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Endodontic Treatment Preferences of Referring General Dentists: A Nationwide Survey
of Dentists

Spence Turner Gibbs

A Thesis submitted to the faculty of the Medical University of South Carolina in partial
fulfillment of the requirements for the degree of Master of Science in Dentistry in the
College of Dental Medicine.

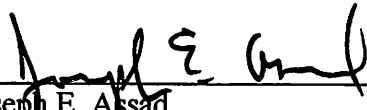
Department of Oral Rehabilitation

Division of Endodontics

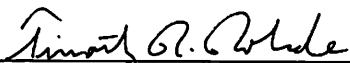
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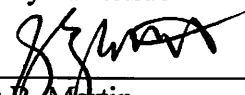
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SPENCE TURNER GIBBS. Endodontic Treatment Preferences of Referring General Dentists: A Nationwide Survey of Dentists Copper Iod. (Under the direction of JOE ASSAD)

Introduction: Previous research has recognized specific recommendations for improving referral relationships between endodontists and general dentists (GDs). Our study's purpose was to build upon previous research by exploring GDs' preferences on select radiographic treatment variables in order to calibrate expectations and improve collaborative referral relationships between endodontists and GDs. **Materials and Methods:** Researchers conducted a cross-sectional study that included a qualitative online survey of GDs in a convenience cohort from September 1st-September 22nd 2017. The two groups included in the survey were members of the South Carolina Dental Association (SCDA) and United States Army Dental Corps. The survey was comprised of ten questions that addressed preference of post endodontic treatment radiographs, participant characteristics, and referral patterns. The radiographic variables studied were working length, sealer extrusion, canal taper, apical tip size preparation, and surgical root resection length. **Results:** Of the 1,762 active members of the SCDA and 846 dentists in the US Army Dental Corps who were sent the email, 467 dentists completed the survey, a response rate of 17.9%. The total GD respondents (n = 339) represented a variety of regions in the United States. The total number of endodontists represented in the study was 45 (9.6% of the total respondents). Results of GD respondent date of dental school graduation were skewed towards younger graduates: before 1980 (15%; n = 51), between 1980-2000 (27%; n = 92), and after 2000 (58%; n = 196). Seventy-five percent of GDs preferred endodontic obturation material to extend to the radiographic apex versus 1 mm

short. Sixty-seven percent of GDs preferred to see sealer extrusion versus not. When analyzing apical tip preparation, GDs preferred a larger apical preparation size (54%) versus a smaller one (32%). Regarding surgical root resection length and canal taper, GDs preferred a more conservative treatment approach for both variables (66% and 67%). The majority of GDs (55%) said that treatment quality was most influential when deciding which endodontist to refer to. **Conclusion:** The current study identified GD preferences regarding five treatment variables when viewed from a post treatment radiograph. The study also revealed that GDs value treatment quality the most when determining what endodontists to work with. More in depth research on ways GDs determine endodontic treatment quality would be beneficial to the endodontic profession.

Introduction

Recent studies reveal the majority (68.5%) of root canal procedures completed in the United States are performed by general dentists (GD) (1) and that most patients (almost 9 out of 10) take the advice of their GD when choosing between an extraction and root canal therapy (RCT) (2-4). Moreover, dental patients receive most of their information about endodontists from their GD provider (2-4). As developments in endodontic technology and materials continue to be heavily marketed towards GDs, endodontists are compelled to align their treatment plans with their referring GDs. In 2015, Lin et al found that 56.3% of endodontists reported that they were not as busy as they would like to be, while only 3% of endodontists reported that they were too busy. These trends suggest the dependency endodontists have on positive referral relationships with GDs.

In 2009 and 2012, the American Association of Endodontists (AAE) Public and Professional Affairs Committee (PPRC) commissioned a survey of GDs to determine characteristics associated with increased referrals to endodontists (5). In response, Abbott et al 2011 identified recommendations for improving referral relationships between endodontists and GDs. Recommendations included: information sharing (i.e., answering technical and procedural questions, sharing information updates, requesting feedback) and patient-related services (patient care collaboration, shared treatment philosophy, timely exchange of patient information, and referring RCT cases back to GDs for restorative work).

Our study's purpose was to build upon previous research by exploring GDs' preferences on select radiographic treatment variables in order to calibrate expectations and improve collaborative referral relationships between endodontists and GDs. To our knowledge, there has not been a study in the literature seeking to identify GD preference on working length, sealer extrusion, canal taper, apical tip preparation, and surgical resection length from a post treatment radiograph.

Materials and Methods

The research team conducted a cross-sectional study that included a qualitative online survey of GDs in a convenience cohort from September 1st 2017- September 22nd 2017. The two groups included in the survey were members of the South Carolina Dental Association (SCDA) and United States Army Dental Corps. The survey link was distributed to GDs by sending an email invitation to participants using surveymonkey. Those who followed the survey link indicated their consent to participate and all submissions were anonymous. No attempt was made to contact nonrespondents.

Two research questions were examined: (1) Do GDs have post-endodontic treatment preferences and (2) if they do, are GD preferences in concordance with accepted evidence based endodontic practice preferences? The independent variable observed was the dental school graduation year of respondents.

The survey was comprised of ten questions that addressed preference of post endodontic treatment radiographs, participant characteristics, and referral patterns. The radiographic variables were included because of their ease of distinction on a two

dimensional radiograph and the ability of each variable to be manipulated clinically by the endodontists during different phases of treatment.

The radiographic variables studied were:

1. Working length
2. Sealer extrusion
3. Canal taper
4. Apical tip size preparation
5. Surgical root resection length

Each radiographic variable was represented by one question, each consisting of two photoshopped radiographic images with a corresponding answer choice. For each question, participants were asked to select their radiographic preference: A (radiograph A), B (radiograph B), or C (no preference). Five other questions were included to gain more understanding of preference and participant characteristics, such as time of dental school graduation and location of practice.

SAS version 9.4 software was used for data analysis. Descriptive statistics (frequencies and means) were conducted to summarize overall results and bivariate analysis, using chi-square, to determine statistically significant differences ($p < .05$) within demographic groups.

Results

Of the 1,762 active members of the SCDA and 846 active dentists in the US Army Dental Corps who were sent the email, 467 dentists clicked on the survey link and completed the survey for a 17.9% response rate. Eighty-three (17.8% of the total respondents) answered that they did not practice general dentistry but practiced another dental specialty besides endodontics. Since they did not meet the inclusion criteria, their data was discarded from the final statistical analysis. The total GD respondents (n=339) represented a variety of regions in the United States. Results of GD date of dental school graduation were skewed towards younger graduates: before 1980 (15%; n = 51), between 1980-2000 (27%; n = 92), and after 2000 (58%; n = 196). The total number of endodontists represented in the study was 45 (9.6% of the total respondents). A separate data analysis was conducted to compare results of endodontists versus GDs.

Overall Results

A large majority, 75% (n = 255), of GDs preferred endodontic obturation material to extend to the radiographic apex. Only 17% of GDs preferred the root filling 1mm short of the radiographic apex. In regards to root canal sealer extrusion, the majority of GDs, 67% (n = 226) preferred to see sealer extrusion versus not (23%). One in ten GDs had no preference regarding sealer extrusion. When analyzing the apical tip preparation size of the root canal, GDs preferred a larger apical preparation size (54%, n = 183) versus a smaller one (32%, n = 108). Regarding surgical root resection length, 66% (n =223) of GDs preferred a conservative, .5 to 1mm resection, versus a greater resection length of 3 to 4mm. A similar finding existed with canal taper. A majority of GDs preferred to have a more conservative canal taper, 67% (n = 228) versus a larger tapered

canal at 25%. The top two answer choices when asked what most influences your radiographic endodontic preferences were: longevity of treatment outcome (44%; n = 149) and my dental education/how I was taught (37%; n = 125). The majority of general dentists, 55% (n = 187) said that treatment quality was most influential when deciding which endodontist to refer to. Only 23% said they were required to refer endodontic treatment in their group practice while 11% felt that positive patient feedback was most influential.

When directly comparing endodontists and GDs, there was a statistically significant difference found in regards to working length and sealer extrusion. 75% of GDs reported preference for root filling termination at the radiographic apex while only 40% of the endodontists preferred obturation to the radiographic apex ($p = .0001$). A slight majority, 42% of endodontists preferred obturation material 1mm short of the apex, while 18% had no preference. In regards to sealer extrusion, 67% of GDs surveyed preferred sealer extrusion beyond the apex while only 36% of endodontists preferred visible sealer extrusion ($P = .0002$). 42% of endodontists preferred no sealer extrusion beyond the radiographic apex while 22% had no preference.

Demographic Differences

When comparing dental school graduation date for the 3 groups studied, 4 out of the 5 radiographic variables analyzed had no statistical difference ($p < .05$). However, when comparing surgical resection length, recent dental school graduates were more likely to prefer a greater surgical root resection length than the other 2 groups studied ($p = .0046$).

Question #1. Which working length obturation do you feel reflects the highest quality of care for tooth #20?



GENERAL DENTISTS

A: **75.2%**

B: **16.8%**

C (NO PREFERENCE): **8.0%**

Figure 1. Working length results

Question #2. Which obturation do you feel reflects the highest quality of care for tooth #20?



GENERAL DENTISTS

A: **22.7%**

B: **66.7%**

C (NO PREFERENCE): **10.6%**

Figure 2. Sealer extrusion results

Question #3. Which obturation apical tip diameter do you feel reflects the highest quality of care for tooth #13?



GENERAL DENTISTS

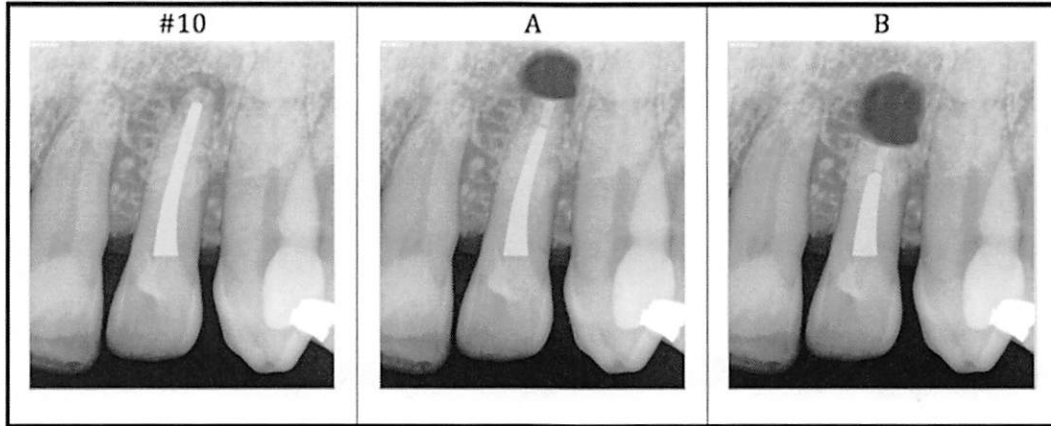
A: **31.8%**

B: **54.0%**

C (NO PREFERENCE): 14.2%

Figure 3. Apical tip size preparation results

Question #4. Which apical resection length do you feel reflects the highest quality of care for tooth #10 (preoperative PA represented on the left) after endodontic microsurgery?



GENERAL DENTISTS

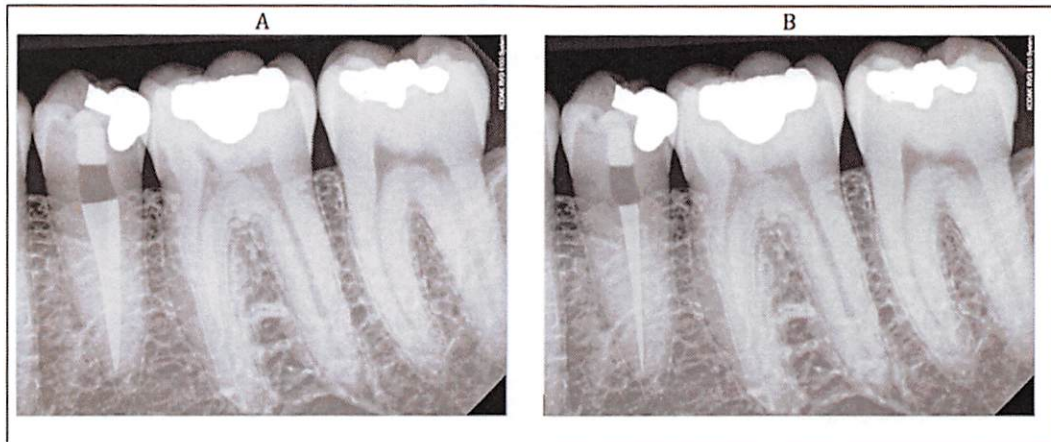
A: **65.8%**

B: **28.6%**

C (NO PREFERENCE): 5.6%

Figure 4. Surgical root resection lengths results

Question #5. Which obturation taper do you feel reflects the highest quality of care for tooth #20?



GENERAL DENTISTS

A: **25.4%**

B: **67.3%**

C (NO PREFERENCE): 7.3%

Figure 5. Canal taper results

Table 1: Chi-square analysis comparing GDs graduation date and resection length

When did you graduate from dental school?	Q4 (p-value=0.0046)		
	A	B	C - No preference
1980-2000	69 75.00	21 22.83	2 2.17
After 2000	113 57.65	68 34.69	15 7.65
Before 1980	41 80.39	8 15.69	2 3.92

Table 2: Chi-square analysis comparing GDs and endodontists for working length

Do you practice general dentistry?	Q1 (p-value<0.0001)		
	A	B	C - No preference
Dentist	255 75.22	57 16.81	27 7.96
Endodontist	18 40.00	19 42.22	8 17.78

Table 3: Chi-square analysis comparing GDs and endodontists for sealer extrusion

Do you practice general dentistry?	Q2 (p-value=0.0002)		
	A	B	C - No preference
Dentist	77 22.71	226 66.67	36 10.62
Endodontist	19 42.22	16 35.56	10 22.22

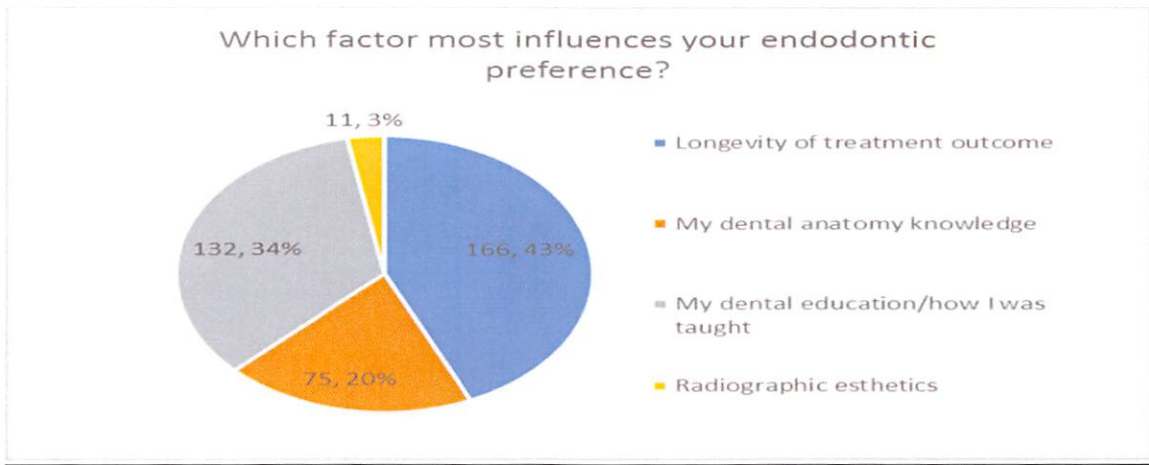


Figure 6. Endodontic preferences

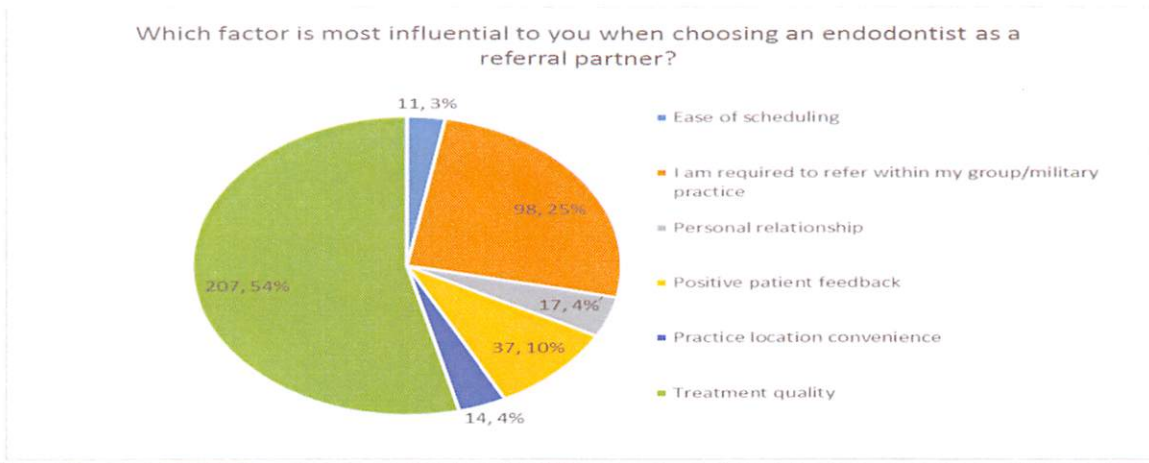


Figure 7. Referral preferences

Discussion

Previous research has revealed that most people acquire information about endodontists from their GDs (2-4) and most U.S. adults would consider the advice of their GD when deciding between saving their natural dentition with RCT or extraction (2-4). Despite the deference to GDs in the referral decision, few studies have surveyed GDs about their perceptions of endodontists and factors that are associated with increased referrals to endodontists (5,6).

As previously mentioned, Abbott et al 2011 outlined nine recommendations for how endodontists could increase referrals from GDs. It was shown that GDs who perceive endodontists as care delivery partners are more likely to refer their patients (5). As such, we sought to explore GD post-endodontic radiographic treatment preferences, and if their preferences were concordant with endodontists. Understanding preferences may enhance collaborative referral relationships between GDs and endodontists. Interprofessional communication through radiographs may potentially facilitate positive referral partnerships between GDs and endodontists.

To date, the post-operative periapical (PA) radiograph of the treatment area is the primary visual communication tool for the endodontist. In an attempt to gain information about current GD treatment philosophy, preference, and feedback this survey utilized photo-shopped post-operative PA radiographs to analyze five different manipulated variables of endodontic treatment: working length, sealer extrusion, apical tip preparation, canal taper, and surgical resection length. The authors feel that by gaining knowledge of these treatment preferences from the GD perspective, endodontists will be better equipped and calibrated to begin dialogue on accepted evidence based endodontic

practices with their referral base. Consequently, we believe this information opens the door for greater relationship building, increased referrals, and better treatment for patients.

The present study identified that most GDs have similar radiographic endodontic preferences. Most GDs preferred obturation material extending to the radiographic apex. When choosing between sealer extrusion or not, most GDs preferred extrusion beyond the radiographic apex. GDs also preferred a larger apical tip preparation when compared to a smaller apical tip diameter. A smaller surgical resection length (1mm) and a more conservative canal taper were preferred. When analyzing specific differences when comparing time of dental school graduation, there was only one significant difference found among the variables studied. Graduates after the year 2000, were more likely to prefer a greater surgical root resection length than the other two age groups ($p < .05$). Contemporary surgical endodontic technique calls for a zero beveled (or less than 10 degrees) 3mm root-end resection (7-9) with a 3mm deep ultrasonic root-end preparation (7-9). Communication and education with more veteran GDs who graduated before 2000 may be beneficial for the endodontists who wish to strengthen referral relationships with GDs while also supporting the adoption of modern practice.

Coming to a clearer understanding of what specific preferences GDs most value when it comes to endodontic treatment was a major goal of this research. This survey identified that treatment quality was the most influential factor when making an endodontic referral and choosing an endodontist to work with, as reported by 55% of GDs. Yet the authors feel it cannot be overlooked that while treatment quality was valued most by GDs, some radiographic preferences were in contradiction to evidence based

endodontic practice. This dichotomy between treatment quality and evidence supports the importance of calibrating and educating referring GDs, ultimately facilitating better treatment for endodontic patients.

Statistically significant differences between endodontists and GDs were observed in working length and sealer extrusion preference. These differences may be attributed to the variations in training programs for endodontists and GDs

The design and methodology of this study are frequently used in market research to obtain results that serve as a basis for strategic and fact-based planning (10). Study limitations include a low response rate (including small sample sizes for some demographic groups) and the inability to generalize results to the overall GP population. Also our data may have a regional bias with the majority of our respondents (58%) having been trained in the Southeast region.

As previously mentioned in the literature, studies to explore the factors that contribute to unfavorable perceptions of endodontists and factors that increase the likelihood that GPs would perform a root canal rather than refer to an endodontist might be an interesting compliment to this study. A study exploring the knowledge and perceptions of GPs on the use of new disinfection technologies (lasers, PIPS, multisonic) in endodontics would be advantageous for the endodontist who is practicing in more competitive markets and may be looking for a way to differentiate him or herself from the competition.

Conclusion

The identification of preferred radiographic variables of GDs when viewing post-operative endodontic radiographs is another attempt in addressing the complex relationships involved in referral behavior. The current study identified GD preferences regarding endodontic working length, sealer extrusion, apical tip size preparation, surgical resection length, and canal taper from a post treatment radiograph. The study also revealed that GDs value treatment quality the most when determining what endodontist to work with. More in depth research on ways GDs determine endodontic treatment quality would be beneficial to the profession.

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