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Original Article

Endodontic malpractice litigations in the United States from 2000 to 2021

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KEYWORDS

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Abstract *Background/purpose:* Little is known regarding the outcomes and distinguishing characteristics of lawsuits related to endodontic procedures. This study used a verdict-based data from United States of America to analyze the factors associated with endodontic malpractice lawsuits and mitigate the risk of litigation.

Materials and methods: The LexisNexis legal database was used to search for endodontic malpractice cases from January 1, 2000 to December 31, 2021 using the terms “medical malpractice” and (I) “endodontist” (II) “endodontics” (III) “root canal” (IV) “dental pulp.” Each case was reviewed for reported medical characteristics and litigation outcomes.

Results: A total of 650 cases were initially identified, and 97 cases were included in the final analysis. Eighty-four (86.6%) of the 97 defendants were general practitioners; 42 cases favored the plaintiff, 53 (54.6%) favored the defendant, 1 was partial win/loss, and 1 was settled. The annual case mean was 4.41 ± 2.17 (Mean \pm SD). The major allegations favored for the patients involving paresthesia, root perforation, rubber dam not use, wrong tooth therapy, and infections. Plaintiffs who claimed with post-procedural reasons had a significantly higher winning rate than non-post-procedural reasons ($P < 0.05$).

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Conclusion: In the present study, 54.6% of endodontic litigation favored the dentists in the US. The authors recommend that general practitioners refer complicated cases to endodontists and treat carefully to avoid paresthesia, canal perforation and infections. Clinicians should always diagnose and treat correctly, shared decision making with the patient, use rubber dam routinely, and timely management to prevent malpractice claims.

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Introduction

Medical dispute seems to become an epidemic issue.¹ Malpractice denunciations are pervasive around the world over the past few decades.² In the United States (US), 7.4% of physicians were involved in a malpractice claim annually, and 75%–99% of physicians in different specialties faced a claim before the age of 65.³ Compensation payments for disputes involving errors were significantly higher than non-errors.⁴ Because of the threat of malpractice liability, 93% of physicians in specialties at high risk of litigation practiced defensive medicine.⁵ In Germany, disciplines most frequently confronted with malpractice charges were orthopedics and accident surgery (30.2%), dentistry (16.4%), general surgery (12.1%), and obstetrics/gynecology (7.8%).⁶ Dentistry was the second most frequent discipline confronted with claims of medical malpractice so that the dentist should pay attention to the malpractice lawsuit. In Taiwan, it is surprising that dentists failed in 35.7% of criminal convictions in malpractice litigation.⁷

Essentially, elements of dental malpractice are almost the same as medical malpractice, wherein a dental professional fail to follow the standards of care, thereby harming the patient.⁸ Among the various divisions in dentistry, cases related to endodontics are commonly filed for malpractice claims.⁹ Endodontic litigation has been addressed in the past 50 years. The first article on endodontic litigation, published in 1973, mentioned that the cases was increasing.¹⁰ Givol et al. analyzed the endodontics-related complaints reported to the Medical Consultants Company during 1992–2008 and found that 520/720 complaints were justified. Additionally, operator errors typically occurred during the intra-procedural phase, specifically during instrumentation (49%).¹¹ This may be because the canal system is extremely variable and can exhibit unusual curvatures. Moreover, root canal therapy (RCT) is a technique-sensitive process involving extensive use of breakable instruments.

Endodontic intervention of damaged teeth constitutes a main part of services provided by dentists worldwide. RCT may save the health and function of the tooth. However, failures in management may lead to malpractice claims. Endodontic litigations pose heavy economic and emotional burdens on dentists. Identification of the factors affecting litigated cases has practical implications. Currently, most materials used to analyze endodontic disputes were obtained from professional liability insurance databases.^{12–14} On the contrary, verdict-based surveys^{15,16} regarding endodontic malpractice lawsuits are lacking. The proximate

causes and judgments of endodontic legal actions are not clear. Therefore, this study investigated the verdicts of endodontic malpractice lawsuits in the US. We aimed to explore the court decisions and distinguish the characteristics of claims related to endodontic procedures. Our findings may contribute toward prevention of endodontic litigations and improvement of medical quality and public welfare.

Materials and methods

Study design and cases screening

The LexisNexis (Dayton, OH, USA) online legal academic database contains case law from US Court decisions. These data were used to search for endodontic treatment-related litigations in the US, from January 1, 2000, to December 31, 2021. A Boolean search was conducted using four strategies with the terms “root canal treatment” & (I) “endodontist” (II) “endodontics” (III) “root canal” (IV) “dental pulp.” Investigators then evaluated the results for relevance to endodontic lawsuits. For the case that has more than one judgment, only the eventual verdict was included. All information regarding the decision year, plaintiff’s gender, defendant’s specialty, malpractice allegations, and final decisions were summarized and cross-reviewed. The allegations were categorized as pre-, intra-, and post-procedural.¹⁶ This study was exempt from the approval of IRB because all data were publicly available.

Statistical analysis

Data were analyzed using chi-squared or Fisher’s exact test for categorical variables based on plaintiff’s demographics, defendant’s qualifications, allegations and outcomes. Statistical significance was indicated by a two-sided $P < 0.05$.

Results

The authors collected 650 cases via the Boolean search, including 71, 65, 441, and 73 from strategies (I) to (IV), respectively, and 2 additional yielded through manual research. Information contained in the 652 initially identified cases were reviewed for relevance. Of the 555 excluded cases, 121 were duplicates in the four search strategies, 265 comprised complaints raised by inmates regarding deliberate indifference, in violation of the *Eighth Amendment*.¹⁷ The remaining 169 were not

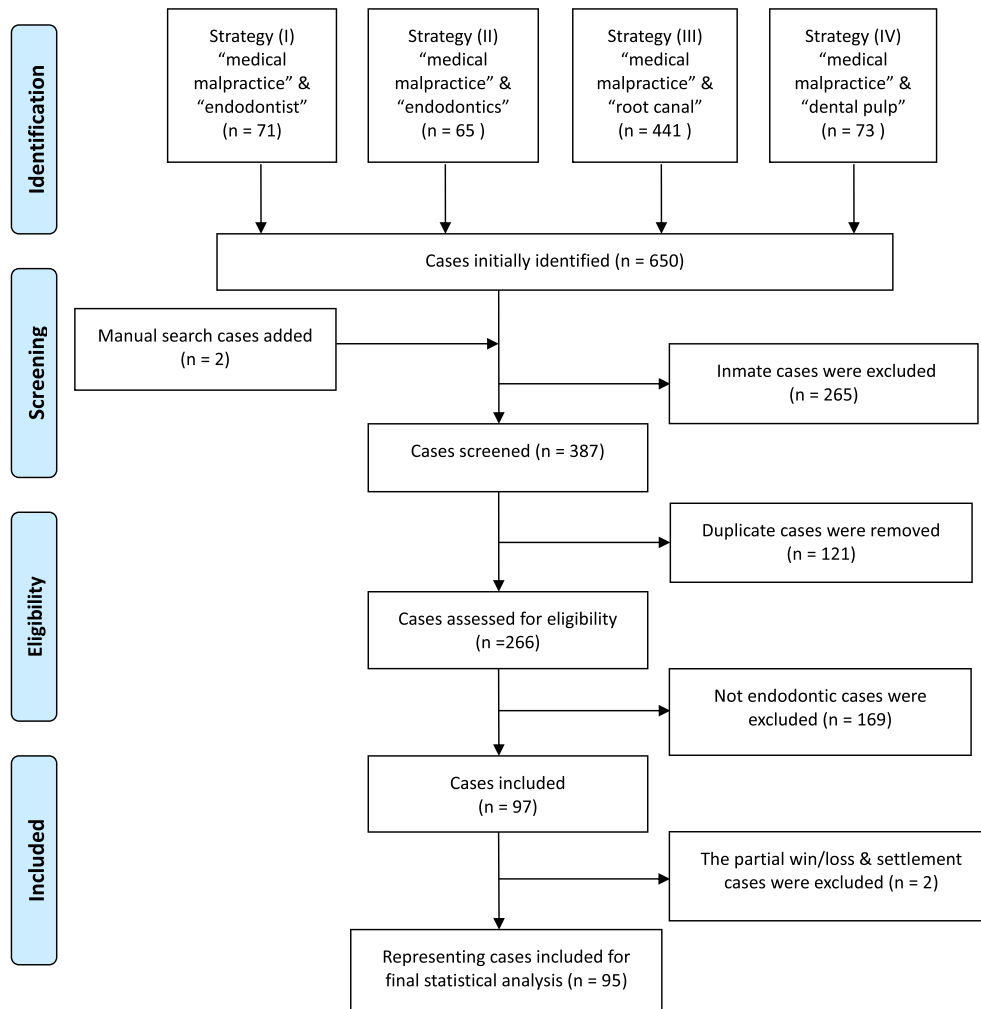


Fig. 1 Cases collection for endodontic malpractice litigation in US.

associated with endodontics. Thus, 97 cases met the inclusion criteria (Fig. 1).

Characteristics of endodontic malpractice cases

Annually, the mean case number was 4.41 ± 2.17 (Mean \pm SD). No significant trend was observed in the number of verdicts based on the year of decision (Fig. 2). Characteristics of cases are presented in Table 1. The plaintiffs were 36 males (37.1%), 59 females (60.8%), and 2 (2.1%) were couples. The defendants won in 53 cases (54.6%) and the plaintiffs in 42 (43.3%), whereas 1 ended with a partial win/loss and 1 with a settlement. General practitioners (GPs) were most commonly involved with the lawsuits (86.6%).

Further analysis of the 95 representing cases, after excluding the partial win/loss and settlement cases ($n = 2$), revealed no significant difference in winning rate either between male/female or GPs/endodontists in defendant-prevailed/plaintiff-prevailed groups. Among these 95 cases, 39 cases had one claim of allegation, 36 cases had two, 11 cases had three, 5 cases had four and 4

cases had five claims of allegations. When allegations were categorized according to the operating procedure, 43 of 95 (45.3%), 74 of 95 (77.9%), and 33 of 95 (34.7%) cases had pre-, intra-, and post-procedural allegations, respectively. Plaintiffs who claimed with post-procedural reasons had a significantly higher winning rate than those who claimed with non-post-procedural reasons ($P < 0.05$; Table 2).

Rationales for lawsuits and court decisions

There were 184 allegations among the 95 cases. Lawsuits were mainly filed due to improper instrumentation or obturation ($n = 36$), and 13 plaintiffs (36.1%) prevailed among these cases. Improper diagnosis ($n = 15$), insufficient information or failure to obtain informed consent (IC; $n = 26$), injury to anatomy ($n = 12$), broken instrument ($n = 18$), and infections ($n = 20$) were the other major allegations, and 7 (46.7%), 9 (34.6%), 8 (66.7%), 9 (50%), 15 (75%) plaintiffs prevailed, respectively. The dentists were liable in all allegations involved with failure to use rubber dam (RD; $n = 2$; 100%) and paresthesia ($n = 8$; 100%); in 5 of the 6 allegations that involved root perforation ($n = 6$;

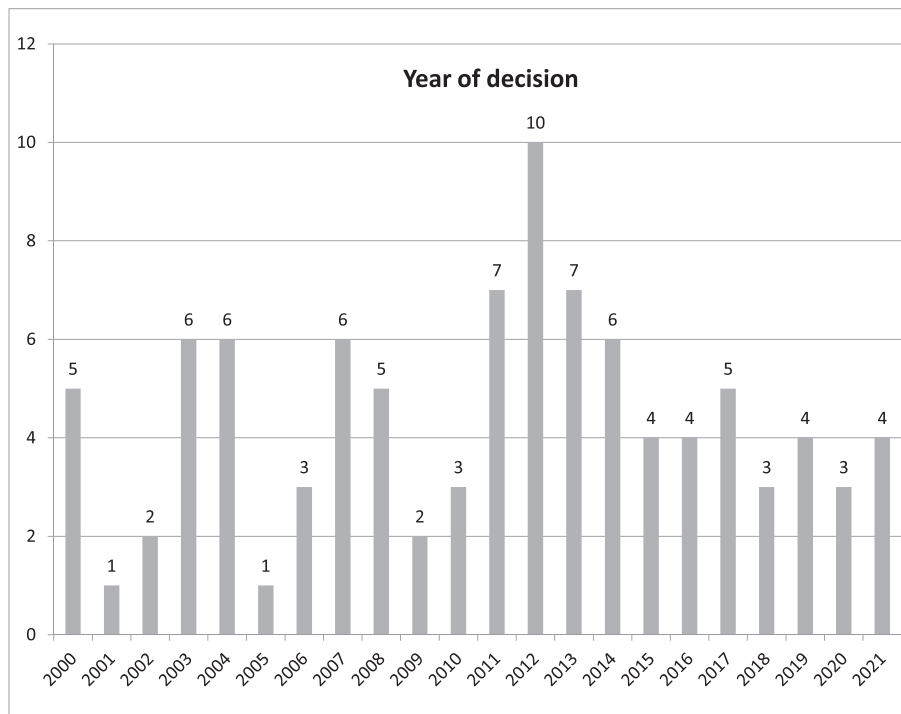


Fig. 2 Year of decision for endodontic malpractice litigation in US.

83.3%) or wrong tooth treatment (n = 6; 83.3%). In contrast, the patients failed in 5 of the 7 allegations of improper anesthesia (n = 7; 71.4%) (Table 3).

Discussion

Modern society is characterized by a culture of high expectations, and patients file legal actions when they are dissatisfied with a service or outcome. The prevalence of

pain following root canal obturation reportedly ranges from 9.6% to 12%.^{18,19} Thus, probably, 10% of patients who undergo RCT are potential plaintiffs.

The current study tries to present the actual situation of endodontic malpractice litigation in the US. However, the withdrawn cases were not available and might cause underestimation of the real claims. Here, we could just identify 97 cases. In general, endodontic claims were settled and resolved via liability insurance,²⁰ just a small part proceeded to litigation. Therefore, cases enrolled in the present study is lesser than studies utilized insurance data.^{12–14} Moreover, original information regarding tooth position, reason for RCT, instrumentation or obturation method, recording chart and radiographs couldn't be accessed. The above are the limitations.

Dentists were found liable in 42 of the 97 cases (43.3%) (Table 1). This result is approximate to that reported by Bjørndal et al.,¹² wherein in 179 of the 482 (37.1%) endodontic claims, the dentist was liable, as determined by the Danish Dental Complaints Board. Furthermore, women file more lawsuits than men (60.8% vs. 37.1%), probably because women undergo more dental therapy than men.^{11,21} This finding is almost consistent with the report by Rosen et al. (women, 59.7%).¹⁴ In general, women are more concerned about oral health, demand more dental treatment, and therefore, have more opportunity to file a lawsuit.²²

Of the 95 representing cases, 43 (45.3%) consisted of pre-procedural allegations. Incorrect or delayed diagnosis and failure to obtain IC prior to the procedure were the major causes. A correct diagnosis and an appropriate treatment plan form the basis for a successful therapy. If a physician acts recklessly in diagnosis, the physician would be held liable for the causation of damages. Furthermore,

Table 1 Characteristics of cases with endodontic malpractice litigation in United States from 2000 to 2021. (N=97).

Gender of plaintiff	Case No (%)
Male	36 (37.11%)
Female	59 (60.82%)
Male & Female	2 (2.06%)
Defendant professional level	
Resident in endodontic department	2 (2.06%)
GPs ^a	84 (86.6%)
Endodontist	9 (9.28%)
GPs ^a & Endodontist	2 (2.06%)
Lawsuit outcomes	
Plaintiff (P)-prevailed	42 (43.30%)
Defendant (D)-prevailed	53 (54.64%)
Partial P/D-prevailed	1 (1.03%)
Settlement	1 (1.03%)
Total	97 (100%)

^aGPs: general practitioners

Table 2 Characteristics of representing cases with court decisions (N=95). Plaintiffs claimed with post-procedural reasons had significantly higher winning rate compared to Non post-procedural reasons.

	Plaintiff-Prevailed Verdict	Defendant-Prevailed Verdict	Chi-squared test
	N=42 (%)	N=53 (%)	P-value
Gender of plaintiff			0.2293
Male	13 (37.1%)	22 (62.9%)	
Female	29 (50%)	29 (50%)	
Male & Female	0 (0)	2 (100%)	
Defendant professional level			0.3637
Resident in Endo department	0 (0)	2 (100%)	
GPs ^a	37 (44.6%)	46 (55.4%)	
Endodontist	5 (62.5%)	3 (37.5%)	
GPs ^a & Endodontist	0 (0)	2 (100%)	
Pre-procedural allegation			0.2115
Non pre-procedural	26 (50%)	26 (50%)	
Pre-procedural	16 (37.2%)	27 (62.8%)	
Intra-procedural allegation			0.8875
Non intra-procedural	9 (42.9%)	12 (57.1%)	
Intra-procedural	33 (44.6%)	41 (55.4%)	
Post-procedural allegation			* < .0001
Non post-procedural	18 (29%)	44 (71%)	
Post-procedural	24 (72.7%)	9 (27.3%)	

*P < 0.05.

^aGPs: general practitioners.**Table 3** Rationales for lawsuits and court decisions. Because most cases had more than one allegation, there are 184 allegations in the 95 representing cases. The plaintiffs won all of the allegations regarding paresthesia (n = 8).

	Claims count	Plaintiff-prevailed group	Defendant-prevailed group	Fisher's Exact Test P-value
Pre-procedural allegation	n=57	n=24 (%)	n=33 (%)	0.6657
abandonment	3	2 (66.7%)	1 (33.3%)	
failing to refer	4	1 (25%)	3 (75%)	
improper treatment plan	9	5 (55.6%)	4 (44.4%)	
incorrect or delay in diagnosis	15	7 (46.7%)	8 (53.3%)	
insufficient information or IC ^a related	26	9 (34.6%)	17 (65.4%)	
Intra-procedural allegation	n=88	n=45 (%)	n=43 (%)	*0.0488
broken instrument	18	9 (50%)	9 (50%)	
failure to use rubber Dam	2	2 (100%)	0 (0%)	
improper local anesthesia	7	2 (28.6%)	5 (71.4%)	
improper instrumentation or obturation	36	13 (36.1%)	23 (63.9%)	
injury to anatomy	12	8 (66.7%)	4 (33.3%)	
NaOCl irritation	1	1 (100%)	0 (0%)	
root perforation	6	5 (83.3%)	1 (16.7%)	
wrong tooth	6	5 (83.3%)	1 (16.7%)	
Post-procedural allegation	n=39	n=29 (%)	n=10 (%)	0.0681
bleeding	1	0 (0%)	1 (100%)	
crack	5	2 (40%)	3 (60%)	
improper medication	3	2 (66.7%)	1 (33.3%)	
improper referral	2	2 (100%)	0 (0%)	
infections	20	15 (75%)	5 (25%)	
paresthesia	8	8 (100%)	0 (0%)	
Total	184	98 (53.3%)	86 (46.7%)	

*P < 0.05.

^aIC: informed consent.

in this study, 27.4% (26/95) of dentists were sued for insufficient information disclosure or failure to obtain IC. A successful healthcare treatment is usually accompanied by effective pre-procedural communication.²³ Mellor et al. reported that lack of communication was significantly more among dentists with official malpractice complaints.²⁴ Failure to obtain IC should be considered as an adverse event.²⁵ Roter et al. indicated that physician dominance is related to the likelihood of being involved in a malpractice claim. They also found that sued doctors were less likely to solicit the patient's opinions or understanding of the provided information.²⁶ Despite variations among states,²⁷ common points of IC include capacity, information, understanding, voluntariness, and choice.²⁸ Even though patients believe that they have understood well, they do not always exhibit adequate comprehension from their IC processes.²⁹ Improvements in the communication process with patient-centered shared decision-making might decrease the risk of liability claim.

Of the 95 cases, 74 (77.9%) consisted of intra-procedural allegations, indicating that intra-procedural errors, same as Givol's report,¹¹ continue to be the most common reason for litigation in endodontic therapy. Non-adherence to strict operating protocols causing substandard treatments was a common cause of malpractice claims. Improper performance (n = 36), broken instrument (n = 18), and anatomical injury (n = 12) were the three major allegations.

Improper performance indicates that the dentist fails to properly perform RCT and promptly treat an infection or adhere to the accepted standard of canal obturation. Instrument separation sometimes happens during RCT, especially in calcified or curved root canals. The consequences of separated rotary instrument may be related to manufacturing process, number and dynamics of instrument use, canal configuration and preparation technique, cleaning and sterilization procedures.³⁰ The file might fatigue during instrumentation, and there is an inherent risk of its breakage. Broken instrument can't be avoided by the exercise of reasonable care and won't be substantially a breach of the standard of care of endodontic therapy. If a piece of file is lodged and cannot be removed, the dentist should inform and refer the patient to an endodontist immediately. The dentist would be liable if this matter is fraudulently concealed, or if an infection is developed due to lack of timely referral. General dentists should review the Endodontic Case Difficulty Assessment Form and Guidelines to determine case complexity. A referral to an endodontist should be considered if the canals are not visible or the curvature (>30°) exceeds clinician's experience and ability.³¹ Infringement upon anatomical structures, such as the lip, mucosa, sinus, nerve, and artery during the enlargement or obturation procedure, can lead to serious complications. The inferior alveolar nerve (IAN) injury or mucosa burn due to NaOCl leakage was the common damage.

In 1980s, Cohen & Schwartz had indicated two intra-procedural errors considered as obvious departures from the standard of endodontic care: 1) failure to use a RD, 2) attempt to fill a canal with paste containing paraformaldehyde and steroids.³² Findings from the Dental

Practice-Based Research Network revealed that not all GPs used a RD.³³ In UK, it was reported that <19% of dentists used a RD routinely, and 44.5% of practitioners indicated that they had never used a RD.³⁴ Rubber dam can reduce the occurrence of anatomical injuries, such as chemical burns or instrument ingestion/inhalation, thereby minimizing the possibility of an endodontic litigation.

Root perforation is another major allegation for intra-procedural errors. Perforations complicate RCT procedure, and the perforated root usually needs to be repaired with mineral trioxide aggregate. In this study, dentists were found to be liable in majority of the claims pertaining to root perforation (83.3%). Supplementary radiographs or cone-beam CT for assessing the canal system might decrease the risk of pulp floor or canal perforation. We also found the majority of dentists were liable for performing RCT on the wrong tooth. Treating recklessly is considered negligence without a doubt. Careful identification of the offending tooth followed by patient's confirmation might aid in avoiding such mistakes. In contrast, patients failed in 5 of the 6 allegations of improper anesthesia. It is difficult for patients to obtain expert testimony to prove the causation of anesthetic damage. In the present study, a significant difference in court decisions between improper anesthesia with the various intra-procedural allegations was observed ($P < 0.05$; Table 3).

Causes of post-procedural allegations involve bleeding, cracks, improper referral or medication, infections, and paresthesia. Of the 95 cases, 33 included post-procedural allegations. It is noteworthy that a high proportion of dentists failed to counter these allegations (72.7%, $P < 0.05$; Table 2).

Previous studies demonstrate that flare-ups might appear in 1.5%–20% of cases following RCT, and they should be regarded as side effects and not as complications.³⁵ In rare cases, patients might develop cellulitis after endodontic treatment. Grönholm et al. evaluated the clinical and radiological findings of patients who presented with locally invading maxillofacial infections from odontogenic sources and required hospital care. Reportedly, unfinished RCT was the most common finding in patients hospitalized due to the local infections.³⁶ Patients with unfinished RCT have been associated with a higher risk of cardiovascular hospitalization.³⁷ In the present study, plaintiffs won in 15 of the 20 cases (75.0%) attributed to post-procedural infections. Thorough debridement of the canal system is essential to minimize the spread of infection. Timely referral to an oral-maxillofacial surgeon with early incision and drainage can minimize mortality and legal actions.

In the cases with post-procedural allegations, the dentists were found to be lost in all claims (n = 8) pertaining to paresthesia. In a recent systematic review, Alves et al. identified 40 cases of endodontic-related paresthesia over a 10-year period.³⁸ Although these incidents are relatively rare, their consequences are serious and may lead to life-long sufferings. Paresthesia following RCT is often caused by extruding filling materials or irrigants from the normal confines of the root causing nerve damages in the jaws. Givol et al. analyzed 16 claims of persistent numbness following RCT and found that most cases (n = 11, 69%)

occurred in the second mandibular molars.¹³ This might be due to the distance between the root apex and roof of the inferior alveolar canal, which is less than 1 mm in the case of the second molar and varies between 1 and 4 mm of the first molar.³⁹ RCT of the mandibular second molar poses a significant potential risk of IAN injury.⁴⁰ Sometimes, filling material was found to penetrate the apex of the mandibular second molar and damage the IAN. Other high-risk areas were located in the mandibular premolars and associated with the mental nerve. Care must be taken to maintain an appropriate working length and avoid over-instrumentation and excessive enlargement of the apical foramen, which favors extravasation of the filling material beyond the apex that could cause chemical or mechanical injury to the nerve. Most outcomes that favored the plaintiffs involved paresthesia and infection, a primary reason for a significantly higher number of patients who prevailed in cases pertaining to post-procedural than non-post-procedural allegations (Table 2; $P < 0.05$). These results may alert dentists about the focus of RCT and mitigate endodontic litigation.

In the current of globalization, the data from US might be applied to different social/cultural backgrounds worldwide. The proximate causes for dentists to lose endodontic lawsuits were failure to use rubber dam, wrong tooth treatment, root perforations, anatomical injury, infections and paresthesia.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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References

- Mello MM, Hemenway D. Medical malpractice as an epidemiological problem. *Soc Sci Med* 2004;59:39–46.
- Ferrara SD. Medical malpractice and legal medicine. *Int J Leg Med* 2013;127:541–3.
- Jena AB, Seabury S, Lakdawalla D, Chandra A. Malpractice risk according to physician specialty. *N Engl J Med* 2011;365:629–36.
- Studdert DM, Mello MM, Gawande AA, et al. Claims, errors, and compensation payments in medical malpractice litigation. *N Engl J Med* 2006;354:2024–33.
- Studdert DM, Mello MM, Sage WM, et al. Defensive medicine among high-risk specialist physicians in a volatile malpractice environment. *JAMA* 2005;293:2609–17.
- Knaak JP, Parzeller M. Court decisions on medical malpractice. *Int J Leg Med* 2014;128:1049–57.
- Wu KJ, Chen YW, Chou CC, Tseng CF, Su FY, Kuo MY. Court decisions in criminal proceedings for dental malpractice in Taiwan. *J Formos Med Assoc* 2022;121:903–11.
- Manca R, Bruti V, Napoletano S, Marinelli E. A 15 years survey for dental malpractice claims in Rome, Italy. *J Forensic Leg Med* 2018;58:74–7.
- Selbst AG. Understanding informed consent and its relationship to the incidence of adverse treatment events in conventional endodontic therapy. *J Endod* 1990;16:387–90.
- Serene TP. Endodontic litigation. *Oral Surg Oral Med Oral Pathol* 1973;36:422–5.
- Givol N, Rosen E, Taicher S, Tsesis I. Risk management in endodontics. *J Endod* 2010;36:982–4.
- Bjørndal L, Reit C. Endodontic malpractice claims in Denmark 1995–2004. *Int Endod J* 2008;41:1059–65.
- Givol N, Rosen E, Bjørndal L, Taschieri S, Ofec R, Tsesis I. Medico-legal aspects of altered sensation following endodontic treatment: a retrospective case series. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011;112:126–31.
- Rosen E, Tsesis I, Tamse A, Bjørndal L, Taschieri S, Givol N. Medico-legal aspects of vertical root fractures in root filled teeth. *Int Endod J* 2012;45:7–11.
- Knaak JP, Parzeller M. Court decisions on medical malpractice. *Int J legal Med* 2014;128:1049–57.
- Murphy BL, Ray-Zack MD, Reddy PN, et al. Breast cancer litigation in the 21st century. *Ann Surg Oncol* 2018;25:2939–47.
- Buranelli V. *The American heritage history of the bill of rights: the Eighth amendment*. Morristown, NJ: Silver Burdett Press, 1991.
- Sjögren J, Kvist T, Eliasson A, Pigg M. The frequency and characteristics of pain and discomfort associated with root filled teeth: a practice-based study. *Int Endod J* 2019;52:1264–73.
- Polycarpou N, Ng YL, Canavan D, Moles DR, Gulabivala K. Prevalence of persistent pain after endodontic treatment and factors affecting its occurrence in cases with complete radiographic healing. *Int Endod J* 2005;38:169–78.
- Pinchi V, Pradella F, Gasparetto L, Norelli GA. Trends in endodontic claims in Italy. *Int Dent J* 2013;63:43–8.
- Manski RJ, Moeller JF. Use of dental services: an analysis of visits, procedures and providers, 1996. *J Am Dent Assoc* 2002;133:167–75.
- Loreto DBL, de Barros BAC, Rosa GCD, de Oliveira R, Rosing CK, Fernandes MM. Analysis of dental case reports in the context of court decisions: causal nexus and aspects of fault. *J Forensic Sci* 2019;64:1693–7.
- Shigli K, Awinashe V. Patient-dentist communication: an adjunct to successful complete denture treatment. *J Prosthodont* 2010;19:491–3.
- Mellor AC, Milgrom P. Dentists' attitudes toward frustrating patient visits: relationship to satisfaction and malpractice complaints. *Community Dent Oral Epidemiol* 1995;23:15–9.
- Fonseca GM, Belmar-Durán M, Matamala-Santander C. Failure to obtain informed consent should also be considered an adverse event. *J Dent Sci* 2020;15:232–3.
- Roter DL, Hall JA. *Doctors talking with patients/patients talking with doctors: improving communication in medical visits*, 2nd ed. Praeger Publishers/Greenwood Publishing Group, 2006.
- Sfikas PM. A duty to disclose: issues to consider in securing informed consent. *J Am Dent Assoc* 2003;134:1329–33.
- Mukherjee A, Livinski AA, Millum J, et al. Informed consent in dental care and research for the older adult population: a systematic review. *J Am Dent Assoc* 2017;148:211–20.
- Moreira NCF, Pacheco-Pereira C, Keenan L, Cummings G, Flores-Mir C. Informed consent comprehension and recollection in adult dental patients: a systematic review. *J Am Dent Assoc* 2016;147:605–19.
- Parashos P, Messer HH. Rotary NiTi instrument fracture and its consequences. *J Endod* 2006;32:1031–43.

31. *Guidelines and position statements*. AAE.org. Available from, <https://www.aae.org/specialty/clinical-resources/guidelines-position-statements/>, 2019. [Accessed 1 October 2020]. Date accessed:.
32. Cohen S, Schwartz S. Endodontic complications and the law. *J Endod* 1987;13:191–7.
33. Anabtawi MF, Gilbert GH, Bauer MR, et al. National dental practice-based research Network collaborative group. Rubber dam use during root canal treatment: findings from the dental practice-based research Network. *J Am Dent Assoc* 2013;144:179–86.
34. Jenkins SM, Hayes SJ, Dummer PMH. A study of endodontic treatment carried out in dental practice within the UK. *Int Endod J* 2001;34:16–22.
35. Tsesis I, Faivishevsky V, Fuss Z, Zukerman O. Flare-ups after endodontic treatment: a meta-analysis of literature. *J Endod* 2008;34:1177–81.
36. Grönholm L, Lemberg KK, Tjäderhane L, Lauhio A, Lindqvist C, Rautemaa-Richardson R. The role of unfinished root canal treatment in odontogenic maxillofacial infections requiring hospital care. *Clin Oral Invest* 2013;17:113–21.
37. Lin PY, Chien KL, Chang HJ, Chi LY. Unfinished root canal treatments and the risk of cardiovascular disease. *J Endod* 2015;41:1991–6.
38. Alves FR, Coutinho MS, Gonçalves LS. Endodontic-related facial paresthesia: systematic review. *J Can Dent Assoc* 2014;80:e13.
39. Tilotta-Yasukawa F, Millot S, Haddioui AE, Bravetti P, Gaudy JF. Labiomandibular paresthesia caused by endodontic treatment: an anatomic and clinical study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;10:e47–59.
40. Chong BS, Quinn A, Pawar RR, Makdissi J, Sidhu SK. The anatomical relationship between the roots of mandibular second molars and the inferior alveolar nerve. *Int Endod J* 2015;48:549–55.