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ORIGINAL ARTICLE

Endodontists' Self-Assessment about Pharmacological Strategies for Management of Endodontic Pain

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ABSTRACT

Objective: To assess the pharmacological strategies of a group of Brazilian endodontists regarding endodontic pain. **Material and Methods:** Specialists answered a questionnaire with two main themes: 1) Pharmacological prescription patterns and 2) Endodontic procedures and risk of postoperative pain. The collective data were presented as descriptive statistics. **Results:** Almost all endodontists reported using drugs for pain management, mainly for apical abscess (65.8%) and irreversible pulpitis (61%), as well as more after (59.6%) than before (23.3%) endodontic procedure. Dipyrone (72.6%) and ibuprofen (56.8%) were the most prescribed systemic drugs. The most used local anesthetics were mepivacaine (58.2%) and articaine (57.5%). When necessary, 74.7% of specialists use supplementary anesthesia with an additional technique. Extravasation of filling materials (81.5%), limit of apical obturation (71.2%), and instrumentation (66.4%) 1 mm beyond were the main endodontic procedures to increase the risk of postoperative pain. **Conclusion:** While most strategies employed by Brazilian Society of Endodontics members are evidence-based, divergences in responses highlight the need for further research. This underscores the importance of more profound insights and potential standardization in pain management strategies among professionals.

Keywords: Endodontics; Toothache; Knowledge.

Introduction

Recently, dental pain was described as pain caused by lesions or disorders affecting one or more teeth and/or their immediately surrounding and supporting structures: the tooth pulp, periodontium, and gingivae [1] and is the most common reason for patients to seek emergency care [2].

Endodontic treatment emerges as a necessary intervention when there is a substantial compromise of the pulp tissue. Its primary objective is to achieve a root canal system completely devoid of microbiota and debris, subsequently sealed hermetically through root canal obturation [3]. However, for the effective execution of this procedure, it is imperative to establish efficient control of pain and post-operative symptoms [4].

Pain is a common symptom in endodontic conditions. Therefore, one of the objectives of endodontic treatment should be its prevention and elimination [5], identifying all tissues and sites involved, and allowing the removal and reduction of causal factors (microbial, physical, and chemical) [6]. From this perspective, it is crucial to evaluate the strategies used by endodontists to diagnose and control pain in endodontic conditions. Such knowledge can change dentists' attitudes [7] and, if necessary, introduce evidence-based change in clinical practice [8].

Despite the advances in the endodontic field, a higher level of knowledge in managing pain before, during, and after different endodontic conditions is imperative since many endodontic patients report varying degrees of pain. Moreover, it is a fact that endodontic procedures have the primary goal of controlling pain in endodontic conditions; however, the use of systemic analgesics, anti-inflammatory and local anesthetics as adjunct to pain management is vital to reduce fear and anxiety related to dental treatment [2], has potential to minimize preoperative pain and mechanical allodynia which seem to be a predictive factor of postoperative pain after root canal treatment [9,10], to improve pulpal anesthesia in patients with irreversible pulpitis [11,12] and for managing postoperative endodontic pain [13,14]. Therefore, professional knowledge about pharmacotherapeutic strategies for patients with endodontic pain is fundamental.

Thus, this study aimed to describe the main pharmacological strategies a group of Brazilian endodontists used to control pain in endodontic conditions. This knowledge could help identify failures and propose the implementation of new clinical routines and treatment approaches related to dental pain and how to use pharmacotherapeutic resources.

Material and Methods

Study Design and Ethical Clearance

This cross-sectional study was conducted following the Declaration of Helsinki and approved by the Human Research Ethics Committee of the Bauru School of Dentistry (Opinion no. 4.447.613). A standardized questionnaire was sent to all 1,088 endodontists dentists listed by the Brazilian Society of Endodontics. Before answering the questionnaire, each participant read the consent form.

Data Collection

Firstly, this questionnaire was included in the Google Forms online platform (Alphabet Co., Mountain View, CA, USA), and a link containing the questions was generated. This link was sent to all participants, preferably via e-mail and/or via WhatsApp (WhatsApp, Mountain View, CA, USA). All data collected were stored in the Google Forms tool and password-protected, so only the researchers had access.

The questionnaire was standardized, anonymized, and contained personal information such as age, sex, time of graduation in dentistry, and time as a specialist in endodontics. The other questions include strategies

endodontists use to control pain before, during, and after different endodontic conditions. The sequential steps and main components of the methodology are presented in Figure 1.

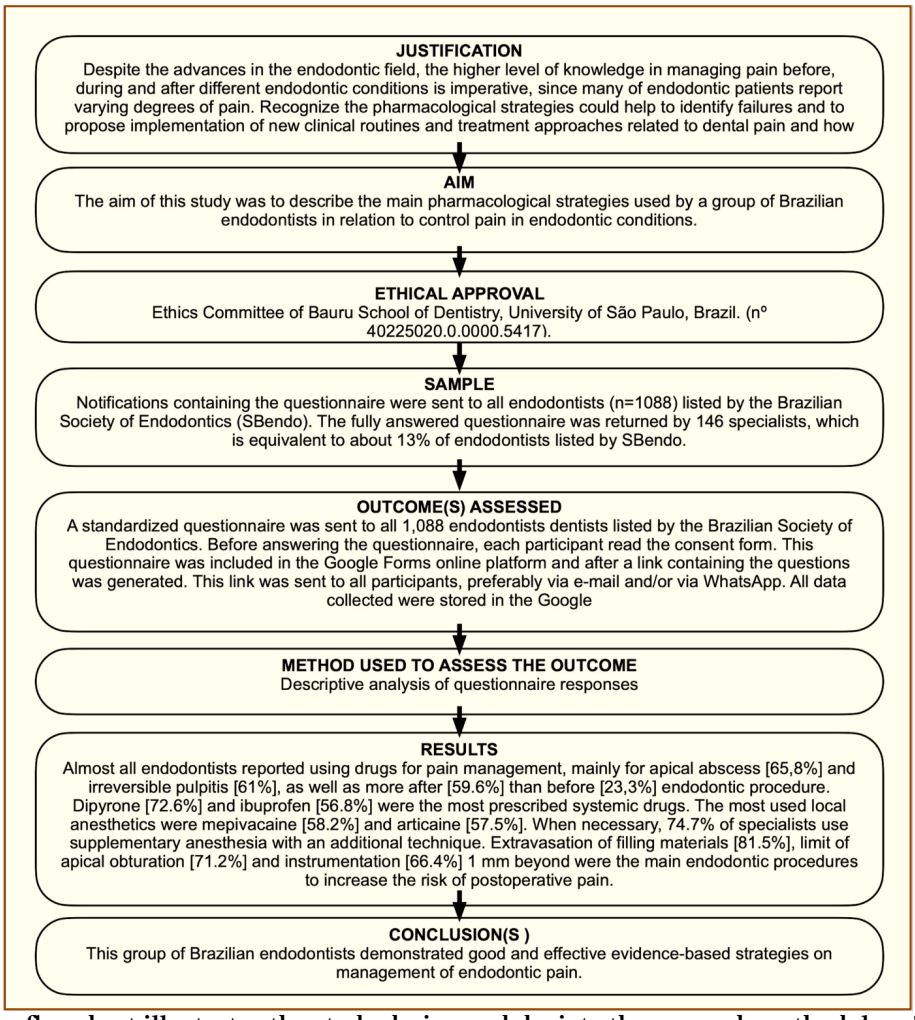

Figure 1. The flowchart illustrates the study design and depicts the research methodology's sequential steps and key components.

Statistical Analysis

The data obtained from the questionnaire were analyzed using the Jamovi software version 2.3.13.0. The collective data were presented as descriptive statistics such as mean, standard deviation, and percentages.

Results

In the present study, notifications containing the questionnaire were sent to all endodontists (n=1088) listed by the Brazilian Society of Endodontics (SBendo). The fully answered questionnaire was returned by 146 specialists, equivalent to about 13% of endodontists listed by SBendo.

Sixty-two men and 84 women (42.5% and 57.5%, respectively) with a mean age of 38.24 (9.47) were evaluated. The mean time of graduation in dentistry and time as a specialist in endodontics was 15.39 (9.69) and 11.10 (9.37) years, respectively. Pain as a primary complaint at the endodontist's dental office was reported by 99 participants (67.5%). Table 1 contains questions to identify the main strategies used by endodontists to control pain before, during, and after different endodontic conditions.

Endodontists cited apical abscess (n=96, 65,8%, irreversible pulpitis (n=89, 61%), and endodontic surgery (n=83, 56.8%) as the main endodontic diagnoses that prescribe pain control medication, but only eleven (7,5%) participants reported to prescribe medication to control pain in the tooth with pulp necrosis. Besides, endodontists preferred to prescribe pain medication to control pain after (postoperative, n=87, 59.6%) than before (preoperative, n=34, 23,3%) endodontic procedure. Dipyrone (n=106, 72.6%), ibuprofen (n=83, 56.8%), and acetaminophen (n=44, 30.1%) were the medications most commonly prescribed by endodontists (Table 1).

Regarding the use of local anesthesia to control pain during the endodontic procedure, it was possible to observe that the most used local anesthetics were mepivacaine, articaine, and lidocaine (n=85, 58.2%, n=84, 57.5%, and n=78 53.4%, respectively), all with vasoconstrictor. Supplementary anesthesia with an additional and different technique (n=109, 74.7%) was reported by endodontists when the patient exhibited persistent moderate or severe pain despite initial local anesthesia (Table 1).

One hundred thirty-six (93.1%) endodontists consider that any endodontic procedure can increase the risk of postoperative pain, with extravasation of filling materials for root canal (n=119, 81.5%), limit of apical obturation and instrumentation 1 mm beyond (n= 104, 71.2% and n= 97, 66.4%, respectively) were the most common reasons for postoperative pain (Table 1).

Table 1. Pharmacological strategies of endodontists for management of endodontic pain.

Strategies	%
Endodontic conditions that you prescribe medication for pain control	
Reversible pulpitis	20.5
Irreversible pulpitis	61.0
Pulp necrosis	7.5
Apical abscess	65.8
Preoperative	23.3
Postoperative	59.6
Endodontic surgery	56.8
Drugs/medications that you prescribe for pain control. Check all relevant items.	
Acetaminophen	30.1
Dipyrone	72.6
Ibuprofen	56.8
Opioids	10.3
Dexamethasone	24.0
Nimesulide	6.3
Amoxicillin	1.4
Others	0.9
Do not prescribe	0.7
The local anesthetic that you administered in your clinical routine. Choose UP to two anesthetics you use the most	
Lidocaine with vasoconstrictor	53.4
Mepivacaine with vasoconstrictor	58.2
Articaine with vasoconstrictor	57.5
Prilocaine with vasoconstrictor	6.8
Others	0.7
What is your conduct when the patient still reports pain during endodontic treatment? Check all relevant items	
Anesthetic supplementation, repeating the initial technique	41.8
Anesthetic supplementation, with an additional technique	74.7
Anesthetic supplementation with another type of anesthetic	19.9
Do you consider that any procedure during endodontic treatment increases the risk of postoperative pain?	
Yes	93.1
No	6.9
Endodontic procedures that you believe to increase the risk of postoperative pain.	
Difficulty in controlling intraoperative pain	39.6

Rotary instrument	10.1
Irrigation solution	38.8
Intracanal medication	12.9
Extravasation of filling material	81.5
Apical instrumentation limit 1 mm short	2.2
Apical instrumentation limit 0	10.1
Apical instrumentation limit 1 mm beyond	66.4
Apical obturation limit 1 mm short	2.9
Apical obturation limit 0	12.2
Apical obturation limit 1 mm beyond	71.2
endodontic diagnosis	35.3
Others	0.7

Discussion

The present study investigated the main strategies used by endodontists to control pain before, during, and after different endodontic conditions. The main findings of the present study were: 1) almost all endodontists started to prescribe medications to control the pain of endodontic origin, mainly for apical abscess, irreversible pulpitis, and endodontic surgery; 2) endodontists prescribed more medication to control pain after (postoperative) than before (preoperative) endodontic procedure; 3) the most used local anesthetics were mepivacaine, articaine and lidocaine and when necessary endodontists used supplementary anesthesia with an additional and different technique; 4) endodontists answered that many endodontic procedures increase the risk of postoperative pain, being the most cited the extravasation of filling materials for root canal, limit of apical obturation and instrumentation 1 mm beyond.

Endodontists reported that around 67.5% of patients had pain as a primary complaint at the dental office. Dental pain is the leading cause of orofacial pain [15] and a common symptom in endodontic conditions [16]. Therefore, the diagnosis and management of pain is an everyday occurrence, and its effective control is essential to ensure the well-being of patients who report varying degrees of pain according to endodontic diagnosis [17].

Dental pain from endodontic origin is mainly solved by endodontic procedures, including cleaning, disinfecting, and filling the root canal system. However, the combination with systemic medication is an adjunct in relieving moderate to intense pain, inflammation, and/or infection to provide more comfort and safety to patients [2,17]. In the present study, almost all endodontists reported prescribing medications to control pain in different endodontic conditions, the most common diagnosis of apical abscess and irreversible pulpitis and the less common pulp necrosis. Moreover, the participants indicated the prescribing of more pain medication to control pain after (postoperative) than before (the preoperative) endodontic procedure. The presence of preoperative pain seems to influence the prevalence of postoperative pain after root canal treatment, so pain management should be an integral part of dental treatment [9].

As described above, management of pain from endodontic origin involves an accurate diagnosis and a definitive endodontic treatment. However, the additional use of systemic medications can help to prevent and reduce dental pain. Our study found different classes of drugs indicated by endodontists for the pharmacological management of endodontic pain, including analgesics, non-steroidal anti-inflammatory, corticosteroids, and antibiotics drugs. Among them, dipyrone, ibuprofen, and acetaminophen were the most common drugs described, which corroborates a previous narrative review [2].

Overall, the use of systemic analgesics and anti-inflammatory medications as adjuncts to pain management in endodontic conditions has the potential to reduce preoperative pain and mechanical allodynia, which seem to be a predictive factor of postoperative pain after root canal treatment [9,10], to improve pulpal

anesthesia in patients with irreversible pulpitis [11,12] and for managing postoperative endodontic pain [13,14].

High-quality pain control in endodontic practice also includes adequate local anesthesia [2]. The present study demonstrated that the most used local anesthetics were mepivacaine, articaine, and lidocaine, all with vasoconstrictor. A recent systematic review with meta-analysis evaluated the effect of different anesthetics on the efficacy of inferior alveolar nerve block in patients with irreversible pulpitis. Among the anesthetic solutions, articaine was considered the most effective, followed by prilocaine, mepivacaine, bupivacaine, and lidocaine (less effective) [18]. Another systematic review with meta-analysis showed that mepivacaine with epinephrine demonstrated the highest probability of providing adequate pulpal anesthesia for teeth with irreversible pulpitis compared to prilocaine, articaine, bupivacaine, and lidocaine [19].

The efficient and deep anesthesia in some endodontic conditions, such as irreversible pulpitis, can be a challenge. Moreover, its failure rate was estimated to range from 43% to 83%, necessitating supplementary injections [19]. The present study verified that endodontists reach out supplementary anesthesia with an additional and different technique or repeat the initial technique when the patient exhibited persistent moderate or severe pain despite initial local anesthesia.

Finally, we asked endodontists about endodontic procedures that may increase the risk of postoperative pain. The most common procedures were extravasation of filling materials, limit of apical obturation, and instrumentation 1 mm beyond. In addition to increasing the risk of postoperative pain [18], endodontic treatment is one of the major causes of nerve injuries in the orofacial region, which can result in chronic neuropathic pain in 3-13% of patients [20,21]. Recently, post-traumatic trigeminal neuropathic pain was defined by the International Classification of Orofacial Pain, and one of the diagnostic criteria is a "history of a mechanical, thermal, radiation or chemical injury to the peripheral trigeminal nerve" [1]. Thus, according to the International Classification of Orofacial Pain, most endodontists' perception of the main endodontic procedures that increase the risk of postoperative pain seems to make sense.

The present study included only a group of Brazilian endodontists listed by the Brazilian Society of Endodontics, which does not represent the entire population of specialists in endodontics from Brazil. Hence, the results cannot be generalized. With that in mind, this group of Brazilian endodontists demonstrated good and effective evidence-based strategies for managing endodontic pain. These strategies included the correct endodontic diagnosis for prescribing systemic drugs, a good practice of analgesic, anti-inflammatory, and local anesthetics prescription, and a good knowledge of main endodontic procedures that increase the risk of postoperative pain.

However, the study, while providing valuable insights into endodontists' practices in pain control, reveals divergences in results that may impact future clinical approaches. The preference for prescribing pain control medications postoperatively rather than preoperatively highlights a potentially reactive approach. The low prescription rate of pain control medications in cases of pulp necrosis (7.5%) raises questions about the perception of pain in this specific context. The frequent use of complementary anesthesia (74.7%) in the face of persistent pain after initial local anesthesia suggests a perceived need for adjustments to standard anesthetic techniques. Additionally, the diversity in cited reasons for postoperative pain, such as obturator material extravasation, apical obturation limit, and instrumentation 1 mm beyond, underscores the complexity and subjectivity associated with pain control in specific endodontic contexts.

Conclusion

Despite the majority of strategies employed by endodontists belonging to the Brazilian Society of Endodontics being evidence-based, divergences found in some of the responses underscore the importance of further research for a deeper understanding and potential standardization of pain management strategies adopted by professionals.

Authors' Contributions

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LRB	https://orcid.org/0000-0002-0080-7678	Conceptualization, Methodology, Formal Analysis, Data Curation, Supervision and Project Administration.

All authors declare that they contributed to a critical review of intellectual content and approval of the final version to be published.

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Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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