ADA CE Program ARTICLE 2

Techniques and materials used by general dentists during endodontic treatment procedures

Findings from The National Dental Practice-Based Research Network

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ABSTRACT

Background. Little is known about which materials and techniques general dentists (GDs) use during endodontic procedures. The objectives were to quantify GDs' use of specific endodontic tools, quantify inappropriate use, and ascertain whether inappropriate use is associated with GDs' practice characteristics.

Methods. GDs in The National Dental Practice-Based Research Network reported in a questionnaire materials and techniques they use during endodontic procedures.

Results. Among eligible GDs, 1,490 (87%) participated. Most (93%; n = 1,383) used sodium hypochlorite to irrigate. The most commonly used sealers were zinc oxide eugenol (43%) and resin (40%), followed by calcium hydroxide (26%). Most (62%; n = 920) used a compaction obturation technique; 36% (n = 534) used a carrier-based method. Most (96%; n = 1,423) used gutta-percha as a filler; 5% used paste fillers. Few used irrigants (n = 46), techniques (n = 49), or fillers (n = 10) that investigators classified as inappropriate.

Conclusions. GDs use a broad range of endodontic techniques and materials, often adapting to newer technologies as they become available. Few GDs use tools that the investigators classified as inappropriate.

Practical Implications. GDs use many types of endodontic techniques and materials, but only a small percentage of them are inappropriate.

Key Words. Dentistry; endodontic materials; endodontic procedures; general dentist; paste obturation; practice-based research.

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The tools available for endodontic treatment continue to evolve and improve, offering clinicians an increasing range of treatment options. Only limited evidence is available regarding how general dentists (GDs) have adapted to these changes, such as whether they have adopted newer technologies and maintain endodontic practice consistent with the latest scientific evidence. Such studies are rare and are generally at a low level of evidence.

Savani and colleagues[1] surveyed 2,000 GDs, finding that most had adopted the more-recent endodontic technologies, such as nickel-titanium (NiTi) rotary instruments, and that more-recent graduates were more likely to have adopted newer technologies. A limitation of the study was a low response rate: 479 responded (24%).

Some endodontic materials and techniques have substantial evidence of effectiveness and, therefore, are appropriate for routine use. We consider others inappropriate, such as irrigants that are not antimicrobial, because early infections may not be clinically apparent. Single-cone techniques lack sufficient research regarding long-term success and, therefore, are controversial.[2-5] Paste fillers are considered inappropriate because of

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difficulties in controlling placement in canals and because many contain formaldehyde.[6]

Gutta-percha has stood the test of time, most often paired with a zinc oxide eugenol (ZOE)–based sealer. Gutta-percha on rigid carriers has become popular, with results from even the earliest studies showing a seal equivalent to that of conventional gutta-percha compacted either with heat or at ambient temperature.[7] We consider single-cone techniques inappropriate because they may not obturate the canal adequately. Paste fillers have fallen from favor mostly because of the difficulty in controlling the material and the inclusion of harmful ingredients.[8-12] Use of paraformaldehyde-containing sealers to obturate canals has never been taught in any US dental school.[13] Results from Newton and coworkers' classic long-term study[6] showed effects of this material in primates; they found that periapical inflammation predominated, whereas the untreated controls showed no inflammation. The objectives of our study were to quantify GDs' use of specific endodontic materials (types of instrumentation files, irrigation solutions, sealers, and fillers) and obturation techniques, identify and quantify inappropriate use, and ascertain whether inappropriate use is associated with dentists' practice characteristics.

METHODS

The National Dental Practice-Based Research Network is a consortium of dentists and dental organizations focused on improving the scientific basis for clinical decision making.[14] Its mission is to improve oral health by conducting dental practice-based research and by serving dental professionals through education and collegiality. It is committed to maximizing the practicality of conducting research about clinical practice across geographically dispersed regions and diverse practice types. Many details about the network are available at its Web site: www.nationaldentalpbrn.org. This study was approved by the respective institutional review boards of each of the network's regions.

Enrollment questionnaire. As part of the network enrollment process, practitioners complete an enrollment questionnaire that describes characteristics about themselves, their practices, and their patient populations. The full questionnaire is publicly available.[15]

Questionnaire on endodontic care practices. After confirming on the questionnaire itself that the GD was still a GD and that he or she performed at least 1 endodontic procedure each month, respondents were asked about categories of instrumentation, irrigation, sealer choice, obturation technique, and obturation material. Each topic had specified categories, as well as an *other* category in which practitioners could describe items not listed; there were no limits to the number of responses allowed. Instrumentation preferences were categorized into NiTi hand files, engine-driven NiTi files of any rotary pattern, stainless steel hand files, and rotary files of any type. Irrigation agents included normal saline, sodium hypochlorite, local anesthetic solution, hydrogen peroxide, and chlorhexidine. Sealer preference categories were ZOE, epoxy resin, calcium hydroxide, and glass ionomer. Obturation technique choices were lateral and vertical compaction, continuous wave, thermoplasticized injection, carrier-based (gutta-percha) techniques, thermomechanical compaction with rotary instruments, and paste. Obturation material options were gutta-percha (Resilon, a filled aliphatic polyester-with-resin sealer; Resilon Research, LLC), resin-coated gutta-percha, endodontic paste, and apical barrier (for example, MTA, Dentsply International).

Administration of questionnaire on endodontic care practices. By January 31, 2014, more than 5,000 people had completed an enrollment questionnaire; 1,876 were invited to participate in the questionnaire because they met these 4 criteria: GD; currently practicing and seeing patients; reported performing at least some endodontic procedures; and selected the *limited* or *full* participation levels, as compared with the *information only* level of participation in the network. We mailed preprinted invitation letters to eligible practitioners, inviting them to participate and informing them they would receive an e-mail with a link to the electronic version of the questionnaire with the option for a paper version.

We asked practitioners to complete the questionnaire within 2 weeks. We sent reminder letters after the second and fourth weeks, if needed. After 6 weeks, we sent e-mail and postal reminders. After 8 weeks, each practitioner was sent a final postal questionnaire. If we did not receive a response within 2 weeks, a regional coordinator followed up these dentists. Data collection was closed 12 weeks after the original e-mail invitation. We remunerated practitioners or their business entities $50 for completing the questionnaire if they confirmed at the end of the survey that they would like remuneration (84% of respondents requested remuneration). We collected data from February 2014 to July 2014.

To document the reliability of these questionnaire items, 43 respondents completed the same questionnaire twice online. The mean (standard deviation) time between test and retest was 15.5 (3.0) days. We quantified the agreement between time 1 and time 2 by using a mean weighted κ score, which was 0.62, with an interquartile range of 0.46 to 0.79. Table 1 shows the characteristics of GDs and their practices.

Statistical methods. We ascertained the overall frequency of types of instruments, solutions, obturation techniques, sealers, and fillers used for performing endodontic procedures (Table 2). We reviewed all items specified in the *other* option and grouped them into existing types or defined new ones. We then categorized these types of instruments, solutions, obturation

ABBREVIATION KEY. **GD:** General dentist. **NiTi:** Nickel-titanium. **ZOE:** Zinc oxide eugenol.