education level	General dentist	107 (70.4)	**<.05***
	Specialist	45 (29.6)	
Specialization	Prosthodontics	18 (11.8)	**<.05***
	Other	134 (82.2)	

*Significant value ($P < .05$).

While 17.1% of the participants never performed gingival retraction, only 8.6% always did before taking an impression. It was determined that the most preferred impression material was condensation silicone (54.6%), and the most frequently used interocclusal recording material was wax (75.8%). The majority of dentists stated that they produced temporary prostheses, and the most preferred technique was the indirect technique (68.5%) (Table 2).

The relationship between the demographic characteristics of dentists and the frequency of retraction, preferred impression and interocclusal record materials, and the frequency and technique of temporary prosthesis fabrication are shown in Tables 3 and 4. No significant differences were found between gender and the materials or techniques used ($P > .05$). However, professional experience significantly

Table 2. Distribution of Dentists' Responses on Fixed Prosthesis Procedures

Questions	Answers	n/%	*P**
How often do you perform a gingival retraction procedure before making impressions for fixed prostheses?	Never	26 (17.1)	**.000***
	Rarely	78 (51.3)	
	Frequently	35 (23)	
	Always	13 (8.6)	
Which material do you routinely use for final impression taking?	Polyether	5 (3.3)	**.000***
	Alginate	22 (14.5)	
	Addition silicone	33 (21.7)	
	Condensation silicone	83 (54.6)	
	Digital impressions	9 (5.9)	
Which kind of interocclusal recording material/bite registration material do you choose?	Silicone	27 (17.8)	**.000***
	Wax	115 (75.8)	
	Zinc oxide eugenol	10 (6.6)	
	Digital	12 (7.9)	
Do you give provisional prosthesis after tooth preparation for all the patients? Which kind of technique do you prefer for provisional prosthesis?	Direct	46 (30.3)	**.000***
	Indirect	104 (68.5)	
	Cad/Cam	13 (9.3)	
	Never	8 (5.3)	

*Chi-square test ($P < .05$).

Table 3. Influence of Demographic Factors on Retraction Frequency and Impression Material Selection

	Frequency of Retraction					Impression Materials					
	Ne	R	F	A	*P**	Po	Al	AS	CS	DI	*P**
Gender											
Female	15 (9.9%)	49 (32.2%)	23 (15.1%)	7 (4.6%)	.852	4 (2.6%)	12 (7.9%)	23 (15.1%)	48 (31.6%)	7 (4.6%)	.488
Male	11 (7.2%)	29 (19.1%)	12 (7.9%)	6 (3.9%)		1 (0.7%)	10 (6.6%)	10 (66%)	35 (23%)	2 (1.3%)	
Years of Professional Experience											
1-5 years	9 (5.9%)	32 (21.1%)	17 (11.2%)	9 (5.9%)	.163	2 (1.3%)	9 (5.9%)	8 (5.3%)	44 (28.9%)	25 (16.4%)	.005
6-10 years	7 (4.6%)	25 (16.4%)	15 (9.9%)	1 (0.7%)		3 (2%)	-	16 (10.5%)	26 (17.1%)	2 (1.3%)	
11-20 years	4 (2.6%)	10 (6.6%)	1 (0.7%)	1 (0.7%)		-	25 (16.4%)	25 (16.4%)	7 (4.6%)	1 (0.7%)	
More than 20 years	6 (3.9%)	11 (7.2%)	2 (0.7%)	2 (0.7%)		-	8 (5.3%)	5 (3.3%)	6 (3.9%)	2 (1.3%)	
Educational Level											
General dentist	20 (13.2%)	50 (32.9%)	27 (17.8%)	10 (6.6%)	.385	2 (1.3%)	21 (13.8%)	15 (9.9%)	63 (41.4%)	6 (3.9%)	.000
Specialist	6 (3.9%)	28 (18.4%)	8 (5.3%)	3 (2%)		3 (2%)	1 (0.7%)	18 (11.8%)	20 (13.2%)	3 (2%)	
Specialization											
Prosthodontics	1 (0.7%)	12 (7.9%)	2 (1.3%)	3 (2%)	.140	1 (0.7%)	-	6 (3.9%)	10 (6.6%)	1 (0.7%)	.334
Other	25 (16.4%)	66 (43.4%)	33 (21.7%)	10 (6.6%)		4 (2.6%)	22 (14.5%)	27 (17.8%)	73 (48%)	8 (5.3%)	

A, always; Al, alginate; AS, addition silicone; CS, condensation silicone; DI, digital impressions; F, frequently; Ne, never; Po, polyether; R, rarely.

influenced the choice of impression material ($P < .05$). While dentists with 1-10 years of experience mainly preferred condensation silicone, dentists with ≥20 years of experience frequently used alginate.

Educational background also had a significant effect on impression material selection ($P < .05$). Specialists were less likely to use alginate as an impression material compared to general dentists. Additionally, a statistically significant difference was observed between prosthodontists and general dentists in terms of the fabrication technique used in temporary prostheses ($P < .05$). Prosthodontists mainly preferred the direct technique for temporary prostheses.

DISCUSSION

Fixed prostheses are one of the most important methods in the restoration of missing teeth, with their success depending on various factors such as patient selection, diagnosis, treatment planning, measurement, cooperation with dental technicians, cementation, patient satisfaction, and regular follow-up.[15] This study aimed to evaluate differences in knowledge, attitudes, and clinical practices among dentists with varying demographic characteristics regarding fixed prostheses fabrication in Türkiye.

One of the most challenging steps in fixed prosthesis fabrication is managing gingival tissues during impression-taking. Gingival retraction ensures accurate impression recording by displacing the gingiva from the preparation margin.[16] While different retraction techniques and their effects on gingival and periodontal health are extensively discussed in the literature,[6,17,18] limited number of studies evaluate clinicians' preferences for these techniques. Previous studies[1,16,19-21] have reported considerable variability in gingival retraction practices. Kannan et al[1] found that 39% of dentists used retraction cords before impression, while Gadhavi et al[16] reported that 38% of prosthodontists did not consider gingival retraction necessary for clinical success and therefore did not perform it. In contrast, Mahjoub et al[20] indicated that 94.5% of clinicians believed retraction was essential for clinical success. Alawwad et al[21] reported that 84.4% of dentists performed gingival retraction in all fixed prosthesis cases, with mechanical methods being the most preferred (62.2%). In this study, 17.1% of dentists never performed gingival retraction, while 8.6% always did, a lower rate than reported in previous studies.[1,19-21]

Interocclusal registration is another critical step in fixed prosthesis fabrication that directly affects occlusal fit and final restoration fit.[7] Studies evaluating the challenges faced by dental technicians during denture fabrication reported that one of the most common problems is inadequate interocclusal registrations, which often lead to occlusal differences in the final restoration.[22] Wax remains the most frequently

Table 4. Influence of Demographic Factors on Interocclusal Record Material and Provisional Prosthesis Fabrication Technique Selection

	Interocclusal Recording Material					Provisional Prosthesis				
	S	W	ZOE	DIR	*P**	D	ID	CC	Ne	*P**
Gender										
Female	19 (12.5%)	72 (42.5%)	5 (3.3%)	6 (4%)	.427	26 (17.1%)	70 (46.2%)	8 (5.3%)	6 (3.9%)	.510
Male	8 (5.2%)	43 (28.3%)	5 (3.3%)	7 (4.6%)		20 (13.1%)	34 (22.3%)	6 (3.9%)	2 (1.4%)	
Years of Professional Experience										
1-5 years	8 (5.2%)	53 (34.9%)	3 (2%)	8 (5.2%)	.257	13 (8.6%)	48 (31.6%)	9 (5.9%)	2 (1.3%)	.164
6-10 years	12 (8%)	36 (23.8%)	4 (2.6%)	1 (0.7%)		17 (11.3%)	36 (23.8%)	2 (1.3%)	4 (2.6%)	
11-20 years	5 (3.3%)	9 (6%)	2 (1.4%)	1 (0.7%)		8 (5.2%)	8 (5.3%)	2 (1.3%)	-	
More than 20 years	2 (1.4%)	17 (11.2%)	1 (0.7%)	2 (1.4%)		8 (5.2%)	12 (7.9%)	1 (0.7%)	2 (1.3%)	
Educational Level										
General dentist	17 (11.2%)	82 (54%)	8 (6.3%)	9 (6%)	.755	29 (19.1)	69 (45.4%)	11 (7.2%)	8 (5.3%)	.160
Specialist	10 (6.7%)	33 (21.8%)	2 (1.4%)	4 (2.7%)		17 (11.3)	35 (23.1%)	3 (2.1%)	-	
Specialization										
Prosthodontics	6 (4%)	15 (9.2%)	1 (0.7%)	1 (0.7%)	.628	12 (7.9%)	9 (5.9%)	2 (1.3%)	-	.026
Other	21 (13.8%)	94 (61.9%)	9 (6%)	12 (7.9%)		34 (22.5%)	95 (62.6%)	12 (7.9%)	8 (5.3%)	

CC, CAD/CAM; D, direct; DIR, digital interocclusal recording; ID, indirect; Ne, never; S, silicone; W, wax; ZOE, zinc oxide eugenol.

used interocclusal record material due to its affordability and ease of manipulation, despite its poor mechanical properties.[7] Alhoumaidan et al[19] found that 61.7% of dentists used wax, while 24.8% used both wax and silicone. Shah et al[23] reported that 94.7% of dentists were knowledgeable about interocclusal materials, yet awareness of newer materials such as polyether, polyvinyl siloxane, and digital intraoral scanners was limited. Consistent with previous studies[7,19] wax was the most preferred interocclusal record material in this study. The use of intraoral scanners was more common among younger dentists and dentist with 1-5 years of experience. This shows that there is a shift towards digital dentistry. With ongoing developments, the adoption of digital technologies is expected to increase.

Regarding impression materials, previous studies indicate that most dentists prefer irreversible hydrocolloids.[6,15] Alhoumaidan et al[19] reported that addition silicone (38.3%) was the most used material, followed by condensation silicone (26.9%), alginate (20.3%), and others (14.5%). Similarly, Brunton et al[24] found addition silicone and polyether were the most preferred impression materials. However, the most commonly used impression material in this study was condensation silicone. Material selection appears to be influenced by expertise, experience, accessibility, and patient affordability.

Making temporary prostheses is one of the important steps in fixed prosthodontic treatments. Elgergeni al[8] reported that 70% of dentists fabricated temporary prostheses, while Kannan et al[1] found that 66% always did, and 20% fabricated them depending on the case. Alhoumaidan et al[19] reported a lower rate (45.5%). In contrast with previous studies, in this study, 94.7% of dentists fabricated temporary prostheses, with the indirect technique being the most preferred among general practitioners, while specialists favored the direct technique.

Digital dentistry, particularly through CAD/CAM technology, has gained considerable popularity over the past 3 decades. This technology has addressed many of the disadvantages associated with conventional methods, especially in terms of quality, labor, and treatment duration, thereby offering considerable benefits to both dentists and patients.[25] A questionnaire-based study conducted by Katkade et al[26] aimed to assess dental practitioners' perceptions, awareness, and attitudes toward digital dentistry. The findings revealed that approximately 2% of the participants were completely unaware of digital technology, while 58% were only somewhat familiar with it. These results indicate that many dental professionals have only a superficial understanding of this technology. Despite the increasingly important role of CAD/CAM in modern dental practice, there is still limited information in the literature regarding current practices and attitudes of dentists toward this innovative approach.[26]

In this study, gender did not significantly influence the choice of materials or techniques in fixed prosthodontic procedures. However, educational background played a role in the selection of impression materials, as specialists were less likely to use alginate compared to general dentists. Additionally, younger dentists demonstrated a greater preference for modern materials, which may be attributed to their exposure to updated dental curricula and training programs that emphasize the use of contemporary techniques and technologies. This outcome is consistent with the findings of Eltawati et al,[27] who reported that specialists preferred more advanced materials over conventional ones. Despite the growing influence of digital dentistry, this study observed that traditional

methods are still prevalent. Rahman et al[28] reported that while digital impression techniques are gaining popularity, traditional approaches continue to be preferred due to cost and accessibility.

The limitations of this study include the small sample size, the low number of prosthodontists among the participants, and the exclusion of dentists treating patients with diverse socioeconomic backgrounds.

Within the limitations of this study, differences in the materials and techniques used in fixed prostheses were determined, and their relationship with demographic factors was emphasized. In the study, it was determined that the most preferred impression material was condensation silicone, and the most frequently used interocclusal recording material was wax. While young dentists preferred modern materials, experienced dentists preferred traditional ones.

This study emphasizes the importance of increasing dentists' knowledge and awareness and keeping up with developments in fixed prostheses. Future research should explore the factors influencing the adoption of digital technologies and investigate the clinical outcomes associated with different procedural approaches in fixed prosthodontics.

Data Availability Statement: The data that support the findings of this study are available upon request from the corresponding author.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of İstanbul Yeni Yüzyıl University (Date: 05.10.2021; Approval no: 2021/10-714).

Informed Consent: Written informed consent was obtained from the participants who agreed to take part in the study.

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