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Comparison of post-endodontic restoration preferences among dental specialists and general dental practitioners: a cross-sectional web-based survey

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Abstract

Purpose The quality and type of coronal restoration are critical determinants of the long-term survival of endodontically treated teeth. Differences in clinical training and professional experience may influence restoration preferences among dental specialists and general dental practitioners. This study aimed to compare post-endodontic restoration choices for mandibular first molars among endodontists, restorative dentistry specialists, prosthodontists, and general dental practitioners.

Methods A web-based survey presenting six standardized clinical scenarios of endodontically treated mandibular first molars was distributed to 1,369 dentists across various institutions. The participants selected among seven treatment options for each case and were asked to indicate their preferred method of restoration for each tooth. A chi-squared test was used to determine the relationship between specialty, years in practice, institution, sex, and treatment choices ($p < 0.05$).

Results A total of 764 dentists completed the survey, yielding a 55.8% response rate. Responses differed significantly between specialties for all cases. Prosthodontists and restorative specialists favored inlay/onlay/overlay restorations, while general dental practitioners and endodontists preferred composites for the Black's class II mesio-occlusal cavity (Case 1) and the Black's class II mesio-occlusal-distal cavity (Case 2) ($p < 0.001$). In Case 3, general dental practitioners mostly chose post–crown restorations, whereas prosthodontists preferred endocrowns ($p < 0.001$). for the hole cavity 2 mm above the cementoenamel junction (CEJ) (Case 4) ($p < 0.001$) and the scenario involving a hole cavity at the CEJ (Case 5) ($p = 0.041$), post–crown restorations were more frequently selected by general dental practitioners. In the cavity without a buccal wall (Case 6), post–crown restorations were the dominant choice across all groups, though proportions varied significantly by specialty ($p = 0.033$).

Conclusions Specialty and practice setting significantly influence post-endodontic restoration choices. These findings underscore the need for updated, cross-specialty guidelines and enhanced educational strategies to improve consistency in clinical decision-making.

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Keywords Coronal restoration, Decision making, Endodontist, Post-endodontic treatment, Prosthodontist

Introduction

The completion of a root canal does not indicate that the treatment of the relevant tooth is finished. The endodontically treated tooth needs to be restored for form, function, and aesthetics. The quality of the coronal restoration will directly affect the survival and success of the endodontically treated tooth [1]. Several studies have confirmed that the long-term prognosis of teeth undergoing endodontic treatment depends not only on the quality of the apical seal achieved during root canal therapy but also on the integrity of the coronal seal provided by the post-endodontic restoration [2–4]. It has been stated that endodontically treated teeth have a good survival rate. Indeed, an epidemiological study with a sample size of 1,462,936 teeth reviewed eight years after treatment showed a 97% survival rate [5]. Interestingly, of the teeth that were lost, 85% had received no full coronal coverage restoration. This was corroborated by a more recent study, which showed a four-year survival rate of 95% and that, again, teeth with cast restorations demonstrated a higher survival rate compared to those without [6]. It has been reported that endodontically treated teeth are extracted as a result of poor coronal restoration rather than endodontic failure [7]. Furthermore, the number of teeth that are lost following endodontic treatment almost doubles in cases of inadequate coronal restoration [7].

Although many studies have analyzed the survival rates of teeth after endodontic treatment, it remains difficult for dentists to choose the type of restoration method to apply, due to the wide variety of study designs and materials available [8–10]. Many studies have further indicated that there is a difference between dentists in their choice of restoration type, post, and material to use following endodontic treatment [10–16].

To the best of our knowledge, no study has yet investigated the treatment choices for post-endodontic restorations among different specialties in dentistry. The aim of this survey-based study was to compare the preferences of dentists in four different specialties for the restoration of endodontically treated lower first molar teeth. The research hypothesis of this study was there were differences among different dental specialties regarding their approaches to post-endodontic restorations.

Methods

An anonymized ten-question survey was prepared by two specialists in endodontics. The study protocol was approved by the Bezmialem Vakif University Ethics Committee (date: 05/05/2020; decision no: 06/100). In calculating the sample size of this study, for each variable, the power (power of test) was required to be at least 0.80, and a type I error of 0.05 was defined. The study employed a non-random, convenience-based sampling method. The survey was distributed to endodontics specialists, restorative dentistry specialists, prosthodontists, postgraduate students from these three departments, and general dental practitioners whose email addresses were publicly available on the websites of universities, hospitals, and dental clinics across Turkiye.

Inclusion criteria were licensed dentists or postgraduate students in endodontics, restorative dentistry, or prosthodontics, and general dental practitioners actively engaged in clinical practice at the time of the survey, who completed the entire questionnaire. Participants who were not currently practicing dentistry, submitted incomplete surveys, duplicate entries (identified by identical IP addresses and demographic details), or provided inconsistent or unreasonable responses (e.g., selecting "extraction" for all scenarios) were excluded.

The survey was emailed to 1,369 potential participants via OnlineAnketler (enuvo GmbH, Zurich, Switzerland), accompanied by a cover letter explaining the study objectives. The survey link was distributed via institutional mailing lists to all eligible participants. To maximize the response rate, participants were reminded twice during the data collection period. Additionally, anonymity and confidentiality of responses were emphasized in the invitation message, which may have encouraged participation. The survey was conducted over four months, from May to August 2020, and data collection ended in August as the target sample size determined by the power analysis had been reached. After screening for completeness and consistency, a total of 764 valid responses were included in the analysis.

The survey had two parts: the first part included four questions relating to the participants' personal information (i.e., specialty, years in practice, institution, and sex), while the second part comprised questions about the participant's choices relating to post-endodontic restoration.

Different coronal cavity types were prepared in six different mandibular first molars by two endodontists. The teeth were embedded in a pink dental wax up to 1.0 mm below the cervical line to simulate the alveolar bone/gingiva. All cavities were prepared in non-carious intact molar teeth, which were extracted for periodontal reasons. After the preparation of six different cavities, the pulp chambers were sealed using glass ionomer cement. Then, images of these cavities were taken with a Canon 4000D 18–55 MM III camera (Canon, Tokyo, Japan). The participants were asked to decide how to conduct post-endodontic restoration for each of the cavities presented.

Fig. 1 Representative images illustrating the six clinical scenarios used in the survey: (1) Case 1, (2) Case 2, (3) Case 3, (4) Case 4, (5) Case 5, and (6) Case 6

The clinical history for all the scenarios was the same. The created scenario involved a 30-year-old male patient with good oral hygiene, who uses toothpaste with fluoride, and who consults a dentist at least once a year. The mandibular first molar of the patient was given a root canal treatment. There were upper and adjacent molar and premolar teeth. There was a Black's Class II mesio-occlusal cavity in Case 1, a Black's Class II mesio-occlusal-distal cavity in Case 2, a cavity without a lingual wall in Case 3, a hole cavity 2 mm above the cementoenamel junction (CEJ) in Case 4, a hole cavity at the CEJ in Case 5, and a cavity without a buccal wall (functional tubercles) in Case 6 (Fig. 1).

Each participant was requested to choose only one option for each case from the treatment alternatives presented below:

a. Endocrown
b. Fiber-reinforced composite restoration
c. Ceramic inlay/onlay/overlay
d. Composite restoration
e. Fiber post + composite restoration
f. Fiber post + crown
g. Extraction

Statistical analysis

The responses were entered into SPSS version 24.0 for Windows (IBM Corp, Armonk, NY, USA). The effects of demographic variables on treatment options were evaluated using Multinomial Logistic Regression Analysis. Associations between categorical variables were analyzed with the Pearson Chi-Square Test and, when appropriate, the Fisher's Exact Test with Monte Carlo correction. Multiple comparisons were performed using the Bonferroni-adjusted Z test. A significance level of $p < 0.05$ was considered.

Table 1 Demographic characteristics of participants ($n = 764$)

Variable	Category	*n*	%
Specialty	Endodontists	222	29.1
	Restorative dentistry specialists	113	14.7
	Prosthodontists	113	14.7
	General dental practitioners	316	41.5
Sex	Male	242	31.6
	Female	522	68.4
Institution	Public hospital	127	16.6
	Private hospital	37	4.7
	Clinic/Polyclinic	235	30.7
	University hospital	365	48.0
Years of experience	0–10 years	603	79.0
	11–20 years	122	15.9
	> 20 years	39	5.1

Results

Surveys were received from 764 dentists in Turkiye, resulting in a response rate 55.8%. The demographic characteristics of the participants are summarized in Table 1.

Prosthodontists and restorative specialists showed a higher preference for inlay/onlay/overlay restorations, while general dental practitioners and endodontists more frequently selected composite restorations for Black's Class II mesio-occlusal cavity (Case 1) and Black's Class II mesio-occlusal-distal cavity (Case 2) ($p < 0.001$). For cavity without a lingual wall (Case 3), general dental practitioners predominantly opted for post crown restorations, whereas prosthodontists more commonly preferred endocrowns ($p < 0.001$). When hole cavity 2 mm above the CEJ (Case 4) ($p < 0.001$) and hole cavity at the CEJ (Case 5) ($p = 0.041$) were investigated, significant differences in treatment choices were observed among groups, with post and crown restorations being more frequently chosen by general dental practitioners. For cavity without a buccal wall (Case 6), although post–crown restorations

emerged as the most prevalent option across all specialties, the distribution of preferences differed significantly between groups ($p = 0.033$). The distribution of responses according to specialization and treatment alternatives are presented in Table 2 in detail.

When treatment preferences were compared according to sex, no statistically significant differences were observed except Black's Class II mesio-occlusal cavity (Case 1) ($p = 0.010$). In this case, restoration preferences differed between female and male groups. Among females, composite restorations (40.8%) were the most frequently chosen option, whereas among males, inlay/onlay/overlay (34.2%) and composite restorations (34.2%) were equally preferred.

No significant differences were observed between years of experience and restoration preferences in all cases ($p > 0.05$), except for hole cavity 2 mm above the CEJ (Case 4) ($p = 0.007$). In this case, dentists with 0–10 years of experience most frequently selected post-crown restorations (46.2%). Among those with 10–20 years of experience, the proportion of post-crown restorations decreased (37.5%), while the preference for endocrowns increased (38.3%). For participants with more than 20 years of experience, endocrowns (35.9%) and inlay/onlay/overlay restorations (28.2%) were chosen more frequently, with a notable decline in the selection of post-crown restorations (20.5%).

When the responses of all participants were investigated according to institution, composite restoration was most frequently selected in public hospitals (55.9%), whereas the rates were lower in university (34.4%) and private dental clinics (37.3%) for Black's Class II mesio-occlusal cavity (Case 1) ($p < 0.001$). Inlay/onlay/overlay restorations were predominantly chosen in universities (48.9%) and private dental clinics (46.8%), but less frequently in public hospitals (28.8%) in Black's Class II mesio-occlusal-distal cavity (Case 2) ($p < 0.001$). For cavity without a lingual wall (Case 3), post + core with crown was markedly higher in public hospitals (61.9%) compared to universities (38.8%) and private dental clinics (42.5%) ($p < 0.001$). Post + core with crown was most common in public hospitals (59.5%), while the rates were

Table 2 Distribution and relationship results between specialty and treatment alternatives

	General dental practitioners *N* (%)	Prosthodontists *N* (%)	Endodontics specialists *N* (%)	Restorative treatment specialists *N* (%)	*P*
Case 1					
Fiber reinforced composite restoration	55 (17,4)[a]	15 (13,4)[b]	37 (16,9)[ab]	31 (27,9)[a]	< 0,001[x]
Inlay/onlay/overlay	70 (22,2)	50 (44,6)	64 (29,2)	28 (25,2)	
Composite restoration	134 (42,4)	24 (21,4)	91 (41,6)	45 (40,5)	
Others	57 (18)[a]	23 (20,5)[a]	27 (12,3)[ab]	7 (6,3)[b]	
Case 2					
Fiber reinforced composite restoration	47 (14,9)	12 (10,7)	29 (13,3)	23 (20,7)	< 0,001[x]
Inlay/onlay/overlay	117 (37,1)[a]	66 (58,9)[a]	95 (43,6)[a]	55 (49,6)[ab]	
Composite restoration	51 (16,2)[a]	5 (4,5)[b]	31 (14,2)[a]	13 (11,7)[ab]	
Others	100 (31,8)[a]	29 (25,9)[ab]	63 (28,9)[ab]	20 (18)[b]	
Case 3					
Endocrown	59 (18,7)[a]	42 (37,5)[b]	59 (27,1)[ab]	29 (26,1)[ab]	< 0,001[x]
Inlay/onlay/overlay	32 (10,1)[a]	16 (14,3)[a]	35 (16,1)[a]	32 (28,8)[b]	
Post + crown	163 (51,6)[a]	46 (41,1)a[b]	89 (40,8)[ab]	35 (31,5)[b]	
Others	62 (19,6)[a]	8 (7,1)[b]	35 (16,1)[ab]	15 (13,5)[ab]	
Case 4					
Endocrown	78 (24,7)[a]	53 (47,3)[b]	89 (40,8)[b]	39 (35,1)[ab]	< 0,001[x]
Inlay/onlay/overlay	37 (11,7)[a]	12 (10,7)[a]	36 (16,5)[ab]	28 (25,2)[b]	
Post + crown	172 (54,4)[a]	45 (40,2)[ab]	79 (36,2)[b]	34 (30,6)[b]	
Others	29 (9,2)	2 (1,8)	14 (6,4)	10 (9)	
Case 5					
Endocrown	76 (24,1)[a]	39 (34,8)[ab]	60 (27,5)[ab]	42 (37,8)[b]	0,041[x]
Post + crown	200 (63,5)	66 (58,9)	138 (63,3)	56 (50,4)	
Others	39 (12,4)	7 (6,3)	20 (9,2)	13 (11,7)	
Case 6					
Endocrown	40 (12,7)	20 (17,9)	39 (17,9)	21 (18,9)	0,033[x]
Post + crown	215 (68)	80 (71,4)	158 (72,5)	76 (68,5)	
Others	61 (19,3)[a]	12 (10,7)[ab]	21 (9,6)[b]	14 (12,6)[ab]	

[x]Monte Carlo corrected Fisher's Exact Test; n (%, [a–b]No significant difference between groups with the same letter. ($P < 0.05$)

Table 3 The multinomial logistic regression analysis for all cases

Case 1	Fiber-reinforced composite restoration		Inley/onlay/overlay		Composite restoration	
	OR (%95 CI)	*p*	OR (%95 CI)	*p*	OR (%95 CI)	*p*
Sex (Female)	1.809 (1.032–3.17)	**0.038**	1.008 (0.618–1.643)	0.974	1.579 (0.984–2.535)	0.059
Year of experience (Reference: > 20 years)						
0–10	1.087 (0.294–4.018)	0.901	0.661 (0.225–1.941)	0.451	0.685 (0.234–2.005)	0.490
10–20	1.37 (0.317–5.927)	0.673	1.215 (0.36–4.1)	0.753	1.122 (0.333–3.784)	0.853
Specialty (Reference: restorative dentistry specialist)						
General dental practitioner	0.316 (0.116–0.859)	**0.024**	0.402 (0.15–1.076)	0.07	0.419 (0.164–1.068)	0.068
Prosthodontist	0.143 (0.05–0.409)	**< 0.001**	0.54 (0.205–1.425)	0.213	0.165 (0.061–0.441)	**< 0.001**
Endodontist	0.323 (0.123–0.851)	**0.022**	0.578 (0.223–1.497)	0.259	0.517 (0.207–1.288)	0.157
Instution (Reference: private hospital)						
University	1.937 (0.52–7.214)	0.325	0.867 (0.287–2.614)	0.799	1.504 (0.492–4.602)	0.474
Private dental clinic	1.489 (0.416–5.331)	0.541	0.763 (0.265–2.197)	0.616	1.347 (0.459–3.95)	0.587
Public hospital	0.781 (0.2–3.054)	0.722	0.364 (0.115–1.157)	0.087	1.721 (0.567–5.227)	0.338

OR (%95 CI): Odss Ratio (%95 Confidence Interval); Likelihood Ratio Tests (x^2=83,718; p < 0,001); Goodness-of-Fit (x^2=193,989; p = 0,083); Cox and Snell R^2 = 0,105; Nagelkerke R^2 = 0,113; [bold]: statistically significant ($p < 0.05$)

Table 4 The multinomial logistic regression analysis for all cases

Case 2	Fiber-reinforced composite restoration		Inley/onlay/overlay		Composite restoration	
	OR (%95 CI)	p	OR (%95 CI)	p	OR (%95 CI)	p
Sex (Female)	1.269 (0.757 - 2.128)	0.366	1.231 (0.837 - 1.811)	0.291	0.695 (0.418 - 1.156)	0.161
Year of experience (Reference: > 20 years)						
0-10	0.357 (0.121 - 1.053)	0.062	0.687 (0.275 - 1.716)	0.422	0.518 (0.163 - 1.647)	0.265
10-20	0.457 (0.141 - 1.477)	0.191	0.525 (0.195 - 1.411)	0.201	0.594 (0.171 - 2.065)	0.413
Specialty (Reference: restorative dentistry specialist)						
General dental practitioner	0.724 (0.325 - 1.611)	0.428	0.478 (0.249 - 0.916)	**0.026**	0.747 (0.309 - 1.805)	0.517
Prosthodontist	0.343 (0.138 - 0.854)	**0.021**	0.778 (0.395 - 1.534)	0.469	0.248 (0.076 - 0.811)	**0.021**
Endodontist	0.417 (0.196 - 0.885)	**0.023**	0.555 (0.301 - 1.022)	0.059	0.718 (0.313 - 1.65)	0.436
Instution (Reference: private hospital)						
University	1.177 (0.441 - 3.143)	0.745	1.66 (0.695 - 3.965)	0.254	6.323 (0.772 - 51.795)	0.086
Private dental clinic	0.464 (0.173 - 1.241)	0.126	1.713 (0.734 - 3.998)	0.213	6.741 (0.843 - 53.868)	0.072
Public hospital	0.564 (0.203 - 1.564)	0.271	0.838 (0.339 - 2.075)	0.703	8.537 (1.053 - 69.208)	**0.045**

OR (%95 CI): Odss Ratio (%95 Confidence Interval); Likelihood Ratio Tests (x^2=73,675; p < 0,001); Goodness-of-Fit (x^2=175,154; p = 0,337); Cox and Snell R^2 = 0,093; Nagelkerke R^2 = 0,101; [bold]: statistically significant ($p < 0.05$)

lower in universities (38.0%) and private dental clinics (42.9%) for hole cavity 2 mm above the CEJ (Case 4) ($p = 0.002$). Post + core with crown was consistently high across all institutions (58.7–66.7%), with no significant difference detected for hole cavity at the CEJ (Case 5) ($p = 0.058$). In cavity without a buccal wall (Case 6), post + core remained the dominant choice (67.8–72%), with significant differences between institutions ($p = 0.027$).

The results of the multinomial logistic regression analysis for this survey study are presented in Tables 3, 4, 5, 6, 7 and 8.

Discussion

This research was conducted to compare the preferences of dentists from different specialties in Turkiye regarding the restoration of endodontically treated teeth. The number of dentists surveyed was 764, a high participation rate compared to other survey studies [8, 10–12]. The fact that the survey was illustrated, short, clear, and understandable made it more effective [17]. In addition, the fact that the survey was completely web-based and included images may have made it more likely to elicit a response from participants.

The widespread use of specialization in dentistry—that is, having dentists working in different disciplines in different clinics—can impact the treatment choices of dentists. To study this, different cavity types were prepared, and the treatment preferences of various specialists and general dental practitioners were investigated. Specifically, in the present study, six different coronal cavity designs were prepared based on the most common types observed at clinics, according to the available literature [18–20]. It was found that the mandibular first molar

Table 5 The multinomial logistic regression analysis for all cases

Case 3	Endocrown		Inley/onlay/overlay		Post+crown	
	OR (%95 CI)	p	OR (%95 CI)	p	OR (%95 CI)	p
Sex (Female)	0.885 (0.523 - 1.498)	0.649	0.991 (0.547 - 1.793)	0.976	0.763 (0.476 - 1.224)	0.263
Year of experience (Reference: > 20 years)						
0-10	1.089 (0.397 - 2.988)	0.869	0.878 (0.297 - 2.592)	0.814	1.979 (0.728 - 5.383)	0.181
10-20	1.771 (0.559 - 5.614)	0.332	1.255 (0.362 - 4.348)	0.72	2.573 (0.823 - 8.047)	0.104
Specialty (Reference: restorative dentistry specialist)						
General dental practitioner	0.538 (0.235 - 1.233)	0.143	0.175 (0.072 - 0.426)	**<0.001**	0.996 (0.464 - 2.135)	0.991
Prosthodontist	2.661 (0.992 - 7.133)	0.052	0.871 (0.303 - 2.508)	0.799	2.562 (0.972 - 6.754)	0.057
Endodontist	0.823 (0.384 - 1.762)	0.616	0.392 (0.178 - 0.864)	**0.020**	1.06 (0.512 - 2.195)	0.876
Instution (Reference: private hospital)						
University	0.632 (0.193 - 2.07)	0.449	0.533 (0.135 - 2.099)	0.368	0.78 (0.257 - 2.369)	0.661
Private dental clinic	0.766 (0.239 - 2.455)	0.654	1.369 (0.357 - 5.247)	0.646	0.979 (0.33 - 2.905)	0.969
Public hospital	0.243 (0.069 - 0.856)	**0.028**	0.202 (0.043 - 0.949)	**0.043**	0.956 (0.317 - 2.883)	0.936

OR (%95 CI): Odss Ratio (%95 Confidence Interval); Likelihood Ratio Tests (x^2=92,056; p < 0,001); Goodness-of-Fit (x^2=150,921; p = 0,823); Cox and Snell R^2 = 0,115; Nagelkerke R^2 = 0,125; [bold]: statistically significant (p < 0.05)

Table 6 The multinomial logistic regression analysis for all cases

Case 4	Endocrown		Inley/onlay/overlay		Post+crown	
	OR (%95 CI)	p	OR (%95 CI)	p	OR (%95 CI)	p
Sex (Female)	0.864 (0.448 - 1.668)	0.663	1.092 (0.526 - 2.27)	0.813	0.748 (0.394 - 1.42)	0.374
Year of experience (Reference: > 20 years)						
0-10	3.506 (1.182 - 10.402)	**0.024**	1.59 (0.519 - 4.874)	0.417	6.809 (2.136 - 21.71)	**0.001**
10-20	1.949 (0.585 - 6.494)	0.277	0.817 (0.228 - 2.927)	0.756	3.445 (0.964 - 12.311)	0.057
Specialty (Reference: restorative dentistry specialist)						
General dental practitioner	0.664 (0.253 - 1.748)	0.407	0.404 (0.143 - 1.14)	0.087	1.625 (0.623 - 4.234)	0.321
Prosthodontist	7.264 (1.489 - 35.445)	**0.014**	2.152 (0.405 - 11.434)	0.368	7.428 (1.505 - 36.662)	**0.014**
Endodontist	1.828 (0.735 - 4.549)	0.194	0.978 (0.372 - 2.566)	0.963	1.943 (0.77 - 4.898)	0.159
Instution (Reference: private hospital)						
University	0.661 (0.129 - 3.385)	0.619	0.663 (0.111 - 3.956)	0.652	0.818 (0.164 - 4.074)	0.806
Private dental clinic	0.582 (0.119 - 2.842)	0.503	0.718 (0.126 - 4.084)	0.709	0.617 (0.131 - 2.919)	0.543
Public hospital	0.438 (0.083 - 2.307)	0.330	0.388 (0.061 - 2.472)	0.316	0.884 (0.177 - 4.425)	0.881

OR (%95 CI): Odss Ratio (%95 Confidence Interval); Likelihood Ratio Tests (x^2=81,399; p < 0,001); Goodness-of-Fit (x^2=174,493; p = 0,350); Cox and Snell R^2 = 0,102; Nagelkerke R^2 = 0,113; [bold]: statistically significant (p < 0.05)

Table 7 The multinomial logistic regression analysis for all cases

Case 5	Endocrown		Post+crown	
	OR (%95 CI)	p	OR (%95 CI)	p
Sex (Female)	0.693 (0.384 - 1.25)	0.223	0.781 (0.45 - 1.355)	0.379
Year of experience (Reference: > 20 years)				
0-10	0.869 (0.231 - 3.266)	0.835	0.875 (0.25 - 3.066)	0.835
10-20	0.828 (0.199 - 3.448)	0.795	0.688 (0.178 - 2.659)	0.588
Specialty (Reference: restorative dentistry specialist)				
General dental practitioner	0.898 (0.38 - 2.121)	0.806	1.48 (0.66 - 3.318)	0.341
Prosthodontist	1.624 (0.584 - 4.517)	0.353	2.113 (0.785 - 5.686)	0.139
Endodontist	0.997 (0.441 - 2.252)	0.994	1.713 (0.789 - 3.717)	0.174
Instution (Reference: private hospital)				
University	3.588 (1.015 - 12.69)	**0.047**	1.861 (0.656 - 5.278)	0.243
Private dental clinic	2.163 (0.638 - 7.333)	0.215	1.253 (0.465 - 3.376)	0.656
Public hospital	2.03 (0.551 - 7.487)	0.287	1.553 (0.534 - 4.514)	0.419

OR (%95 CI): Odss Ratio (%95 Confidence Interval); Likelihood Ratio Tests (x^2 =21,278; p = 0,266); Goodness-of-Fit (x^2=99,355; p = 0,798); Cox and Snell R^2 = 0,028; Nagelkerke R^2 = 0,034; [bold]: statistically significant (p < 0.05)

Table 8 The multinomial logistic regression analysis for all cases

Case 6	Endocrown		Post+crown	
	OR (%95 CI)	p	OR (%95 CI)	p
Sex (Female)	1.376 (0.764 - 2.478)	0.287	1.039 (0.66 - 1.635)	0.870
Year of experience (Reference: > 20 years)				
0-10	1.440 (0.498 - 4.162)	0.501	2.167 (0.909 - 5.166)	0.081
10-20	1.763 (0.514 - 6.045)	0.367	2.645 (0.953 - 7.341)	0.062
Specialty (Reference: restorative dentistry specialist)				
General dental practitioner	0.492 (0.198 - 1.222)	0.127	0.777 (0.372 - 1.621)	0.501
Prosthodontist	1.078 (0.4 - 2.907)	0.882	1.237 (0.534 - 2.865)	0.619
Endodontist	1.246 (0.521 - 2.977)	0.621	1.452 (0.693 - 3.042)	0.322
Instution (Reference: private hospital)				
University	2.748 (0.644 - 11.728)	0.172	1.799 (0.706 - 4.587)	0.219
Private dental clinic	3.559 (0.862 - 14.684)	0.079	1.668 (0.683 - 4.073)	0.261
Public hospital	1.31 (0.293 - 5.846)	0.724	1.106 (0.442 - 2.769)	0.830

OR (%95 CI): Odss Ratio (%95 Confidence Interval); Likelihood Ratio Tests (x^2 =27,412; p=0,072); Goodness-of-Fit (x^2=102,376; p=0,732); Cox and Snell R^2=0,036; Nagelkerke R^2=0,044

most often received endodontic treatment [21]. A previous study also showed that a terminal tooth in the arch had a lower survival rate and that teeth with proximal contacts, both mesially and distally, had a higher survival rate [6]. The cases and scenario in the present study were created according to these findings. Based on the fact that metal–ceramic crowns, composite resin, ceramic inlays/onlays/crowns, fiber posts, and composite resin restoration are frequently preferred in the restoration of posterior molar teeth that have received endodontic treatment, the treatment options from which the participants could choose were prepared (according to the literature) [18–22].

In recent years, amalgam has lost popularity among some clinicians and, especially, patients due to concerns about the toxic effect of metal ions released over time. Amalgam is non-sticky and leads to a higher risk of spikes or root fractures when traditionally used without a cuspal coating [23]. Hence, it was not included in the list of treatment options given to the participants.

Metal and ceramic posts show full resistance to incoming forces, especially to side forces, without any flexion in their structure. However, because fiber post systems distribute incoming forces equally, they show a dentine-like structure and minimize the risk of fracture. Studies have shown that the elastic modulus of fiber posts is similar to that of dentine [24]. Therefore, we opted to include fiber posts in the list of treatment options.

For the Black's Class II cavity shown in Case 1, more than 40% of participants chose composite restoration, while 44.6% of prosthodontists chose inlay/onlay/overlay restoration. A possible reason for this is that the computer-assisted design/computer-assisted manufacturing application used in inlay/onlay/overlay restoration may be better known and more often used by prosthodontists. For other professionals, applying a composite restoration may be more practical than is inlay/onlay/overlay restoration [22]. Similarly, in Black's Class II mesio-occlusal-distal cavity (Case 2), more than 37% of dentists chose inlay/onlay/overlay restoration, but the highest percentage (58.9%) occurred among prosthodontics. As such, the research hypothesis was accepted.

Thus far, there has been no consensus about whether posts improve the survival of teeth [25]. As the authors of this study compared the choice of treatment, we did not make a general recommendation for or against the use of posts. In cases 3, 5, and 6, 44.2%, 60.9%, and 69.9%, respectively, of participants preferred post + crown restoration. In the current literature, an endocrown supported by the pulp chamber has been suggested in cases where there is no ferrule [26]. In cases where crowning is intended, the preparation of a ferrule is required [18]. However, according to the results of our study, when there was no ferrule (as in Case 5), post + crown was preferred. Interestingly, when a ferrule was present (in Case 4), more than 35% of participants, with the exception of general dental practitioners, preferred endocrowns. As such, it was found that the presence of a ferrule could change dentists' treatment decision, in line with previous studies [8]. Additionally, prosthodontists were significantly more likely to select endocrown (OR = 7.264; p = 0.014) and post-crown (OR = 7.428; p = 0.014) treatments compared to restorative dentistry specialists for Case 4. The preference of prosthodontists for endocrown and post-crown restorations may reflect their specialty training, which emphasizes prosthetic and indirect approaches, whereas restorative specialists tend to favor more conservative, tooth-preserving strategies.

There were significant differences between the treatment options chosen for a cavity without a lingual wall (Case 3) and a cavity without a buccal wall (Case 6). In Case 3, 44.2% of the participants chose fiber

post + crowns, while in Case 6, 69.9% chose post + crowns. While no participant chose extraction in Case 3, an average of 6.8% of participants opted for extraction in Case 6. The highest extraction rate was observed among general dental practitioners. This suggests that the absence of functional tubercles could affect the treatment option selection of all participants.

A total of 39 participants (5.1%) had more than 20 years in practice. This was a low rate that could be explained by the fact that those with more years of experience are likely to be older and less familiar with using the internet and digital surveys compared to their younger counterparts. Accordingly, the group of participants with fewer than 10 years of clinical experience showed a very high response rate of 79%. A possible reason for this finding could again be the higher incidence of internet use among younger age cohorts. According to another survey, this participant rate is not surprising [12]. In the present study, no significant association was found between years of clinical experience and restoration preferences across all cases ($p > 0.05$), except for Case 4 ($p = 0.007$). For this case, the decline in the preference for post + core with crown restorations among more experienced clinicians appears to indicate a tendency toward more conservative strategies, such as endocrowns or inlay/onlay restorations. These approaches are advantageous in preserving a greater amount of remaining tooth structure, which is particularly relevant in clinical scenarios where the cavity extends 2 mm above the CEJ, as demonstrated in Case 4.

The findings of the present study are supported by the findings of Ratnakar et al.'s study, which found that when coronal damage is minimal, a conservative treatment in the form of composite resin restoration should be considered [27]. When a tooth has more than 50% of the coronal structure missing, the use of a post and core foundation is recommended. A prefabricated post with a restorative core build-up material is widely used [25]. However, to the best of our knowledge, the impact of specialty in dentistry on treatment decision making has not been studied. In addition, because our study presents cases in the form of photographs, the decision made the participants is likely to be more realistic.

When the institutions of the participants and their treatment selections were compared, it was found that the endocrown selection was highly preferred by university hospital dentists in almost all cases. The reason for this may be that endocrown education is given in university faculties during the graduate period. In addition, the choice of tooth extraction was more often preferred in public hospitals. This may be because there are too many patients in public hospitals, and it may not be possible to spare time in public hospitals to treat cases in which the prognosis is seen to be poor, such as a hole cavity at the CEJ (Case 5) and a cavity without a buccal wall (Case 6). In Black's Class II mesio-occlusal-distal cavity (Case 2), dentists working in public hospitals were 8.537 times more likely to select composite restorations compared to those in private practice ($p = 0.045$). Their likelihood of choosing inlay/onlay/overlay restorations was significantly lower than that of private practitioners in cavity without a lingual wall (Case 3) ($p = 0.045$), which may be related to limited resources, restricted access to digital technology, or higher patient turnover in public institutions.

In previous studies, the post-endodontic treatment decisions of general dental practitioners and specialists were investigated for cases involving the presence of periapical lesions and for non-healing endodontic cases, in relation to the choice of implant, dental post presence/absence, and the choice of material type [11–13, 27–29]. In the current study, many treatment options were presented for the visually differently cases regardless of the material type. To the best of our knowledge, no study has yet investigated treatment choices for the restoration of endodontically treated lower first molar teeth among different specialties in dentistry.

One limitation of this web-based survey study is that it only compared treatment choices for the post-endodontic restoration of posterior teeth. Considering that aesthetic concerns are more prominent for anterior teeth, post-endodontic restoration studies on anterior teeth may attract more attention. Additionally, the use of a non-random, convenience sampling method and voluntary participation may have introduced selection bias. The sample may not fully represent the overall distribution of dental practitioners across different institutions and specialties, which could limit the generalizability of the findings. Moreover, this study was performed among dentists in Turkiye. Post-endodontic treatment choices among dental specialists and general dental practitioners working in other countries may differ. Although standardized clinical scenarios were provided in addition to photographs, the complexity of real-life decision-making—including biological, mechanical, and patient-related factors—could not be fully captured in this survey. Further studies may be beneficial to supplement the related literature.

Conclusion

In conclusion, there were significant differences between different groups of dentists with respect to their decision making in post-endodontic restoration. These findings demonstrate that updated treatment planning guidelines and further education regarding post-endodontic treatment is needed for practicing clinicians.

Abbreviation
CEJ Cementoenamel junction

Supplementary Information

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Supplementary Material 1.

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Authors' contributions
G.N.Ç. and B.A.A.U. contributed equally to the conceptualization of the study and the methodology. G.N.Ç. led the data curation, investigation, and writing of the original draft. B.A.A.U. led the formal analysis and supervision of the project. Both authors were equally involved in the validation process and participated in the review and editing of the manuscript. Both authors read and approved the final manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
This research involving human participants was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from Bezmialem Vakıf University Ethics Committee, approval number 06/100 (date: 05/05/2020). The ethical approval document has been submitted as an additional file. Informed consent to participate in the study was obtained from all participants. No participants under the age of 16 were included in the study.

Consent for publication
At the beginning of the survey, it was clearly stated that participation was voluntary and based on informed consent.

Competing interests
The authors declare no competing interests.

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