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Original Research Article

Frequency of Survival of Endodontically Treated Teeth Restored With Filling or Crown

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Abstract: *The long-term success of endodontically treated teeth significantly depends on the quality of the final restoration. Whether direct (fillings) or indirect (crowns), restorations are critical in protecting tooth structure and preventing reinfection. However, comparative survival outcomes of these restorations remain under-evaluated in clinical settings.* ***Objective:*** *To determine the survival frequency of endodontically treated teeth restored with either a direct filling or a crown.* ***Methods:*** *This cross-sectional descriptive study was conducted at the Department of Operative Dentistry, Islamic International Dental Hospital, Islamabad, from September 30, 2024, to March 29, 2025. One hundred six endodontically treated teeth from patients aged 13 to 60 were assessed. Dentists treated eligible cases with a minimum qualification of BDS. Clinical evaluation included assessing periodontal status, cracks or fractures, bleeding on probing, and attachment loss. Radiographic evaluation assessed the quality of root canal obturation and bone loss. Data were collected via case history interviews and analyzed using descriptive statistics in SPSS version 26.* ***Results:*** *The mean age of the participants was 37.79 ± 14.03 years, with a higher proportion of female patients. Out of 106 evaluated teeth, 97 (91.5%) remained clinically and radiographically successful following endodontic treatment and subsequent restoration with either a filling or a crown.* ***Conclusion:*** *This study demonstrates a high survival rate (91.5%) for endodontically treated teeth restored with either a filling or a crown, emphasizing the effectiveness of both restorative modalities in maintaining tooth integrity post-treatment.*

Keywords: *Endodontically Treated Teeth, Survival, Filling, Crown*

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Introduction

Endodontic treatment is a dental procedure that has been used for the preservation of carious teeth or, sometimes, traumatic teeth. It is defined as the biomechanical preparation and three-dimensional obturation of the whole root canal system (1, 2). Success rates reported in the literature range from 39% to 96% for endodontic treatments (3). Life expectancy for an endodontically treated tooth requires acknowledging the multiple aspects related to biological and mechanical factors, which cannot be separated. Ideally, the treatment should retain as much of the natural dentition as possible for as long as possible (4).

The success of root canal therapy depends on factors, including adequate preparation of the root canal space, precision of clinical techniques, quality of the endodontic treatment, and the final restoration (5). The coronal restoration and the quality of the root canal filling are equally important in determining the treatment outcome. Interestingly, other studies have reported that coronal restoration has a more profound effect on the health of periapical tissue (6). Effective coronal sealing prevents residual bacteria from accessing nutrients, supports the tooth against masticatory forces, and reduces the risk of fractures (7).

Radiographs are an excellent and accurate diagnostic tool for assessing the quality of root canal fillings, coronal restorations, and the condition of the periapical tissues surrounding the tooth, making them an essential modality in evaluating endodontic patients (8). Studies have shown that poor coronal restorations lead to significant coronal leakage, a major cause of failure in root canal treatment (9).

Another study of 795 endodontically treated teeth, which were then restored with either fillings or crowns, demonstrated a survival rate of 98.1% (failure rate: 1.9%) at 4.48 years and 95.4% (failure rate: 4.9%) at 9.6 years (10).

For several reasons, examining the survival of endodontically treated teeth restored with fillings or crowns is important. The lack of localized research only flags the need to address this gap in our knowledge, hence creating a need to analyze it in our demographic and clinical settings. Variations in patient demographics, socio-economic conditions, and regional clinical practices may influence treatment outcomes dramatically. These nuances become important in tailoring clinical decision-making to improve patient care and optimize long-term results. Furthermore, the clinician's expertise and the patient-specific factors related to dietary habits will play a pivotal role in the longevity of the restorations. Treatment success is not dependent upon clinical skill but also on patient behavior; hence, these elements should be considered in comprehensive investigations.

Methodology

This cross-sectional descriptive study was done at the Department of Operative Dentistry, Islamic International Dental Hospital (IIDH), Islamabad, from 30th September 2024 to 29th March 2025. Using the OpenEpi software, the calculated sample size was 106, which was determined with a 4% margin of error and a 95% confidence level. This calculation was based on a previously reported survival rate of 95.4% for endodontically treated teeth (10). This study used a non-probability consecutive sampling technique to recruit participants. The sample comprised 106 teeth treated endodontically by dentists with at least a BDS qualification. Radiographic assessments were carried out to evaluate the opacity of root canal sealing materials, and a comprehensive case history was taken to establish whether the selected teeth had ever been treated endodontically. Patients in the study belonged to the age group between 13 and 60 years, males and females. Clinical examinations were made to select those teeth that showed no evidence of periodontal disease, cracks,

or fractures. These selected teeth were evaluated further by assessing bleeding on probing and attachment loss. Patients with systemic diseases, teeth with no history of trauma after the completion of root canal treatment, and teeth restored with temporary materials like glass ionomer cement or zinc oxide eugenol were excluded. In addition, patients with more than one endodontically treated tooth were excluded. The data was entered and analyzed through SPSS-23.

Results

Table 1 shows that the survival of endodontically treated teeth that were restored either with fillings or crowns had a high success rate, 97 (91.5%) survived after the treatment. In contrast, only 9 (8.5%) did not survive. This shows that most endodontically treated teeth, if appropriately restored, last long and do not lose their integrity and functionality. The survival rate is quite high, showing that restorative techniques, including fillings and crowns, effectively preserve endodontically treated teeth.

Stratification of survival rates of endodontically treated teeth based on age groups shows consistent success across the different age brackets. Among patients ≤18 years, 11 out of 12 teeth (91.7%) survived; only 1 (8.3%) failed. In the age 19-39 years, 41 out of 46 teeth (89.1%) survived, with five failures (10.9%). For patients between 40 and 60 years, there was survival for 45 of the 48 teeth (93.8%) with only 3 (6.2%) failures. The overall mean age was 37.79±14.03 years. Chi-square test gave a χ^2 value=0.646, p-value 0.724, and not statistically significant, hence no variation in survival in the different ages. It then implies that aging does not substantially affect the survival of endodontically treated teeth, thereby vindicating the suitability of post-endodontic restorations of all ages (Table 2).

Stratification of survival rates of endodontically treated teeth by gender shows a slightly higher success rate among females than males. Of the 43 male patients, 38 teeth survived (88.4%), and five teeth failed to survive (11.6%). Among the 63 female patients, 59 teeth survived (93.7%), and only four teeth failed to survive (6.3%). Overall survival in both genders is still very high, with 97 of the 106 teeth surviving, giving an overall survival of 91.5%. There is no statistically significant difference between males and females regarding the survival, based on a χ^{2two}value of 0.917 with a p-value of 0.338, as obtained from the chi-square test (Table 3).

When the survival of endodontically treated teeth was stratified by the location in either the maxilla or mandible, a slightly higher percentage was noted in the mandible. Of the 55 teeth treated in the maxilla, 49 (89.1%) survived, and 6 (10.9%) failed; of the 51 teeth treated in the mandible, 48 (94.1%) survived, with only 3 (5.9%) failures. In general, both the maxillary and the mandibular teeth showed high survival rates. In all, 97 out of the 106 teeth survived, representing a survival of 91.5%. There are no statistically significant differences in teeth' survival rate based on the tooth's location (χ^2=0.861; p=0.354) (Table 4).

The stratification of survival rates for endodontically treated teeth according to the type of tooth showed similar results for anterior and posterior teeth. Of 52 anterior teeth, 48 survived (92.3%), and four did not survive (7.7%). Of 54 posterior teeth, 49 survived (90.7%), and five failed (9.3%). A total survival rate of 97 of the 106 teeth, or 91.5%, was recorded in both groups. Endodontic treatment was extremely successful, independent of the tooth type. The chi square test value of χ^2=0.884 and a p value of 0.772 nindicated that survival ratesfor both anterior and posterior teeth did not differ statistically significantly (Table 5).

Table 1: Frequency of survival of endodontically treated teeth restored with filling or crown

Survival	Number	Percentage
Yes	97	91.5
No	09	08.5
Total	106	100.0

Table 2: Stratification by age

Age	Survival of endodontically treated teeth		Total	P value/ χ^2
	Yes	No		
≤18	11(91.7%)	1(8.3%)	12(100%)	P=0.724
19-39	41(89.1%)	5(10.9%)	46(100%)	χ^2=0.646
40-60	45(93.8%)	3(6.2%)	48(100%)	
Total	97(91.5%)	9(8.5%)	106(100%)	
Mean±SD	37.79±14.03			

Table 3: Stratification about gender

Sex	Survival of endodontically treated teeth		Total	P value/ χ^2
	Yes	No		
Male	38(88.4%)	5(11.6%)	43(100%)	P=0.338
Female	59(93.7%)	4(6.3%)	63(100%)	χ^2=0.917
Total	97(91.5%)	9(8.5%)	106(100%)	

Table 4: Stratification about location

Location	Survival of endodontically treated teeth		Total	P value/ χ^2
	Yes	No		
Maxilla	49(89.1%)	6(10.9%)	55(100%)	P=0.354
Mandible	48(94.1%)	3(5.9%)	51(100%)	χ^2=0.861
Total	97(91.5%)	9(8.5%)	106(100%)	

Table 5: Stratification about tooth type

Tooth type	Survival of endodontically treated teeth		Total	P value/ χ^2
	Yes	No		
Anterior	48(92.3%)	4(7.7%)	52(100%)	P=0.772
Posterior	49(90.7%)	5(9.3%)	54(100%)	χ^2=0.884
Total	97(91.5%)	9(8.5%)	106(100%)	

Discussion

It has been evaluated from various standpoints, from the efficacy of endodontic treatment in preventing or resolving periapical lesions (1), to assessing functional restoration of ETT (11), to long-term survival rates of ETT (10). More recent evidence, however, suggests that factors other than those related to the quality of the endodontic procedure per se have a major impact on long-term outcomes. It has been found that the quality of coronal restoration is more important to the successful completion of endodontic treatment than that of the endodontic filling (12).

In our study, the survival rate of endodontically treated teeth is the factor that determines the long-term success of endodontic treatment. The survival rate for the endodontically treated teeth, which were restored either with a filling or with a crown, was 91.5% (97 out of 106 teeth), whereas the failure rate was 8.5% (9 out of 106 teeth) (Table 1). These results agree with those from a study by Skupien et al (10) who found that endodontically treated teeth restored with either crowns or fillings had a survival rate of 98.1% after 4.48 years, with a failure rate of 1.9%. After a longer follow-up period of 9.6 years, the survival rate decreased to 95.4%, with a failure rate of 4.9%.

Studies have concluded that ETTs restored with crowns demonstrate higher survival rates compared to those teeth restored with direct fillings. In the systematic review by Ng et al (13), it was found that an 81% survival rate for teeth restored with crowns, while the survival rates of those restored with fillings were drastically lower over time. A cohort study by Lazarski et al (14) showed that the type of coronal restoration significantly influences the outcome; crown-restored teeth had better survival rates than those restored with filling. Aquilino and Caplan (15) concluded that endodontically treated teeth, without crowns, were 6 times

more likely to be lost than those restored with crowns.

Pirani et al (16) published a 10-year follow-up study of a master's endodontics program, and the success rate for root fillings was 85%. In a 20-year follow-up study, Prati et al (17) found that 80% of the endodontically treated teeth survived and concluded that the most frequent causes of extraction of root-filled teeth were non-endodontic. In a publication, Stenhagen et al (9) evaluated the influence of coronal restorations on the survival of ETT. The researchers found a higher survival rate among the teeth with indirect restorations rather than direct restorations.

Landys-Borén et al. [18] estimated an 81.5% survival rate following treatment of teeth.18 In high-quality studies, this has varied from 86 to 93%. However, thus, not consistent due to the variability related to differences in study design and methodologies (13), however, 98% survival has also been reported by Alley et al. (19) This could be partly a reflection of the ability of the participating dentists to sort out the teeth which had a preoperative reasonably estimated good prognosis from those that were hopeless and suggested for extraction.

Conclusion

The high survival rate (91.5%) for endodontically treated teeth restored with either a filling or a crown. The decision to use a crown or a filling should be based on the extent of tooth structure loss and the functional demands on the tooth.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-MMNCS-0331d-24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

KN (Postgraduate Trainee), AA (Professor)
Review of Literature, Data entry, Data analysis, and article drafting. Manuscript drafting, Study Design,
FA (Associate Dentist), IHZ (Associate Dentist), AA (BDS Student)
Study Design, manuscript review, and critical input.
Conception of Study, Development of Research Methodology Design

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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