

Perception of Prophylactic Root Canal Therapy for Teeth used as Abutments in Fixed Partial Dentures among Dental Surgeons in Maharashtra and Kerala: A Questionnaire-based Cross-sectional Survey

ASHWINI A NARAYANAN¹, JYOTI S MANDLIK², SARITA V SINGH³, NOORA ABOOBACKER⁴, SHIVANI CHAVAN⁵, RAJASHREE JADHAV⁶



ABSTRACT

Introduction: The pulps of healthy teeth used as abutments for Fixed Partial Dentures (FPD) undergo mechanical and thermal stresses during tooth preparation. The remaining dentin thickness, the heat produced during tooth preparation, and the permeability of dentinal tubules influence the severity of pulpal injury. Prophylactic Root Canal Therapy (RCT) could be an option to provide better outcomes for FPD treatment.

Aim: To assess dentists' perception regarding the need for prophylactic RCT of abutment teeth in FPD through a questionnaire.

Materials and Methods: A questionnaire based cross-sectional survey was conducted among 200 dental professionals in the Indian states of Kerala and Maharashtra over a period of two months. The participants included dental professionals from private clinics, dental Institutions, and postgraduate students in these states. The Chi-square test of proportion was performed to assess significant differences between each response.

Results: Total 67 out of 200 practitioners, accounting for 33.5%, recommended prophylactic RCT, while 60 (30%) practitioners disagreed with it. A total of 152 (76%) practitioners suggested clinical assessment of abutment teeth before starting the tooth preparation. Total 70 (35%) practitioners had never experienced pulpal damage in abutment teeth in their clinical practice. In contrast, 127 (63.5%) practitioners experienced pulpal damage in less than half of the total cases, and 3 (1.5%) practitioners experienced failures like pulp necrosis or irreversible pulpitis in more than half of the total cases.

Conclusion: Total 33.5% of the surveyed dental practitioners recommended prophylactic endodontic treatment for abutment teeth in FPDs. Implementing precise elective RCT guidelines into dental curricula was suggested as a potential avenue to enhance decision-making and improve patient outcomes by reducing the incidence of pulpal damage beneath FPDs.

Keywords: Dentin bonding agents, Symptomatic irreversible pulpitis, Treatment protocol, Vital tooth preparation

INTRODUCTION

Preparation of the tooth for receiving a crown causes a great deal of distress to the pulp [1]. The action of the high-speed handpiece, along with burs of varying abrasiveness, involves cutting dentin as well as the odontoblastic process, generating mechanical as well as thermal insults to the pulp. These situations could eventually lead to the loss of vitality of the tooth, rendering the entire exercise of tooth preparation futile [2]. The net response of the pulp to these insults is the cumulative outcome of various factors, including the pressure applied during tooth preparation, permeability of the dentinal tubules, thickness of the remaining dentin, bacterial infection, frictional heat, desiccation, chemical injury, and tooth preparation technique [3]. The odontoblasts may get injured during tooth preparation, and the severity of the injury is largely determined by the extent of the trauma. The pulp vitality and reparability of dentin of the prepared tooth are influenced by the viability of the odontoblasts underneath the site of injury. The nature of the insult to the tooth, whether of a gradual onset as in caries or of a sudden onset, also holds great importance [4]. Tooth preparations for crowns require the removal of most of the tooth enamel. Dentinal canals are opened by the tooth preparation procedure, and prepared teeth are highly susceptible to dehydration [5].

All-ceramic or polymer crowns require significant tooth reduction, typically around 2 mm on occlusal surfaces, 1.5 mm on proximal and facial surfaces, and at least 1 mm on marginal areas. For

young or sensitive teeth, this can have evident consequences. The resin-based cements, which are potentially irritating to the pulp, can render the tooth highly sensitive. Often, the patient may experience lingering postoperative tooth sensitivity and the potential need for endodontic therapy [6]. Additionally, it is worth noting that immediately after tooth preparation and before making impressions for indirect restorations, a dentin bonding agent could be applied to freshly cut dentin. This procedure is known as Immediate Dentin Sealing (IDS). IDS serves as a preventive measure to minimize the adverse effects on pulp vitality and postoperative sensitivity caused by mechanical and thermal insults during tooth preparation [7].

Prior investigations by researchers, including Cheung GS et al., Mani R et al., Kannan A et al., and Bharathi R and Sandeep AH, have explored various aspects of RCT and prophylactic endodontic therapy in fixed prostheses and dental bridges, providing insights into diverse practices and occurrences across demographics and geography [1,3,8,9]. Despite existing research, there was a literature gap in the practices and prevalence of prophylactic endodontic therapy and intentional RCT in the Indian states of Kerala and Maharashtra. The present study provides region-specific insights into dental practitioners' practices, aiming to guide clinical decision-making and reduce the risk of pulpal damage in abutment teeth. This unique contribution addresses a region-specific gap and offers valuable insights for practitioners. The survey assesses dental practitioners' understanding of abutment teeth pulpal status

and the need for intentional endodontic treatment for FPDs using a questionnaire.

MATERIALS AND METHODS

In present cross-sectional survey conducted over a two-month period, from August to September 2022, a questionnaire was administered to dental professionals via electronic means (Google Forms) and distributed to participants through email/WhatsApp. The survey included dental professionals registered with the Dental Council of India. The Institutional Ethics Committee approval was received with the reference number (BVDU/IEC/R1/18/22-23).

Inclusion and Exclusion criteria: The study included actively practicing dentists in private clinics, Dental Institutions, and postgraduate students pursuing Master's courses in Dental Colleges within the specified states of Kerala and Maharashtra. Dentists who were no longer actively engaged in clinical practice were excluded from participation in present study.

Sample size calculation: Sample size calculations were conducted using Gpower software version 3.1, considering a study with a power of 80%, an alpha error of 5%, and a 95% confidence interval. This process resulted in an estimated sample size of 163. Subsequently, a pilot study involving 30 practitioners was carried out to assess their responses to the questionnaire's final draft, allowing for the refinement of the study design. Based on the insights gained from the pilot study, the final sample size for the main study was set at 200 participants.

Study Procedure

The questionnaire, comprising 15 questions, was developed by the authors of the study. It was formulated based on an extensive review of existing literature and relevant research in the field of dental practice and endodontics, drawing inspiration from several key references in the area. Notable among these were Mani R et al., and Kannan A et al., [3,8]. This design was not directly taken from any single reference but was influenced by a compilation of relevant research.

Initially, the questionnaire was reviewed by 10 experts in relevant fields with the highest procedure frequency. After considering their feedback, questions with scores below the quality threshold were eliminated. Subsequently, the team replaced these questions with new ones suggested by the experts, resulting in an improved questionnaire. Formal validity and reliability assessments for the questionnaire were not conducted due to resource and time constraints. However, the questionnaire underwent a comprehensive development process, including expert reviews, to ensure its quality. This refined version was then distributed to practitioners.

Participants were approached electronically, primarily via email and WhatsApp. The initial group received the questionnaire through existing professional networks, and they were encouraged to share it with eligible colleagues, facilitating a snowball sampling method for participant inclusion. The participants were instructed to complete the questionnaire digitally by following a provided Google link. The questionnaire, available exclusively in English, was thoughtfully structured to systematically collect data on individual attributes, their self-assessed comprehension of the importance of prophylactic endodontic treatment before FPD, and their management perspectives.

STATISTICAL ANALYSIS

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software (IBM Corp) version 21.0. Microsoft Excel was used for data entry. Descriptive statistics, like frequency and percentage, were computed. A Chi-square test of proportion was performed to assess significant differences between each response. A p-value of less than 0.05 was considered statistically significant at a 95% confidence interval in the study.

RESULTS

The study enrolled a total of 200 participants, with a gender distribution of 140 (70%) females and 60 (30%) males. Out of the total 200 surveyed dental professionals, 133 (66.5%) had 1-5 years of postgraduation practice, indicating a predominantly young demographic. Additionally, 37 practitioners (18.5%) reported 6 to 10 years of experience, 24 (12.0%) had practiced for 11 to 20 years, and only six practitioners had other levels of experience [Table/Fig-1].

The majority, comprising 115 individuals (57.5%), were full-time clinicians dedicated to patient care. Additionally, 76 participants (38.0%) were part-time practitioners, including postgraduate students. Other categories, such as academicians, dental interns, house surgeons, and those on sabbatical, represented a smaller portion of the sample. A total of 132 (66.0%) held a Bachelor of Dental Surgery (BDS) degree, while 33.5% had a Master of Dental Surgery (MDS) qualification [Table/Fig-1].

Total years of practice after graduation	Frequency	Percentage (%)
1-5 years	133	66.5
6-10 years	37	18.5
11-20 years	24	12.0
More than 20 years	6	3.0
Total	200	100.0
Type of practice	Frequency	Percent
Academician	1	.5
Dental intern	1	.5
Full-time practitioner	115	57.5
House surgeon	1	.5
On sabbatical	1	.5
Part-time practitioner (includes postgraduate students)	76	38.0
Part-time practice	1	.5
Postgraduate student	1	.5
Postgraduate	1	.5
Postgraduate student	1	.5
Undergraduate	1	.5
Total	200	100.0
Highest qualification	Frequency	Percent
BDS	132	66.0
MDS	67	33.5
Other higher qualification	1	.5
Total	200	100.0

[Table/Fig-1]: Demographic details and general information. This table shows data of the qualification among the participants

The analysis of the questionnaire highlighted key trends among dental practitioners. A significant majority of 152 practitioners (76.0%) consistently performed radiographic assessments of abutment teeth before initiating FPD tooth preparation, showcasing a strong commitment to preoperative evaluation. The survey responses regarding the advisement of prophylactic endodontic treatment for abutment teeth exhibited a spectrum of perspectives: 67 practitioners (33.5%) endorsed the recommendation, 60 (30.0%) opposed it, and 73 practitioners (36.5%) indicated a middle-ground response by choosing 'Sometimes.' This distribution highlighted the diverse clinical viewpoints within the practitioner cohort.

Regarding vital tooth preparations, 175 practitioners (87.5%) relied on clinical and radiographic judgments, emphasising individualised assessments. Proactive patient follow-up practices were observed, with 48.0% of practitioners (96 individuals) scheduling recalls after six months, and 37.5% (75 individuals) opting for 3-month intervals. The responses from practitioners to various questions were as follows: 1) 75% (150) of practitioners reported infrequent post-preparation pain in their practice. 2) 56.5% (113) consistently advocated for

provisional restoration. 3) 63.5% (127) experienced post-treatment biological failures in less than half of their cases. 4) About 40.5% (81) of practitioners considered intentional root canal treatment before tooth preparation. The study highlighted diverse approaches

among practitioners in advising prophylactic endodontic therapy for abutment teeth in FPDs. 34% of the practitioners were not aware of Immediate Dentin Sealing (IDS), and only 16.5% performed it after tooth preparation [Table/Fig-2].

Questions (1-15) and responses		Frequency (n)	Percentage (%)	p-value
1. Do you perform a radiographic assessment of abutment teeth before tooth preparation for Fixed Partial Dentures (FPD) (preoperative assessment)?	Yes	152	76.0	0.001*
	No	11	5.5	
	Sometimes	37	18.5	
2. Do you always advise prophylactic endodontic treatment on abutment teeth for Fixed Partial Dentures (FPD)?	Yes	67	33.5	0.530
	No	60	30.0	
	Sometimes	73	36.5	
3. How often would you advise vital tooth preparations for Fixed Partial Dentures (FPD)?	All situations	22	11.0	<0.001*
	Based on clinical and radiographic judgements	175	87.5	
	Never	3	1.5	
4. Do you keep a follow-up of patients who have undergone vital tooth preparations?	Yes	106	53.0	0.012*
	No	25	12.5	
	Sometimes	69	34.5	
5. If yes, how often do you recall?	3 months	75	37.5	<0.001*
	6 months	96	48.0	
	Others	29	14.5	
6. In how many cases have you found patients coming back to your clinic complaining of pain/sensitivity after vital tooth preparations?	Most of the cases	14	7.0	0.032*
	None	36	18.0	
	Very few	150	75.0	
7. Do you always advise provisional restoration after tooth preparation for FPD?	Yes	113	56.5	<0.001*
	No	24	12.0	
	Not regularly	63	31.5	
8. How often do you come across a post-treatment biological failure (pulp necrosis/irreversible pulpitis) in vital abutment teeth for Fixed Partial Dentures (FPD) in your clinical practice?	Less than half of the total cases	127	63.5	<0.001*
	More than half of the total cases	3	1.5	
	None	70	35.0	
9. Do you consider that doing intentional Root Canal Treatment (RCT) for abutment teeth prior to tooth preparation would invariably be beneficial for the longevity of the Fixed Partial Denture (FPD)?	Yes	81	40.5	0.05*
	No	53	26.5	
	Sometimes	66	33.0	
10. Do you educate the patient coming to your clinic/ practice about the need for doing prophylactic endodontic therapy (whenever indicated)?	Yes	166	83.0	0.001*
	No	12	6.0	
	Sometimes	22	11.0	
11. If the patient is unwilling for undergoing intentional RCT, do you make the patient aware of the risks/ benefits/prognosis/alternate treatment options available?	Yes	183	91.5	<0.001*
	No	8	4.0	
	Sometimes	9	4.5	
12. What factors would you give priority to, before deciding whether the chosen tooth would need to undergo intentional RCT?	Amount of remaining dentin thickness	154	77.0	0.011*
	Location of the tooth in the arch	36	18.0	
	Other	10	5.0	
13. How often would you perform intentional RCT abutment teeth for Fixed Partial Dentures (FPD) in your clinical practice?	All situations	11	5.5	0.001*
	As per the clinical judgment	152	76.0	
	Based on the thickness of the remaining dentin	1	.5	
	In all the cases	1	.5	
	Usually prefer not to do	35	17.5	
14. Are you aware of the procedure of Immediate Dentin Sealing (IDS)?	Yes	101	50.5	<0.001*
	No	68	34.0	
	Not sure	31	15.5	
15. Do you perform IDS for every case after the preparation of the tooth?	Yes	33	16.5	0.023*
	No	105	52.5	
	Sometimes	62	31.0	

[Table/Fig-2]: Questionnaire-related analysis.

*p-value <0.05 statistically significant; Chi-square test of proportion

DISCUSSION

The present study aimed to provide a comprehensive understanding of dental practitioners' knowledge and perspectives regarding the need for prophylactic endodontic treatment in abutment teeth for FPDs. The study revealed that 33.5% of participants always recommended prophylactic endodontic treatment for abutment teeth in FPDs, which aligns with the findings of previous studies by Kannan A et al., (2018) where 35% of dental practitioners suggested intentional RCT [8]. In contrast, Cheung GS et al., reported a 15.6% failure rate of bridges due to endodontic reasons [1]. Additionally, a study by Bharathi R and Sandeep AH indicated that elective RCT is a valid approach, although the exact prevalence percentage may differ [9]. These variations highlight the evolving landscape of dental practices and the diversity of perspectives in the field. Multiple studies have reported complications from FPDs but could not provide information regarding the reasons for these complications [10, 11]. Won K and Berlin-Broner Y identified multiple restorations as a significant predictive factor for the need for endodontic treatment after crown cementation [11]. In a retrospective study by Lockard MW, tooth reduction procedures with air-water coolant were suggested to minimise pulp damage [12]. The risk of overheating is inversely proportional to dentin thickness, which is crucial for heat dissipation and reducing pulp trauma [13]. Nyman S and Lindhe J's study reported a less than 8% technical failure rate in FPDs, with 2.4% attributed to abutment tooth issues [14].

Symptomatic irreversible pulpitis often occurs in teeth following reduction, during the provisional period, or after crown placement. Previous studies [1, 15-17] have indicated that crowned teeth have a probability of developing pulpal pathology after ten years, with reported percentages ranging from 8% to 15.6% [15]. However, these studies had limitations, including small sample sizes and poor follow-ups. Yavorek A identified that younger age and a greater amount of coronal tooth destruction were definite predictors of RCT after crown placement [18]. However, these findings lacked support from other studies, and no investigation had explored additional predictors of pulpal damage following crown placement. Kramer IR study concluded that pulpal damage is more severe after cavity preparation with a turbine handpiece compared to cutting with a slowly rotating cutting point. However, no linear relationship was observed between cutting speed and pulp damage [19].

Intentional RCT was considered valid, as observed in a review by Ahmed H, with a prevalence of up to 9% [20]. During the study, it was emphasised that universal guidelines are crucial for precisely defining the criteria for considering intentional RCT as an elective procedure for abutments. The risks associated with intentional RCT were found to be consistent with routine RCT. Dental practitioners were expected to manage procedural mishaps and negative outcomes of RCT, highlighting the importance of patient awareness regarding risks, benefits, and alternative treatment options [20].

The present study provided clinicians with evidence-based insights from dental practitioners' experiences. To enhance knowledge about prophylactic endodontic treatment for abutment teeth in FPDs, several essential measures were recommended, including ongoing education, evidence-based guidelines, and interdisciplinary collaboration. The study emphasised the implementation of case studies, clinical protocols, and updates in dental technology, along with mandatory continuing education. Regular knowledge dissemination through dental societies, collaborative research, and discussion forums was proposed to foster learning. Encouraging continuous self-assessment and peer feedback was recommended to promote improved practices and patient care.

In summary, the present study presented a nuanced picture of dental practitioners' knowledge and practices, highlighting areas where

current practices aligned with best practices and others where substantial gaps persisted. The findings can inform future research and educational initiatives aimed at improving clinical outcomes in dental practice.

Limitation(s)

The participant pool mainly represented a specific geographical area, potentially limiting broader generalisation. Reliance on self-reported data introduced the possibility of bias, and the survey design may have influenced responses. The study lacked comprehensive clinical data and patient outcomes, focusing primarily on practitioner perceptions. Limited to a specific timeframe, it may not have fully captured evolving trends in dental practices. Non response bias and sample representativeness were also considerations. Despite these constraints, the study provided foundational insights, emphasising the need for future research to address these challenges.

CONCLUSION(S)

Prophylactic endodontic treatment for abutment teeth in FPDs was recommended by 33.5% of surveyed dental practitioners, while 30% disagreed with it. About 34% of the practitioners were not aware of IDS, and only 16.5% performed it after tooth preparation. The key takeaway is the importance of personalised, patient-centered care, involving patients in their treatment decisions. Educating patients about the pros and cons of prophylactic RCT promotes informed choices and improves patient satisfaction, ultimately enhancing the quality of dental care.

REFERENCES

- [1] Cheung GS, Lai SC, Ng RP. Fate of vital pulps beneath a metal-ceramic crown or a bridge retainer. *Int Endod J*. 2005;38(8):521-30.
- [2] Jackson CR, Skidmore AE, Rice RT. Pulpal evaluation of teeth restored with fixed prostheses. *J Prosthet Dent*. 1992;67(3):323-25.
- [3] Mani R, Thomas AR, Reddy TVK, Ramaswamy H, Kumar SA, Elavarasu P. A survey assessing the knowledge and perception of dental practitioners on the need for prophylactic endodontic treatment in abutment teeth for fixed partial dentures. *J Conserv Dent*. 2021;24(4):384-88.
- [4] About I, Murray PE, Franquin JC, Remusat M, Smith AJ. The effect of cavity restoration variables on odontoblast cell numbers and dental repair. *J Dent*. 2001;29(2):109-17.
- [5] Christensen GJ. Avoiding pulpal death during fixed prosthodontic procedures. *J Am Dent Assoc*. 2002;133(11):1563-64.
- [6] Christensen GJ. Has tooth structure been replaced? *J Am Dent Assoc*. 2002;133(1):103-05.
- [7] Magne P. Immediate dentin sealing: A fundamental procedure for indirect bonded restorations. *J Esthet Restor Dent*. 2005;17(3):144-54; discussion 155.
- [8] Kannan A, Venugopalan S, Ganapathy DM, Jain A. A knowledge, attitude, and practice survey on "the methodology followed in the fabrication of fixed partial denture amongst private practitioners". *Drug Invention Today*. 2018;10(8):1349-56.
- [9] Bharathi R, Sandeep AH. Retrospective analysis on number of patients requiring intentional rct for prosthodontic rehabilitation. *Specialis Ugdymas/Special Education*. 2022;1(43):10520.
- [10] Goodacre CJ, Bernal G, Runghcharassaeng K, Kan JY. Clinical complications in fixed prosthodontics. *J Prosthet Dent*. 2003;90(1):31-41.
- [11] Won K, Berlin-Broner Y. Factors associated with the need for a primary endodontic treatment after single-unit crown cementation: A retrospective case-control study. *J Endod*. 2022;48(6):730-35.
- [12] Lockard MW. A retrospective study of pulpal response in vital adult teeth prepared for complete coverage restorations at ultrahigh speed using only air coolant. *J Prosthet Dent*. 2002;88(5):473-78.
- [13] Nyborg H, Brännström M. Pulp reaction to heat. *J Prosthet Dent*. 1968;19(6):605-12.
- [14] Nyman S, Lindhe J. A longitudinal study of combined periodontal and prosthetic treatment of patients with advanced periodontal disease. *J Periodontol*. 1979;50(4):163-69.
- [15] Valderhaug J, Jokstad A, Ambjørnsen E, Norheim PW. Assessment of the periapical and clinical status of crowned teeth over 25 years. *J Dent*. 1997;25(2):97-105.
- [16] Bergenholtz G, Nyman S. Endodontic complications following periodontal and prosthetic treatment of patients with advanced periodontal disease. *J Periodontol*. 1984;55(2):63-68.
- [17] Whitworth JM, Walls AWG, Wassell RW. Crowns and extra-coronal restorations: Endodontic considerations: The pulp, the root-treated tooth and the crown. *Br Dent J*. 2002;192(6):315-20, 323-27.
- [18] Yavorek A. The influence of full coverage restorations on pulp vitality: a ten-year retrospective study [Master's thesis]. Wisconsin: Marquette University; 2019. Available from: https://epublications.marquette.edu/theses_open/522/.

- [19] Kramer IR. The effects of cavity preparation on the dental pulp. *Aust Dent J*. 1967;12:565.
- [20] Ahmed H. Elective root canal treatment: A review and clinical update. *Endo-Endodontic Practice Today*. 2014;8(2):139-44.

PARTICULARS OF CONTRIBUTORS:

1. Postgraduate Student, Department of Conservative Dentistry and Endodontics, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Pune, Maharashtra, India.
2. Professor, Department of Conservative Dentistry and Endodontics, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Pune, Maharashtra, India.
3. Associate Professor, Department of Conservative Dentistry and Endodontics, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Pune, Maharashtra, India.
4. Postgraduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Yenepoya Dental College, Mangalore, Karnataka, India.
5. Assistant Professor, Department of Conservative Dentistry and Endodontics, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Pune, Maharashtra, India.
6. Professor, Department of Prosthodontics and Crown and Bridge, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Pune, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Ashwini A Narayanan,
"Karthika", Opposite Anandashram, P.O. Anandashram, Kanhangad,
Kasaragod-671531, Kerala, India.
E-mail: ashwinianarayanan@gmail.com

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