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A survey of commonly used impression materials and techniques for fixed partial denture among dentists in Malabar region – Kerala: A cross sectional study

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ABSTRACT:
Introduction: There are multiple concepts and techniques in fixed prosthodontic practice and several studies have concluded that clinicians definitely deviate from the recommended clinical protocols. If this happens during treatment with fixed prosthesis, the quality of fixed prostheses is compromised which affects its longevity. Aim of this study was to evaluate the use of impression materials and techniques in fixed partial denture among dentists in Malabar region - Kerala. Materials and Method: A cross-sectional, questionnaire-based online survey was done amongst dentists in Malabar region - Kerala through Google forms. Data from the completed questionnaires were analysed using the SPSS version 22. All statistical analyses were carried out at a significance level of $P < 0.05$. Out of 225 participants, 190 (84.4%) dentists always made diagnostic impression for fabrication of study cast. 102(45.3%) dentists used Addition silicone and 93(41.3%) used Alginate for final impression making. Most commonly used elastomeric impression technique was Putty Resin/Dual mix Technique (36%). Regarding retraction cord, 82.6% of dentists used Plain gingival retraction cord. Conclusion: The study found that most of the responses on use of impression materials and techniques were significantly associated with the level of knowledge, proficiency and clinical experience.

KEYWORDS: Fixed prosthodontics, Impression materials, Impression techniques, Retraction cord, Alginate

I. INTRODUCTION:

Twentieth century witnessed remarkable changes with regard to human life expectancy worldwide, and the twenty first century is set to carry forward the gain in llife expectancy further, both in the developing and developed world[1]. Various impression materials and techniques came into use since times earlier till today. All of them have some pros and cons and are suitable for specific conditions.

Most of the dental practitioners pay more attention to patient's flow, cost and treatment time and less focus towards the appropriate technique, material and armamentarium which are required for long- term success[2]. There are numerous technique described for making impression , including copper band technique , mono - phase technique , single step technique , or the double - step technique and several types of impression materials that can be used in fabricating prostheses which including alginate , condensation silicone , polysulfide , polyether and polyvinyl siloxane[3].

As Fixed Prosthodontic procedures are widely practiced for dental rehabilitation, it is very important to evaluate the details of basic steps in the field of fixed prosthodontics and the way of practicing this important branch of dentistry. Therefore, knowledge of dental professionals regarding materials and techniques used is important for the successful outcome of dental treatment[4]. The ability to identify and analyze inaccurate impressions and to understand how to avoid them is key to successful treatment[5]. This study is a questionnaire-based survey to assess and know the impression materials and techniques for fixed partial dentures that are being followed by the dentist in Malabar region.

II. MATERIALS AND METHODS:

This study was conducted among general dentist and specialist among dentists of Malabar region form 15/11/2022 to 15/01/2023. 225 dentists practicing in the Malabar region were selected for the study. Approval of Institutional Ethics Committee, KMCT Dental College, Mukkam, Calicut was obtained before starting the

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investigation. (KMCTDC/IEC/2022/34)
A cross-sectional questionnaire based online survey was conducted among the dental practitioners including general dentist and specialists in Malabar region of Kerala. Confidential questionnaire was designed and adapted to suit the local context to assess the details of impression materials and techniques .Purpose of the study was explained to all the dentists. Questionnaire was developed in Google forms and posted to the dentist through groups in WhatsApp, Facebook and Instagram. The first section of the questionnaire consists of personal and demographic information of the participants. Second and third sections accessing the use of impression material and techniques used in dentistry.

Dentists interested to take part in this study were requested to fill up and submit the Google form. Informed consent was taken from all the participants. Multiple submissions were avoided by asking the participants to enter the email address. 225 dentists responded to the questionnaire sent via Google form within the given time frame. Data was collected in spreadsheet and exported to Microsoft Excel. Data was then analyzed using SPSS version 22. Data was presented in the form of Frequency, Percentages and Fishers T test was applied to find the association of the various responses. P value of less than 0.05 was taken as statistically significant.

III. RESULT:

After evaluating the survey results it was found that most of the dentists in the Malabar region use recommended impression materials and techniques. The responses of 225 participants regarding the use of impression materials in Fixed Prosthodontics are summarized in Table 1. Majority of dentists 204 (90.6%) responded that they often use alginate as diagnostic impression material before tooth preparation. There are 4.4 % of practitioners who use Agar – Alginate combination, 0.8% of dentists use Agar and 4% of them use other impression material for making diagnostic cast. 66.2% of dentists chose the stock tray, 11.5% chose both (stock and custom made), 7.1% reported using a custom made tray, 6.2% reported using sectional tray and 8.8 reported using dual arch tray for making final impression.

TABLE 1: ASSOCIATION OF USE OF COMMONLY USED IMPRESSION MATERIALS IN FIXED PARTIAL DENTURE

SL NO.	QUESTIONS	RESPONSES	NO	%	P VALUE
1.	Which material do you habitually use for diagnostic impression before tooth preparation	Alginate	204	90.6	1.0863E-256
		Agar – Alginate	10	4.4	
		Others	9	4	
		Agar	2	0.8	
2.	Which tray do you all prefer for making the impression after tooth preparation	Complete Arch/Stock Tray	149	66.2	2.3616E-226
		Sectional Tray	14	6.2	
		Dual Arch Tray	20	8.8	
		Custom Made Acrylic Tray	16	7.1	
		Compete Arch Tray	26	11.5	
3	Which material do you routinely use for impression after tooth preparation	Addition silicon	102	45.3	4.9555E-190
		Alginate hydrocolloid	93	41.3	
		Polyether	9	4	
		Agar	4	1.77	

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		hydrocolloid			
		Agar-Alginate combination	4	1.77	
		Condensation silicon	9	4	
		Poysufide	1	0.4	
		Others	3	1.3	
4	With what material is cast poured	Dental stone Type III	80	35.5	
		Dental Plaster Type II	18	8	
		Dental stone high strength Type IV	123	54.6	4.9546E-167
		Others	3	1.3	
		Dental stone high strength, high expansion Type V	1	0.4	

***E – Exponential value, P value<0.05 statistically significant**

Majority of dentists used addition silicone for final impression and average responses overall for each material for final impression were: Addition silicone 102(45.3%), Alginate 93(41.3%), Condensation silicone 9(4%), Polyether 9(4%), Agar hydrocolloid 4(1.77%), Agar – Alginate Combination 4(1.77%), Polysulfide 1(0.4%), Others 3(1.3%). Out of 225 dentists 123(54.6%) of them use dental stone high strength type IV for pouring the master cast. 35.5% of them preferred Type III Dental stone and only 0.4% preferred Dental stone high strength high expansion Type V for the same.

Table 2 shows all the responses of impression techniques utilized in Fixed Partial Denture. Most of the dentists 190 (84.4%) responded that they often made diagnostic impression for fabrication of study cast. There are 15.5% of practitioners who never made diagnostic impressions and proceed with the tooth preparation after the clinical intraoral examination. 64.8% of dentists always took a preoperative radiograph for the abutment tooth/ teeth and 43.5% of dentists always did vitality test for restored abutment before tooth preparation. 41.1% of dentists indicated that they always retracted the gingiva before final impression and among the dentists who use elastomeric impression material 84(37.33%)% used putty resin/dual mix technique without spacer, 79(35.11%)% used putty resin/dual mix technique with spacer, 24%% used single mix (Monophase) technique and 3.5% used multiple mix technique.

Table 2: Association of commonly used impression techniques in Fixed Partial Denture

Sl no.	Questions	Responses	No	%	P value
1.	Do you all make diagnostic impression for fabrication of study cast	Always	190	84.4	1.6359E-249
		Never	35	15.5	
2.	Do you take a preoperative radiograph for abutment tooth / teeth evaluation	Always	146	64.8	2.15E-224
		Rare	45	20	
		Often	34	15.1	
		Never	0	0	
3	Do you do vitality test for restored abutment tooth before beginjng preparation	Rare	127	56.4	1.08E-210
		Often	98	43.5	

4	If you are using elastomeric impression material ,then which impression technique do you use	Putty Resin/ Dual Mix Technique with Spacer	79	35.11	7.5334E-166
		Putty Resin/ Dual Mix Technique without Spacer	84	37.33	
		Single Mix Technique	54	24	
		Multiple Mix Technique	8	3.55	
5	Do you all retract gingiva before final impression	Often	93	41.3	5.97E-181
		Rare	132	58.6	
6	What do you all practice routinely for gingival retraction	Gingival retraction cord	186	82.6	9.325E-248
		Laser	7	3.1	
		Electrosurgery	8	3.5	
		Others	21	9.3	
		Rotary Curettage	3	1.3	
7	Do you pour the cast in clinic	Yes	168	74.6	1.26E-237
		No	57	25.3	
8	Do you give provisional prosthesis to all patients after tooth preparation	Yes	147	65.3	9.45E-225
		No	78	34.6	
9	Communication method with dental laboratory	Verbal	17	7.5	6.01E-204
		Written	36	16	
		Both verbal and written	172	76.4	
10	Reason for any short comings observed in an FPD treatment	Clinical error	16	7.1	6.0071E-204
		Lab error	50	22.2	
		Patients Mental Attitude	9	4	
		No short comings	32	14.2	
		Both Clinical and Lab error	118	52.4	
11	Observation of dentist during 1 year follow up appointment of patients with FPD	Food lodgement	72	32	3.6482E-157
		Secondary caries	7	3.1	
		Mobility /periodontal disease	13	5.7	
		Fracture / dislodgement	28	12.4	
		No abnormal findibgs observed	105	46.6	

***E – Exponential value, P value<0.05 statistically significant**

82.6% of dentists most commonly used plain gingival retraction cord, 3.1% of them used Laser, 3.5% used electro surgery and 1.3% used rotary curettage. 74.6% of dentists always pour the cast in the clinic while 25% of them send the impression to the lab. 65.3% of the respondents always provided provisional crown or bridge after tooth preparation and 34.6% never provided provisionals. 76.4% of dentists had both verbal and written communication with the dental laboratory, 7.5% used verbal communication only while 16% of dentists used written prescription as communication method.52.4% of the dentists observed short comings in Fixed Partial Denture

treatment due to both clinical and lab error. 46.6% of them noted no abnormal finding during 1 year follow up appointment of patients with FPD, 32% found food lodgement and 12.4% observed fracture or dislodgement after 1 year.

Most of the responses regarding the use of materials and techniques were correlated significantly as shown in Table 1 and 2. Differences in selecting materials and techniques evolved by level of education and years of clinical practice/experience. This study found that a positive correlation between the respondents and the test is statistically significant for $P<0.05$.

IV. DISCUSSION :

Prosthetic dentistry has evolved abundantly in the past few years. Fixed Prosthodontic treatment provides an exceptional satisfaction for both patients and dentists at primary care level. Fixed prosthesis should restore the form, function and promote the health of the masticatory unit and provide longevity[6].These criteria are influenced by the quality of the clinical procedures, the standards of the laboratory work, and the oral condition prevailing in patient[7].Fabrication of study models and evaluation of the abutment is considered as an essential part in diagnosis and treatment planning for fixed partial denture restorations[8, 9]. It helps in assessing the treatment outcome that is planned and any other treatment if required before proceeding with the fixed partial denture treatment[10].The results revealed that most of the study participants (43.3%) used addition silicon as the material of choice when taking final impression. However, a study conducted in Pakistan reported that more than 90% of their participants used alginate as a material of choice for final impression[11].

The current survey showed that 84.4% of participants always fabricated diagnostic casts routinely before starting treatment. 146 (64.8%) of participants always used radiographs for abutment tooth evaluation. Vitality test for restored abutments were always done by 127 (56.4%) respondents. Mohamed AB et al. found that the majority of the surveyed practitioners rarely used study casts 56 (38.1%) and 35.6% rarely use radiograph for the abutment tooth and 68 (46%) of surveyed practitioners never used vitality test for abutment tooth[12].A study showed that 78.3% of the participants assessed abutment tooth radiographically, also most of them (37.2%) fabricated study cast before starting crown and bridge procedures[13].

When the preference of trays for final impression was concerned, it was revealed that around 66.2% of participants preferred using a stock tray instead of custom tray. On the other hand, a study conducted by Vohra et al. (2015) reported that more than 65% of their study participants were in favor of custom trays for taking final impression, which is not in favor with the findings of this study[14]. In addition to take the primary impressions, study participants preferred alginate impression material (90.6%) as a first choice. However, a study conducted in the University of Medical Sciences, Tabriz, Iran, reported even higher number of study participants(96%) using alginate as the material of choice for primary impression[15]. Another study done by Moldi et al. (2013) states that 29% of dental practitioners do not take diagnostic or preliminary impressions and directly proceed with tooth preparation after clinical intraoral examination[16]. Another study conducted in Khartoum showed that alginate (68.2%) was the most commonly used impression material[17].

Gingival retraction before a final impression is an integral procedure during fixed partial denture treatment but can be very time consuming. Many different techniques have been developed over the years to overcome this. The current survey showed that most of private practitioners (41.3%) prefer to record impressions without any gingival retraction which is in accordance with the study conducted by Kannan A et al in 2018[18].Similar study conducted in Sudan indicated that 53.69% never used the retraction cord.[12] In another study, 62% preferred the use of gingival displacement technique for successful clinical practice while 38 % of them did not follow the procedure believing it does not make major difference in clinical practice[19].

The choice of material used for gingival retraction revealed that exceedingly high number of participants (82.6%) preferred gingival retraction cord, whereas a similar study conducted in Romania among their dental students revealed that around 78% chose retraction cord as the material of choice for gingival retraction[20].Similar study conducted by Al Houmaidan et al. in Qasim region of Saudi Arabia reported that 40.3% of dental practitioners always used retraction cord[21]. Interestingly, the findings of this study showed that majority of dentists(82.6%) preferred using retraction cord for the purpose of gingival retraction and 3% of them preferred laser,3.5% preferred electrosurgery and only 1.3% were using rotary curettage. Similar findings were reported by KarunakarShetty et al. in Makkah region of Saudi Arabia that 80% of dentists were using retraction cord for gingival retraction, whereas only 5% of

them using elecrosurgery and 6.6% of them were using gingifoam and the study participants who were using retraction cord along with hemostatic agent comprised 94.5% and plain were 5.5%.[22] Regarding impression technique used for final impression, Putty resin/dual mix technique with and without spacer were mostly used by dentists 36.2% .Another study found that elastomeric impression technique practiced most commonly is putty reline with/without spacer (77.2%)[16].

Proper communication between laboratory technicians and dentists has a predictable role in success of the fixed prosthesis. In a study done in Ireland, Fixed prosthodontics laboratories revealed that the technicians are often dissatisfied with the information provided in work authorizations. Poor communication between dental practitioners and dental technicians for fixed prosthodontics was cited. Poor or no written instructions were provided in 55% of cases examined and three-quarters of written instructions for FPDs do not specify the number of pontics to be included in its design[23].About 64% of technicians had an agreed protocol between lab and clinic, and 40.74% of Prosthodontists notified technicians through notes on impression bags[24].76.4% of dentists had both verbal and written communication with the dental laboratory, 7.5% used verbal communication only while 16% of dentists used written prescription as communication method in this study.

More than one third of the investigated dental practitioners (36%) in Sudan never made provisional crown and bridge restorations, and the majority of the two thirds often make it,[12] while the current study showed that 65.3% of the dentists always provided provisional crown or bridge and 34.6% rarely provided provisionals after tooth preparation. The utilization of properly fabricated provisional prostheses will permit a higher rate of success of the definitive treatment[25]. A Survey shows that many practitioners prefer dental stone (Type III) as a material of choice because of its low cost. But literature shows that Die stones i.e. high strength stones (Type IV) are most successful die materials because of their high strength and greater abrasion resistance which s in accordance with our study[26].

V. CONCLUSION :

Within the limitations of this study, it can be concluded from present investigations that dentists in Malabar region have a strong inclination toward a particular material for primary or secondary impressions or gingival retraction options and it was found that most of the dentists consistently follow recommended impression materials and techniques. Most of the dentists are using standard procedures for impression techniques and materials, including alginate for diagnostic impressions, retraction cord for gingival retraction and polyvinyl-siloxanematerial(Addition silicon) for final impressions. However to further enhance the knowledge and proficiency; there is a need to encourage and instruct them about the use of various materials having different properties. The cast should be poured preferably in dental clinics. Proper manufacturer's instructions should be followed about the recommended time for pouring of the cast for particular impression material to avoid distortion. If impression is being sent to the laboratory; communication with the laboratory should be clear. The die stones are preferred over dental stone. Provisional restorations should be given after tooth preparation. Recall examinations are especially important for patients with fixed dental prosthesis and should be carried out by the dentist. Patient must understand the limitations of fixed prosthesis before treatment begins. Ideal materials, technique, and armamentarium are required for the long-term success of the treatment for fixed partial denture. If ideal procedures are not followed, it will lead to a compromised fit of the final prosthesis and failure of the treatment.

CONFLICT OF INTEREST:

The authors have no conflicts of interest regarding this investigation**.**

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