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Knowledge and Awareness on Cementation Protocols for Fixed Partial Dentures Among Dental Students

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ABSTRACT

Continuous development of technology in dental medicine and the high esthetic demands of the patients determined an increased awareness regarding the success of treatment among the clinical practice of dental students. The longevity of prosthesis depends on the type of luting cement, isolation techniques and the protocols used with tooth preparation. So it is important to educate students regarding this to achieve successful bonding of FPD. The aim of this study was to evaluate the knowledge and awareness of cementation protocols for Fixed Partial Dentures (FPDs) among undergraduate and postgraduate dental students in achieving success of Fixed dental prosthesis. It is a university setting study. Total of 150 students both undergraduate and postgraduates who are practicing in dental clinics in saveetha dental college were included in this study. A questionnaire containing 15 questions focused on the perceptions and experiences on protocols followed by dental students for cementation of prosthesis were given to them. The data obtained was entered in excel and imported to SPSS. Chi square association was done to compare the responses between undergraduates and postgraduates and were represented in the form of bar graphs. Out of 150 students, 70% were undergraduate and 30 % were postgraduate students. 19.33% of the postgraduates were aware about all of the protocols followed during cementation, whereas majority of the undergraduates chose isolation as the protocols to be followed 13.33% of the postgraduates and 49.33% of the undergraduates, both were equally aware that inadequate isolation majorly as led to the failure of FPD post cementation, which was statistically significant (p <0.05).20% of the postgraduates were aware about all the steps to be followed during re-cementation of FPD, whereas majority of the undergraduates chose better isolation to be followed, which shows that post graduates were more aware about re-cementation protocols than undergraduates and was statistically significant (p<0.05). This survey shows that both undergraduate and postgraduate dental students have fairly good knowledge about the cementation protocols for FPD.Through increased awareness of dental students expectations and experiences, restorations can be planned, made and placed in harmony with the hard and soft oral tissues, and in harmony with the patient's expectation as well

KEY WORDS: CEMENTATION, FIXED PARTIAL DENTURES, ISOLATION, POSTGRADUATES, UNDERGRADUATES.

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INTRODUCTION

Edentulism and dental disease have a profound effect on the quality of life of patients. Tooth loss is a common finding among individuals (Fiske et al., 1998) . Despite the ongoing progress in oral health services offered world wide, had caused a reduced number of partially dentate patients, demanding care in fact as it really widened (Loera, no date). Loss of tooth or tooth form often occurs due to caries, periodontal pathology or trauma (Rosenstiel and Land, 2001).

Fixed prosthetic replacement and restoration of teeth restores form, function and aesthetic of the damaged or lost dentition. Fixed prosthodontics treatment modality provides exceptional satisfaction for both patients and the dental practitioner (Kannan et al., 2018). It can transform an displeasing, unhealthy dentition with poor function into a more comfortable, healthy occlusion capable of years of further oral activity while greatly improving aesthetics. The quality of construction of fixed prostheses directly affects its long-term survival (Prath, Ashwatha Prath and Jain, 2017). It is essential that the dental practitioner follows all the fundamental clinical guidelines for longevity of the treatment.

Continuous development of technology in dental medicine and the high esthetic demands of the patients determined an increased awareness regarding the success of treatment among the clinical practice of dental students (Rosenstiel, Land and Crispin, 1998). The longevity of prosthesis depends on the type of luting cement, isolation techniques and the protocols used with tooth preparation (Hill, 2007). The clinician's understanding of various cements, their advantages and disadvantages is of utmost importance. In recent years, isolation techniques, protocol measures, luting agents cements have been introduced claiming clinically better performance than existing materials due to improved characteristics (Macorra, de la Macorra and Pradies, 2002).

The foremost goal of any clinician is providing the patient with a restoration which preserves the longevity and pulpal vitality of natural abutments of fixed partial dentures and regaining the lost function (Chen et al., 2006). A luting agent is defined as the application of a dental cement connecting the underlying prepared tooth structure to a fixed dental prosthesis. A luting agent's primary and most vital function is to fill the voids present at the restoration-tooth interface so as to prevent any marginal leakage which may lead to secondary caries and mechanically interlock the prosthesis in place to prevent its dislodgement during masticatory activities (Diaz-Arnold, Vargas and Haselton, 1999). Depending on the expected longevity of the dental cement, a luting agent may be classified into definitive (long term) or provisional (short term) restoration. In recent years, many luting agents and dental cements have been introduced with better clinical performance than existing materials due to improved characteristics.

Post cementation sensitivity is one of the most significant complications in fixed Prosthodontics, especially when the prosthesis is cemented on teeth with vital pulps (Hill and Rubel, 2009). However, the incidence of this post cementation complication is underestimated by most clinicians. The selection of permanent luting cement for fixed partial dentures is critical as it has an important role to play in controlling the post cementation sensitivity and success of the final prosthesis.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickelchromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about knowledge and awareness of cementation protocols for Fixed Partial Dentures (FPDs) among undergraduate and postgraduate dental students in achieving success of Fixed dental prosthesis.

Figure 1: Questionnaire regarding cementation protocol for Fixed Partial Denture

1)	
	Are you aware of the protocols to be followed for cementation of dental prosthesis?
	a) Yes b) No
2)	What protocols do you follow?
	a) Isolation
	b) Retentive properties
	c) Suitable cement selection
	a) All of the show
33	What are the isolation methods do you follow?
-,	a) Cotton rolls
	b) Rubber dam
	c) Airway syringe
4)	Do you instruct the patients regarding the maintenance of prosthesis?
	a) Yes
	b) No
5)	Do you follow all the steps necessary for the proper fabrication of the prosthesis?
	a) Yes
63	by no
	a) Yes
	b) No
73	If so what do you think the reason is ?
	a) Voids present in the restoration-tooth interface
	b) Undercuts
	c) Irregularities between two materials
	d) Inadequate isolation
8)	Which step do you think is crucial for the prevention of failure of cementation of prosthesis?
	a) Proper isolation
	b) Retentive factor
	d) Broost for in
93	How do you think the life span of the prosthesis after cementation?
-,	a) >5 years
	b) <5 years
10)	What is the most common reasons do you think for replacement of dental prosthesis?
	a) Periodontal disease
	b) Secondary caries
	c) Fracture of crown
	d) Lack of retention
111	Which material in your opinion requires more precaution measures?
11)	Which material in your opinion requires more precaution measures? a) Metal ceramic
11)	Which material in your opinion requires more precaution measures? a) Metal ceramic b) Ceramic
11)	Which material in your opinion requires more precaution measures? a) Metal ceramic b) Geramic c) Zirconia
11)	Which material in your opinion requires more precaution measures? a) Metal ceramic b) Ceramic c) Zirconia What are usual complaints patients tell to you after the cementation of prosthesis?
11) 12)	Which material in your opinion requires more precaution measures? a) Metal ceramic b) Geramic c) Zirconia What are usual complaints patients tell to you after the cementation of prosthesis? a) Phonetics problem
11) 12)	Which material in your opinion requires more precaution measures? a) Metal ceramic b) Ceramic vicconia What are usual complaints patients tell to you after the cementation of prosthesis? a) Phonetics problem b) Discomfort
11) 12)	Which material in your opinion requires more precaution measures? a) Metal ceramic b) Ceramic c) Zirconia What are usual complaints patients tell to you after the cementation of prosthesis? a) Phonetics problem b) Circonid c) Unasethetic
11)	Which material in your opinion requires more precaution measures? a) Metal ceramic b) Geramic c) Zirconia What are usual complaints patients tell to you after the cementation of prosthesis? a) Phonetics problem b) Discomfort c) Unasethatic d) Pain
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MATERIAL AND METHODS

Study setting: It is a university setting study, conducted in Saveetha Dental College from November 2019 to January 2020. The pros of the study are flexibility, low cost. The cons of the study are that it is limited to a certain population. Total of 150 students who were pursuing their undergraduate and postgraduate studies in Saveetha dental college were randomly selected. Approval was obtained from the Institutional Ethical Committee (IEC), Saveetha Dental College. Two examiners were included in the study.

Sampling: Simple random sampling was done to minimise sampling bias. It was generalised to South Indian population.

Figure 2: Bar graph shows distribution of level of study of the study population. X axis shows the level of study and Y axis shows the percentage of students in each category. Out of 150 students, 70% were undergraduate and 30 % were postgraduate students.



Data collection: Questionnaire based study. Questionnaires [Figure 1] consisting of fifteen questions focused on the perceptions and experiences on protocols followed by dental students for cementation of prosthesis were distributed through Survey planet link and were asked to fill by both the undergraduate and postgraduate students.

Analysis: Data was entered in excel in a methodical manner and was imported to SPSS software 2.0. Descriptive statistics were used to evaluate the distribution of undergraduate and postgraduate students. Chi square association was done to compare the responses between undergraduates and postgraduates and were represented in the form of bar graphs.

RESULTS AND DISCUSSION

In relation to the distribution of level of study of the study population, it was found that out of 150 students, 70% were undergraduate and 30 % were postgraduate students [Figure 2]. In relation to association between protocols followed and level of study, it was seen that 19.33% of the postgraduates were aware about all of the

protocols followed during cementation, whereas majority of the undergraduates chose isolation as the protocols to be followed, which shows that post graduates were aware mostly when compared to undergraduates regarding protocols to be followed during cementation, and was statistically significant .(Pearson Chi square =36.588, p value =0.001(<0.05), hence statistically significant) [Figure 3 and Table 1].

Figure 3: Bar graph shows association between protocols followed and level of study. X axis shows protocols followed during cementation of FPD and Y axis shows the percentage of students in both undergraduate and postgraduate categories.(Pearson Chi square =36.588, p value =0.001 (<0.05), hence statistically significant) 19.33% of the postgraduates were aware about all of the protocols followed during cementation, whereas majority of the undergraduates were not aware of all the protocols followed and was statistically significant.



Figure 4: Bar graph shows association between isolation methods followed and level of study. X axis shows isolation methods followed during cementation of FPD and Y axis shows the percentage of students in both undergraduate and postgraduate categories.(Pearson Chi square =7.465, p value =0.024 (<0.05), hence statistically significant) 18% of the postgraduates and 56% of the undergraduates were equally aware that cotton rolls were majorly used as an isolation method followed during cementation, which was statistically significant.



In relation to association between isolation methods followed and level of study, it was seen that 18% of the postgraduates and 56% of the undergraduates were equally aware that cotton rolls were majorly used as an isolation method followed during cementation, which was statistically significant.(Pearson Chi square =7.465 , p value =0.024 (<0.05), hence statistically significant) [Figure 4 and Table 1]. In relation to association between reason for replacement of FPD and level of study it was seen thatv10.67% of the postgraduates and 40% of the undergraduates ,both were equally aware that fracture of crown majorly as led to the replacement of FPD, which was not statistically significant. (Pearson Chi square =6.473, p value =0.91(>0.05), hence not statistically significant)[Figure 5 and Table 1].

Figure 5: Bar graph shows association between reason for replacement of FPD and level of study. X axis shows for replacement of FPD and Y axis shows the percentage of students in both undergraduate and postgraduate categories. (Pearson Chi square =6.473, p value =0.91(>0.05), hence not statistically significant) 10.67% of the postgraduates and 40% of the undergraduates ,both were equally aware that fracture of crown majorly as led to the replacement of FPD, which was not statistically significant.



In relation to association between reason for failure of FPD and level of study, it was seen that 13.33% of the postgraduates and 49.33% of the undergraduates ,both were equally aware that inadequate isolation majorly as led to the failure of FPD post cementation, which was statistically significant. (Pearson Chi square =11.307, p value =0.010 (<0.05), hence statistically significant) [Figure 6 and Table 1]. In relation to association between steps followed during re-cementation of FPD and level of study, it was seen that 20% of the postgraduates were aware about all the steps to be followed during re-cementation of FPD, whereas majority of the undergraduates chose better isolation to be followed, which shows that post graduates were more aware about re-cementation protocols than undergraduates and was statistically significant. (Pearson Chi square =20.015, p value =0.001 (<0.05), hence statistically significant) Figure 7 and Table 1].

Dentistry is an art and science that should go hand in hand for a successful dental treatment. The clinical success of a dental restoration is determined by its resistance to fracture, marginal fit, esthetic outcome, and survival (Goodacre et al., 2003). A reliable marginal seal is among the factors that are vital to the clinical success of a dental restoration . This requires proper cementation protocols to be followed which results in ultimate prosthodontic success (Tan et al., 2004). This study discusses the knowledge and awareness of cementation protocols among both undergraduate and postgraduate dental students. Postoperative sensitivity after cementation of fixed prosthesis is a common complaint especially in cases where the abutments have vital pulp (Rosenstiel and Rashid, 2003)

Figure 6: Bar graph shows association between reason for failure of FPD and level of study. X axis shows reason for failure of FPD and Y axis shows the percentage of students in both undergraduate and postgraduate categories.(Pearson Chi square =11.307, p value =0.010 (<0.05), hence statistically significant) 13.33% of the postgraduates and 49.33% of the undergraduates ,both were equally aware that inadequate isolation majorly as led to the failure of FPD post cementation, which was statistically significant.



Figure 7: Bar graph shows association between steps followed during re-cementation of FPD and level of study. X axis shows steps followed during re-cementation of FPD and Y axis shows the percentage of students in both undergraduate and postgraduate categories.(Pearson Chi square =20.015, p value =0.001 (<0.05), hence statistically significant) 20% of the postgraduates were aware about all the steps to be followed during re-cementation of FPD, whereas majority of the undergraduates chose better isolation to be followed, which shows that post graduates were more aware about re-cementation protocols than undergraduates and was statistically significant.



In relation to the protocols followed during cementation of Fixed partial dentures, post graduates were aware of all the protocols like isolation, retentive properties, suitable luting cement, proper try in etc, whereas undergraduates were not aware of all the protocols. This was in line with the study by Keerthana et al (Keerthna, Dhanraj and Jain, 2018), where majority of the dental students were aware about the protocols followed during cementation of fixed partial dentures. The selection of the luting agent for fixed dental prosthesis with vital abutments is considered critical as it has an important role to play in controlling post cementation sensitivity and success of the final prosthesis.So it is important that students should be aware of all the factors necessary for proper cementation of Fixed dental prosthesis.

response, chi square value and p value have been reported.								
Questions	Responses	Response by undergraduates (%)	Response by postgraduates (%)	Cumulative Response (%)	Chi square test	p value		
Are you aware of the	Yes	52	26.67	78.67				
protocols to be followed					9.138	0.003*		
for cementation of FPD?	No	18	1.33	19.33				
What protocols	Isolation	36	1.33	37.33				
do you follow?	Retentive	4.67	2	6.67				
	properties							
	Suitable luting							
	cement	8	4.67	12.67	36.588	0.001*		
	Proper try in	6.67	2.67	9.34				
	All of the above	14.67	19.33	34				
What are the	Cotton rolls	56	18	74				
isolation	Rubber dam	4	2	6	7.465	0.024*		
methods do	Air way		10					
you follow?	syringe	10	10	20		0.701		
	Voids present					0.701		
	In the	6.67	4	10.67				
What do you	tooth interface	0.07	4	10.67				
think is the reason	Undercuts	8.67	10	18.67	11 30			
for failure of	Irregularities	0.07	10	10.07	11.50			
cementation	hetween	5 3 3	2.67	8				
of FPD?	2 materials	5.55	2.07	0				
	Inadequate isolation	49.33	13.33	62.66				
Which step is	Proper isolation	42	16	58	4.848	0.183		
crucial for	Retentive	14	3.33	17.33				
prevention	factor							
of failure?	Suitable	4.67	4	8.67				
	luting							
	cement							
	Proper	19.33	6.67	26				
	try in							
What do you	Periodontal	10	8	18				
think is the	disease							
common reason	Secondary	10	5.33	15.33	6.473	0.91		
for replacement of FPD?	caries							
	Fracture	40	10.67	50.67				
	of crown			• • •				
	Lack of retention	10	6	16		İ		

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How long do you	Greater than 5 years	41.33	28.67	70	7.539	0.006*			
think the lifespan of FPD after cementation is?	Lesser than 5 years	34.67	5.33	30					
What are the	Excess cement	41.33	16	57.33					
difficulties you					0,905	0.824			
after cementation?	Deficient cement	13.33	6.67	20					
	Debonding	6	2	8					
	Unaesthetic	9.33	5.33	14.66					
	Lack of retention	22	14	36					
What are the	Deficient crown	19.33	4	23	5.918	0.116			
conditions you									
recommend for									
new prosthesis?	Discomfort	8.67	5.33	14					
	unaesthetic	20	6.67	26.67					
	Better isolation	26	3.33	29.33					
What are the	Selection of								
steps you follow	suitable	10	4	21	20.015	0.001*			
during re-cementation	luting		_						
of prosthesis?	cement	13.33	2.67	16					
	Uniform sealing								
	All of the above	20.67	20	40.67					
*p<0.05 statistically significant									

In relation to isolation methods followed during cementation of prosthesis, it was seen that both the undergraduates and postgraduates equally selected cotton rolls for isolation during cementation of FPD. It was in line with the study by Raigrodski et al (Raigrodski et al., 2012), where he stated that proper isolation using cotton rolls, suction tip and air way syringe during cementation of Fixed dental prosthesis will lead to increased longevity of the fixed dental prosthesis when compared to those prosthesis which was not cemented with proper isolation protocols. But this was contradictory to the study by Mitchell et al (Mitchell et al., 2009) where undergraduates were not aware of isolation as an important factor in determining the longevity of a fixed dental prosthesis. The probable reason for this could be differing sample size, less knowledge regarding protocols to be followed/ So these students have to be educated regarding the isolation protocols.

In relation to the replacement of fixed partial dentures, both undergraduates and postgraduates were equally aware about the reasons for replacement of FPD like periodontal disease, secondary caries, fracture of crown and lack of retention. Secondary caries usually occur when there is deficiency of luting cement during cementation of the prosthesis which results in marginal leakage, predisposing to secondary caries. This was stated in the study by (Song et al., 2013). Also, fractures and dislodged crowns are common when they are not properly cemented which causes premature contacts resulting in fractures and dislodgement. So it is important to follow proper cementation protocols while cementation and students should be aware of this in order to achieve prosthodontic success at the final.

In relation to the failure of Fixed partial dentures, both undergraduates and postgraduates were aware of the reasons for failure of FPD, like inadequate isolation, voids between restoration-teeth interface, undercuts. This was in line with the study by Scurria et al (Scurria, Bader and Shugars, 1998), where he stated that inadequate isolation leads to contamination of the prosthesis with saliva during cementation which results in weak bonding between the tooth and the prosthesis. Also, deficient cement and voids between restoration-tooth interfaces leads to poor bonding of the prosthesis with the tooth which reduces the lifespan of the prosthesis. In relation to the steps followed during recementation of fixed dental prosthesis, post graduates were more aware about the steps when compared to undergraduates. The reason for this may be postgraduates are the ones who will experience recementation of prosthesis when compared to undergraduates. This was in line with the study by Miettinen et al (Miettinen and Millar, 2013) It is important to follow better isolation techniques, proper selection of luting cement and uniform sealing in order to achieve successful treatment outcome. The limitations of the study include small sample size, single-centered study and examiner's subjectivity. The future scope of study is to extensive research and to educate dental students regarding the cementation protocols for fixed partial dentures which would result in successful treatment outcome and increased longevity of the fixed dental prosthesis.

CONCLUSION

Within the limits of this study it is seen that both undergraduate and postgraduate dental students have fairly good knowledge about the cementation protocols for FPD. Postgraduates were more aware about all the cementation protocols as well as recementation of FPD. Undergraduates and postgraduates were equally aware about the reason for failure of FPD and replacement of FPD. Multiple educational webinars, conferences, scientific and panel discussions can be conducted to improve the knowledge of the students.Through increased awareness of dental students' expectations and experiences, restorations can be planned, made and placed in harmony with the hard and soft oral tissues, and in harmony with the patient's expectation as well.

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Author's Contribution: First author Vaishali.S performed data collection, analysis and interpretation and wrote the manuscript. Second author Subhabrata Maiti contributed to conception, study design, analysis, interpretation and third author Jessy P critically revised the manuscript. All the authors have discussed the results and contributed to the final manuscript.

Conflict of Interest: Nil

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