

UNIVERSIDADE DE SÃO PAULO  
FACULDADE DE ODONTOLOGIA DE BAURU

PAULO ROBERTO JARA DE SOUZA

**Clinical, sensory and psychological evaluation in patients  
with irreversible pulpitis and referred pain**

**Avaliação clínica, sensorial e psicológica em pacientes  
com pulpite irreversível e dor referida**

BAURU  
2022

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**Clinical, sensory and psychological evaluation in patients with irreversible pulpitis and referred pain**

**Avaliação clínica, sensorial e psicológica em pacientes com pulpite irreversível e dor referida**

Dissertação constituída por artigo apresentada à Faculdade de Odontologia de Bauru da Universidade de São Paulo para obtenção do título de Mestre em Ciências no Programa de Ciências Odontológicas Aplicadas, na área de concentração Endodontia.

Orientador: Prof. Dr. Leonardo Rigoldi Bonjardim

BAURU  
2022

Souza, Paulo Roberto Jara de  
Avaliação clínica, sensorial e psicológica em  
pacientes com pulpite irreversível e dor referida /  
Paulo Roberto Jara de Souza. -- Bauru, 2022.  
63 p. : il. ; 31 cm.

Dissertação (mestrado) -- Faculdade de  
Odontologia de Bauru, Universidade de São Paulo,  
2022.

Orientador: Prof. Dr. Leonardo Rigoldi  
Bonjardim

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Assinatura:

Data:

Comitê de Ética da FOB-USP  
Protocolo nº: 68553717.0.0000.5417  
Data: 08/05/2017

## ERRATA

Universidade de São Paulo  
Faculdade de Odontologia de Bauru  
Assistência Técnica Acadêmica  
Serviço de Pós-Graduação



## FOLHA DE APROVAÇÃO


Dissertação apresentada e defendida por  
**PAULO ROBERTO JARA DE SOUZA**  
e aprovada pela Comissão Julgadora  
em 14 de abril de 2022.





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## **DEDICATÓRIA**

Dedico esta dissertação de mestrado aos meus pais, Paulo e Priscila, minha avó Cesária e meus irmãos Abel e Angel, por todo amor, apoio e orações que possibilitaram a conclusão deste trabalho.

## **AGRADECIMENTOS**

Agradeço primeiramente a Deus que tornou possível esse sonho, me abençoando e guiando meus caminhos.

Aos meus pais Paulo Roberto e Priscila Jara, minha avó Cesária Almada que sempre me apoiaram e deram forças para que conquistasse meus objetivos, a oração diária com certeza facilitou meu caminho até a conclusão dessa etapa, meu amor por vocês é imensurável. Se eu cheguei até aqui foi graças a vocês. Muito obrigado por tudo!

Aos meus irmão Abel Jara e Angel Jara por todo companheirismo que me fortaleceu durante esse período. Amo vocês!

A minha namorada Patrícia Camargo com quem convivi diariamente desde o início da minha graduação e tive o prazer de contar com essa parceria também durante o Mestrado. Foi com quem dividi as alegrias, as tristezas, e esteve sempre presente me ajudando e apoiando em tudo que fosse preciso, com certeza tornou meus objetivos muito mais leves e fáceis de alcançar. Amo muito você!

Aos meus Sogros Mario e Célia que me acolheram com muito amor e carinho, sendo minha família no estado de São Paulo. Obrigado por tudo!

Aos meus amigos Mateus, Larissa, Giovanna e Daniel que sempre se apresentaram dispostos a ajudar. Obrigado pelos momentos de descontração que fizeram esses anos mais divertidos.

A minha turma de mestrado: German, Gabryella, Larissa e Shirley. Obrigado por sempre estarem dispostos a ajudar uns aos outros.

Aos alunos de Doutorado Renan e Vanessa que ajudaram nos atendimentos aos pacientes das pesquisas. Muito obrigado

Ao professor Yuri Martins Costa da FOP-UNICAMP e sua orientada de doutorado Soraya que me ajudaram na produção do artigo. Sou grato por todos ensinamentos, ajuda e disponibilidade.

Aos Professores Marco Antônio Húngaro Duarte, Rodrigo Vivan, Guilherme Ferreira e Murilo Alcalde que são os responsáveis pela minha formação na área de Endodontia, sempre com muita paciência me orientaram e ensinaram a ser um profissional melhor. Muito obrigado pela convivência que se tornou amizade, o que eu aprendi a respeito de endodontia eu devo a vocês!

Ao meu orientador Leonardo Rigoldi Bonjardim, que tive o prazer de ser orientado em duas iniciações científicas durante a graduação e durante o mestrado. Muito obrigado por todos os ensinamentos, orientações os puxões de orelha sempre na maior educação do mundo que me fizeram entender melhor sobre a pesquisa e a docência.

### **AGRADECIMENTOS INSTITUCIONAIS**

À Faculdade de Odontologia de Bauru, Universidade de São Paulo (FOB-USP), na pessoa do seu diretor, Prof. Dr. Carlos Ferreira dos Santos. Agradeço esta Universidade que permitiu meu crescimento pessoal e profissional e por todo conhecimento obtido desde a graduação até a pós-graduação.

À Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) (processo nº 88887.357014/2019-00) que financiou meus estudos e permitiu o desenvolvimento da pesquisa dessa dissertação.

À Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) (processo nº 2017/18471-0)



*“Se eu vi mais longe, foi por estar em ombros de gigantes”.*

***Isaac Newton***

## RESUMO

O objetivo deste estudo foi comparar pacientes com pulpíte irreversível sintomática com e sem dor referida, considerando aspectos (1) clínicos relacionados à dor, (2) somatossensoriais e (3) psicológicos que podem contribuir para o diagnóstico precoce e posterior tratamento endodôntico. Pacientes com pulpíte irreversível sintomática foram divididos em dois grupos de acordo com a presença de dor referida (com e sem,  $n = 23$  e  $12$ , respectivamente). As características clínicas da dor foram avaliadas para o dente com diagnóstico de pulpíte irreversível. Aspectos psicossociais e descritores de dor foram avaliados por meio de questionários. A intensidade e a duração da dor após os testes de sensibilidade pulpar foram mensuradas nos dentes com pulpíte e contralateral, bem como uma avaliação qualitativa somatossensorial foi realizada nas regiões intra e extra-orais, no início e após a anestesia. Também foram registradas informações sobre a localização da dor, presença de dor referida, uso de medicamentos para alívio da dor e necessidade de anestesia complementar. Os testes T, Qui-quadrado e McNemar foram aplicados aos dados. Os pacientes com dor referida apresentaram pior condição clínica, ou seja, maior intensidade da dor dentária (teste T,  $t = 4,39$ ,  $df = 33$ ,  $p < 0,05$ ). Além disso, esses pacientes também apresentaram resultados piores para os descritores de dor, ou seja, índice de classificação de dor mais alto (teste T,  $t = 2,18$ ,  $df = 14,07$ ,  $p < 0,05$ ) e maior número de descritores de dor (teste T,  $t = 2,93$ ,  $df = 33$ ,  $P < 0,05$ ). Além disso, a intensidade da dor (teste T,  $t = 2,89$ ,  $df = 32,31$ ,  $p < 0,05$ ) e tempo de dor após o teste de sensibilidade pulpar no dente contralateral foram maiores para os pacientes com dor referida (teste T,  $t = 2,30$ ,  $df = 32,93$ ,  $P < 0,05$ ). Conclui-se que pacientes com dor referida apresentam alterações relevantes principalmente relacionadas à dor clínica e provocada. A presença de dor referida pode contribuir para uma melhor caracterização e avaliação clínica dos pacientes com pulpíte irreversível sintomática com possíveis implicações no tratamento destes pacientes.

Palavras-chave: Diagnóstico. Pulpíte. Dor Referida.

## **ABSTRACT**

### **Clinical, sensory and psychological evaluation in patients with irreversible pulpitis and referred pain**

The aim of this study was to compare patients with symptomatic irreversible pulpitis with and without referred pain, considering (1) general clinical aspects related to pain, (2) somatosensory and (3) psychological aspects that may contribute to early diagnosis and subsequent endodontic treatment. Patients with symptomatic irreversible pulpitis were divided into two groups according to the presence of referred pain (with and without, n = 23 and 12, respectively). Clinical features of pain were evaluated for the tooth diagnosed with irreversible pulpitis. Psychosocial aspects and pain descriptors were assessed using questionnaires. The intensity and duration of pain after pulp sensitivity tests were measured in the teeth with pulpitis and contralateral, as well as a qualitative somatosensory assessment was performed in the intra- and extra-oral regions, at baseline and after anesthesia. Information on pain location, presence of referred pain, use of pain relief medications and need for additional anesthesia were also recorded. T, Chi-square and McNemar tests were applied to the data. Patients with referred pain had a worse clinical condition, that is, greater intensity of dental pain (T test,  $t = 4.39$ ,  $df = 33$ ,  $p < 0.05$ ). In addition, these patients also presented worse results for pain descriptors, that is, higher pain classification index (T test,  $t = 2.18$ ,  $df = 14.07$ ,  $p < 0.05$ ) and greater number of pain descriptors (T test,  $t = 2.93$ ,  $df = 33$ ,  $P < 0.05$ ). In addition, pain intensity (T test,  $t = 2.89$ ,  $df = 32.31$ ,  $p < 0.05$ ) and pain time after pulp sensitivity test on the contralateral tooth were higher for patients with referred pain. (T test,  $t=2.30$ ,  $df=32.93$ ,  $P<0.05$ ). Patients with referred pain present relevant changes mainly related to clinical and evoked pain. The presence of referred pain may contribute to a better characterization and clinical evaluation of patients with symptomatic irreversible pulpitis with possible implications for the treatment of these patients.

Keywords: Diagnosis. Pulpitis. Referred pain.

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## LISTA DE ABREVIATURA E SIGLAS

i.e.	id est
e.g.	exempli gratia
TMD	Temporomandibular disorder
QualST	Qualitative sensory testing
HADS	Hospital Anxiety and Depression Scale
PSQI	Sleep Questionnaire. Pittsburgh
PCS	Sleep Questionnaire. Pittsburgh
OHIP-14	Oral Health Impact Profile
SD	Standard deviation
CI	Confidence interval
NRS	Numeric rating scale
PRI	Pain rating index
NWC	Number of words chosen
CS	Central sensitization
VITA	Vitality
BA	Baseline
AN	Anesthesia
SE	Standard Error

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# 1

## INTRODUÇÃO





## 1 INTRODUÇÃO

A dor de dente é conhecida como uma alteração pulpar ou periodontal com alta prevalência na região orofacial<sup>1,2</sup>. Em geral, pode se manifestar com diferentes padrões clínicos associados ou não à dor referida<sup>1,2</sup>. Nesse direção, foi verificado que pacientes com pulpite irreversível em molares inferiores apresentavam dor referida em regiões comumente acometidas por outros tipos de dores orofaciais, como orelha e base da mandíbula<sup>3</sup>. A dor referida pode ser entendida como a percepção da dor em uma região diferente e/ou distante da origem real da dor<sup>1,4</sup>. Portanto, essa sobreposição de condições, ou seja, dor de dente e dor referida, pode levar a um diagnóstico mais complexo e a sub ou sobretratamentos.

Acredita-se que um dos mecanismos relacionados à dor referida seja a convergência neuronal<sup>1,5</sup>. No geral, diferentes nociceptores aferentes dos tecidos superficiais e profundos convergem para o complexo trigeminal no tronco encefálico e fazem sinapse em uma região comum com outros neurônios secundários<sup>1,5</sup>. Além disso, a somação espacial e temporal também pode contribuir para a dor referida<sup>1,6</sup>. A dor referida pode se manifestar ipsilateral ou mais raramente contralateral e pode ter um padrão contínuo ou episódico, o que pode levar a uma má interpretação diagnóstica e difícil manejo do paciente<sup>7</sup>.

A pulpite irreversível sintomática está associada à dor intensa e espontânea<sup>8</sup>. A identificação de patologias pulpares em estágios iniciais contribui para tratamentos conservadores e evita o agravamento para condições mais críticas<sup>9,10</sup>. O diagnóstico é baseado principalmente na história detalhada da dor, ou seja, localização, duração, qualidade e intensidade da dor, por meio de testes de sensibilidade pulpar e de exames complementares como exame radiográfico<sup>11</sup>. Respostas ou achados anormais para esses testes indicam estágios avançados de alteração pulpar<sup>12,13</sup>.

Estudos anteriores mostraram uma sobreposição entre dor de dente e outras condições orofaciais devido à dor referida<sup>14,15</sup>. Essa complexidade destaca a importância de identificar a origem da dor como o primeiro passo para o estabelecimento de um diagnóstico correto.

Assim, apesar da notável importância na diferenciação dessas condições dolorosas, a endodontia contemporânea tem primado nos últimos anos pelo desenvolvimento de equipamentos e técnicas para realizar um tratamento endodôntico conservador e eficaz<sup>16,17</sup>. Não há dúvidas sobre a importância dos avanços tecnológicos na endodontia. Porém, é necessário avançar concomitantemente na área de diagnóstico e caracterização de pacientes. Estudos anteriores mostraram alterações clínicas em pacientes com doenças pulpares e periodontais, tais como alodinia mecânica, maior intensidade da dor e hipersensibilidade à percussão<sup>12,13,18,19</sup>.

Além da relação complexa entre dor de dente e dor referida, essas alterações, quando avaliadas e identificadas com cuidado, podem ajudar o cirurgião-dentista a uma abordagem mais precisa do tratamento. Portanto, um melhor entendimento de como os pacientes com pulpite irreversível sintomática experimentam e / ou relatam dor, e como ela se correlaciona com outras características clínicas, pode fornecer uma ferramenta valiosa para o diagnóstico e manejo corretos<sup>12</sup>.

Com base nesses princípios e na importância do diagnóstico de dor orofacial de origem dentária, o presente estudo teve como objetivo identificar condições clínicas, sensoriais e psicológicas associadas a presença de dor referida em pacientes com pulpite irreversível, em busca de uma melhor caracterização da doença. Nossa hipótese *a priori* era que pacientes com pulpite irreversível e presença de dor referida apresentariam piores condições clínicas associadas.

2

ARTIGO





## 2 ARTIGO

The article presented in this Dissertation was written according to the Journal of Endodontics and guidelines for article submission

(<https://www.aae.org/specialty/publications-research/journal-of-endodontics/joe-authors/guidelines-publishing-papers-joe/> )

**Title:** Referred pain is associated with a worse clinical condition in patients with symptomatic irreversible pulpitis.

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### Acknowledgements

Supported by São Paulo Research Foundation (grant nos. 2015/09913-4, 2017/18741-0, and 2019/06035-7).

## Abstract

**Introduction:** This study aimed at comparing patients with symptomatic irreversible pulpitis with and without referred pain considering general clinical aspects that could contribute to early diagnosis and subsequent treatment. **Methods:** Patients with symptomatic irreversible pulpitis were divided into two groups according to the presence of referred pain (with and without,  $n = 23$  and  $12$ , respectively). Clinical pain characteristics was measured for the affected tooth. Psychosocial aspects and pain descriptors were evaluated applying questionnaires. Dental pain intensity and duration of pulp sensibility tests were applied to the affected and contralateral tooth at baseline and pos-anesthesia. Furthermore, somatosensory assessment was performed for intra- and extraoral sites at baseline and pos-anesthesia. Information about referred pain location, use of medication, pain relief, and complementary anesthesia, were also recorded. T-test, Chi-squared and McNemar tests were applied to the data ( $P = .50$ ).

**Results:** Patients with referred pain presented a worse clinical condition, i.e., greater dental pain intensity (T-test,  $t = 4.39$ ,  $df = 33$ ,  $P < .05$ ). In addition, these patients also showed worse outcomes for the pain descriptors, i.e., higher pain rating index (T-test,  $t = 2.18$ ,  $df = 14.07$ ,  $P < .05$ ), and number of pain descriptors (T-test,  $t = 2.93$ ,  $df = 33$ ,  $P < .05$ ). Moreover, the pain intensity (T-test,  $t = 2.89$ ,  $df = 32.31$ ,  $P < .05$ ), and time of aftersensations (T-test,  $t = 2.30$ ,  $df = 32.93$ ,  $P < .05$ ), in pulp sensibility tests of the contralateral tooth were higher for patients with referred pain. **Conclusions:** Patients with referred pain present relevant alterations mainly related to clinical and evoked pain. The presence of referred pain can contribute to a better characterization and clinical assessment of patients with symptomatic irreversible pulpitis with possible management implications.

**Keywords:** dental pulp test, diagnosis, pain perception, pulpitis, referred pain, sensory testing.

## 1. Introduction

Toothache is known as a pulpal or periodontal alteration with high prevalence in the orofacial region (1, 2). In general, it can be manifest in a wide array of clinical patterns associated or not with referred pain (1, 2). A previous study showed that irreversible pulpitis in mandibular molars caused referred pain in regions commonly affected with others orofacial pain, such as the ear and base of the mandible (3). Referred pain can be understood as the pain perception in a region different and/or distant from the actual source of the pain (1, 4). Therefore, this overlapping of conditions, i.e., toothache and referred pain, may be led to a more complex diagnosis and to under- or over-treatments.

It is believed that one of the mechanisms related to referred pain is neuronal convergence (1, 5). Overall, different nociceptive afferent inputs from superficial and deep tissues converge into the trigeminal brainstem and synapse in a common region with other secondary neurons (1, 5). Furthermore, spatial, and temporal summation can also contribute to referred pain (1, 6). Referred pain can be manifested ipsilateral or more rarely contralateral and it can have a continuous or episodic pattern. This may lead to diagnostic misinterpretation and difficult patient management (7).

Symptomatic irreversible pulpitis is associated with intense and spontaneous pain (8). The identification of pulp pathologies in the early stages contributes to conservative treatments and prevent worsening for more critical conditions (9, 10). The diagnosis is mainly based on detailed pain history, i.e., location, duration, quality and pain intensity, pulp sensibility tests, and complementary exams as radiographic examination (11). Abnormal responses or findings for these tests indicate the advanced stages of pulp alteration (12, 13). Previous studies showed an overlapping between toothache and other orofacial conditions due to referred pain (14, 15). This complexity highlights the importance of identifying the source of pain as the first step towards establishing a correct diagnosis.

Despite the remarkable importance in differentiating these painful conditions, contemporary endodontics strives for the development of equipment and techniques to carry out a conservative and effective endodontic treatment (16, 17). There is no doubt about the importance of technological advances in endodontics. However, it is necessary to advance concomitantly in the area of diagnosis and characterization of patients. Previous studies showed clinical alterations in patients with pulpal and

periodontal diseases as mechanical allodynia, higher pain severity, and percussion hypersensitivity (12, 13, 18, 19). In addition to the complex relationship between toothache and referred pain, these alterations when carefully assessed and identified can help clinicians to take a more precise approach to treatment. Therefore, a better understanding of how symptomatic irreversible pulpitis patients experience and/or report pain, and how it correlates with other clinical characteristics can provide a valuable tool for correct diagnosis and management (12).

Thus, based on these findings, this study aimed at comparing patients with symptomatic irreversible pulpitis with and without referred pain considering general clinical aspects that could contribute to early diagnosis and subsequent treatment. Our hypothesis was that patients with symptomatic irreversible pulpitis and referred pain would present worse associated clinical conditions.

## **2. Material and methods**

### *2.1 Sample and Ethics*

The population from which the sample of this study originated were subjects who sought the Dental Emergency and Emergency Service of the Faculty of Dentistry of Bauru, with dental pain and who had a confirmed diagnosis of irreversible pulpitis. The sample was recruited using the convenience sampling method from August 2017 to June 2018.

Inclusion criteria were an age over 18 years and the clinical diagnosis of unilateral irreversible pulpitis according to the following criteria: history of dental pain caused, e.g., by temperature changes, chewing or postural change, or spontaneous and that became continuous and of moderate or severe intensity; hypersensitivity to cold, measured by applying a coolant spray at  $-50\text{ C}^{\circ}$  to the affected tooth and contralateral mirror tooth using flexible cotton swabs, and persistence of pain in the affected tooth after stimulus removal and periapical radiographic findings suggesting inflammation of the pulp (e.g., deep caries, extensive restorations, and periodontal ligament thickening) (13, 20-22).

The exclusion criteria were periodontal disease; presence of craniocervical anomalies; temporomandibular disorder (TMD) (23), orofacial neuropathies, chronic dental pain, sinusitis or otitis, chronic primary headache (24), fibromyalgia, history, or presence of uncontrolled systemic diseases; neurological, hormonal, rheumatic or

psychiatric disorders; doses not stable for at least 6 months in case of use of centrally acting medications; pregnancy, lactation, or irregular menstrual cycle. The evaluation of the participants to determine their eligibility was carried out by a specialist in Endodontics. The taking of a detailed medical history associated with a comprehensive clinical and radiographic examination were the main sources of information in determining the eligibility criteria.

This study was conducted in accordance with the Declaration of Helsinki and started only after approval by the Ethics Committee for Research on Human Beings of the Faculty of Dentistry of Bauru. The free and informed consent form was explained before any procedure and the consent and agreement of the participants was requested through their respective signatures. This study involves secondary analyses from a larger sample (25).

## *2.2 Primary outcomes*

### *2.2.1 Clinical variables*

The main variables collected were 1) the report of the intensity of spontaneous dental pain, at the time of consultation and in the last 24 hours, measured using a numerical scale 0-100, 2) Intensity of pain caused by the cold-pulp sensitivity test with spray refrigerant -50°C, applied for 2 seconds, with a cotton swab, on the mid-facial / occlusal surface of the tooth. Dental pain intensity was assessed immediately after stimulus removal on a numerical rating scale from 0 to 100, where 0 means "no pain" and 100 means "worst imaginable pain", before and after local anesthesia, in affected tooth and its contralateral mirror 3) the duration in seconds of this perception of dental pain caused by the pulp vitality test, measured with a digital stopwatch, before and after local anesthesia 4) presence of referred pain and region where it was referred 5) need for analgesic medication for pain control in the last 24 hours and pain relief caused by the medication.

### *2.2.2 Sensory variables*

A simplified battery of qualitative sensory testing (QualST) that assess changes in tactile, thermal, and painful sensitivity was performed. To assess sensitivity to dynamic touch, a single 1-2cm touch was performed with a cotton swab. With a 7 stainless steel spatula (soaked in ice water for at least 5 minutes before application) was applied for 1-2 seconds to assess sensitivity to cold stimulus, and with a dental

examination probe (intraoral) or toothpick (extraoral) was applied for 1-2 seconds with moderate force (i.e., without causing any penetration into the mucosa/skin to assess sensitivity to bite needle stimulus). For all somatosensory modalities, the participant was asked to report greater sensation (hypersensitivity), weaker sensation (hyposensitivity), or an equal sensation (normal sensitivity) on the affected or left side compared to the contralateral unaffected or right side. All stimuli were applied in the same order, touch, cold and needle prick on the affected side followed by the contralateral side.

### *2.3 Secondary variables*

Level of anxiety and depression, quality of sleep, degree of catastrophizing, quality of life related to oral health and multidimensional characteristics of pain were measured by the following questionnaires: Hospital Anxiety and Depression Scale (HADS), Sleep Questionnaire. Pittsburgh (PSQI) Pain Catastrophizing Scale (PCS), Oral Health Impact Profile (OHIP-14) and McGill Pain Questionnaire.

#### *2.3.1 HADS*

This questionnaire is a self-administered instrument, containing 14 multiple-choice questions, consisting of two interspersed subscales, one for anxiety (7 questions), the other for depression (7 questions). The HADS was developed to be applied to patients in non-psychiatric services of a general hospital or primary care, and a Brazilian Portuguese version of this scale has already been validated (26). However, currently HADS has been applied in the general population, outside the hospital (27). The scores range from 0 to 21 points, and subjects with values between 0-7 are considered free from symptoms of anxiety and/or depression, between 8 and 10 anxiety and/or mild depression, between 11 and 14 anxiety and/or moderate depression and between 15 and 21 anxiety and/or severe depression.

#### *2.3.2 PSQI*

This questionnaire was developed to be a reliable, valid, and standardized instrument to assess sleep quality, to discriminate individuals who sleep “good” or “poorly”, to be an easy index to be used by individuals and researchers, and to inform clinically several sleep disorders that can influence the quality of sleep. It consists of 19 self-report questions and 5 third-party reporting questions. Third-party reporting questions are for informational purposes only but are not tabulated in the final score. The 19 self-report questions assess various factors related to sleep quality, including

estimates of sleep duration and latency and frequency and severity of specific sleep problems. These 19 items are divided into 7 groups that are tabulated separately, each on a scale from 0 to 3. The 7 scores are then added together and result in the overall PSQI score, which ranges from 0 to 21. Scores ranging from 0 to 5 indicate good sleep quality and scores from 6 to 21 indicate poor quality and the higher the score, the worse sleep quality. The version validated for Brazilian Portuguese was used (28).

### 2.3.3 PCS

This questionnaire measures catastrophic thoughts in pain. This questionnaire was completed by the research subject himself before the surgical procedures and indicates the frequency with which he has catastrophic thoughts when his pain is strong. There are 13 statements in total that vary on a frequency scale ranging from 0 - 5 (0 = almost never and 5 = almost always), and the total score is calculated by the sum of all items, which ranges from 0 to 52 points and the higher the value, the more the degree of catastrophizing. The version validated for Brazilian Portuguese was used (29).

### 2.3.4 OHIP-14

This questionnaire specifically assesses the impact of oral health on the individual's quality of life through questions about functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and disability. It analyzes aspects of oral health that can compromise the physical, psychological, and social well-being of an individual., attributing a value of 0 (zero) for never, 1 (one) for rarely, 2 (two) for occasionally, 3 (three) for almost always and 4 (four) forever. It contains 14 statements in total and the participant must answer how often they had the problems presented using a scale ranging from 0 - 5 (0 = almost never and 5 = almost always), and the total score is calculated by summing of all items, ranging from 0 to 56 points and the higher the value, the greater the impact of oral health on quality of life. The version validated for Brazilian Portuguese was used (30).

### 2.3.5 McGill Pain Questionnaire

This questionnaire is a widely used tool to assess sensory, affective, and evaluative characteristics of the painful experience. This multidimensional pain assessment is mainly done through an exhaustive list of descriptors that are presented for participants to choose the terms that best represent their pain experience (31).

## 2.4 Design

The sensory tests in this study were performed on the gingiva and on the nerve outputs of the infraorbital and mental nerves. In the intraoral evaluations, the affected tooth region (case group) and the upper left premolar region (control group) and the contralateral mirror side were considered. In the bilateral extraoral evaluations, the nervous division of the dental arch in question was considered: infraorbital nerve entry zone in cases of superior teeth and mental nerve exit in cases of inferior teeth. The order between the intra and extraoral evaluations was randomly made. Also, in the case group, sensory tests were measured at two times: a) initial assessment and b) after local anesthetic block, which is the usual procedure before dental pulp removal, while in the control group, assessments were performed only once.

### *2.5 Statistical analysis*

The quantitative outcome variables were reported as means, standard deviation (SD) and 95% confidence interval (CI) of mean, and the qualitative outcome variables were reported as percentages and 95% CI of mean. Normal distribution was assessed with the aid of the Kolmogorov- Smirnov test, and log<sub>10</sub> transformations were applied when the results were significant ( $\alpha=5\%$ ,  $p<0.05$ ).

Pain intensity, clinical pain characteristics and duration, pain descriptors, and psychosocial differences between groups were analyzed by the t test for independent samples or the Mann-Whitney test ( $p=0.05$ ) when applicable. The significance level was set at 5% ( $p=0.05$ ). The use of medication, pain relief, complementary anesthesia, and QualST assessment were analyzed using the Chi-square or McNemar tests for, respectively, between-group differences (patients with and without referred pain) and within-group differences. Moreover, McNemar tests were also performed for within-group differences, considering intraoral and extraoral sites and baseline and post-anesthesia periods.

## **3. Results**

### **3.1 Sample characteristics**

Twenty-three patients (13 females and 10 males) with symptomatic irreversible pulpitis and referred pain with a mean age (SD) of 38.3 (10.8) years and 12 patients (7 females and 5 males) with symptomatic irreversible pulpitis and no referred pain with a mean age (SD) of 37.6 (13.6) years were included. The maxillary arch composed 61% and 58% of the affected teeth for the patients with and without referred pain,



respectively. There were no significant between-group differences regarding age, gender and affected tooth ( $p>0.05$ ).

### 3.2 Referred pain location

The table 1 describes the absolute and relative frequencies of referred pain location for the patients with symptomatic irreversible pulpitis and referred pain. The ear and head were the most prevalent location of referred pain (40,7% and 22,2%, respectively), followed by the upper jaw, inferior jaw, left face (7,4%), and masseter, ear, posterior to others inferior teeth and right face (3,7%).

**Table 1.** Absolute and relative frequencies, and 95% confidence interval (CI) of mean of referred pain localization for the patients with referred pain and symptomatic irreversible pulpitis.

<i>Referred pain location</i>	Absolute and relative frequency	CI 95%
Ear	11/27 (40.7%)	22.4 – 61.2
Head	6/27 (22.2%)	8.6 – 42.3
Upper and Inferior jaw. Left face	2/27 (7.4%)	0.9 – 24.3
Masseter. Ear. Posterior to others inferior teeth. Right face	1/27 (3.7%)	0.1 - 19

CI, confidence interval.

### 3.3 Pain intensity and Psychosocial assessment

Table 2 describes the perceived pain intensity and the psychosocial aspects of symptomatic irreversible pulpitis patients with and without referred pain. Overall, patients with referred pain reported higher numeric rating scale (NRS) scores considering the 'average of the last 24 hours' when compared to the patients with no referred pain (86.52 (14.05) and 59.08 (22.98), respectively;  $p<0.05$ ). However, the perceived pain intensity 'at the moment' did not differ between the groups ( $p>0.05$ ). Regarding to the psychosocial assessment, no significant differences was observed between the groups ( $p>0.05$ ).

**Table 2.** Mean, standard deviation (SD) and 95% confidence interval (CI) of mean of perceived pain intensity and psychosocial aspects of patients with and without referred pain and symptomatic irreversible pulpitis.

	No referred pain		Referred Pain	
	Mean (SD)	CI 95%	Mean (SD)	CI 95%
<i>Pain intensity (NRS)</i>				
<b>At the moment</b>	50 (28.28)	32.02-67.97	62.30 (30.73)	49.01-75.59
<b>Last 24 hours</b>	59.08 (22.98)	44.48-73.68	86.52 (14.05) *	80.44-92.59
<i>Psychosocial assessment</i>				
<b>HADS-A</b>	6 (5.64)	2.41-9.58	6.21 (4.20)	4.39-8.03
<b>HADS-D</b>	4.58 (3.96)	2.06-7.10	3.78 (3.20)	2.39-5.16
<b>PSQI</b>	6.33 (2.96)	4.44-8.21	8.08 (4.54)	6.12-10.05
<b>PCS</b>	23.27 (16.14)	12.42- 34.11	29.95 (12.50)	24.55- 35.36
<b>OHIP-14</b>	19.45 (16.58)	8.31-30.59	24.82 (9.70)	20.63- 29.02

NRS, numeric rating scale (0–100); HADS, Hospital Anxiety and Depression Scale; PSQI, Pittsburgh Sleep Quality Index, PCS, Pain Catastrophizing Scale; OHIP-14, Oral Health Impact Profile short form. All values are described in terms of mean and standard deviation for all variables. \* Represents a significant difference between groups ( $p < 0.050$ ).

### 3.4 Clinical pain characteristics and duration

Pain intensity and duration (in seconds) of aftersensation of affected and contralateral teeth were evaluated in both groups at baseline and pos-anesthesia

(supplemental table 1). Patients with referred pain reported higher NRS pain scores in the pulp sensibility test for the contralateral tooth at baseline when compared to patients with no referred pain (37.17 (28.31) and 17.25 (12.27), respectively;  $p < 0.05$ ). Also, the same group reported a longer aftersensation, i.e., longer time in seconds for the perceived pain cease after pulp sensibility test (10.34 (6.05) and 6.83 (2.94), respectively;  $p < 0.05$ ). In particular, a significant difference was found when the relative difference was calculated considering the duration (aftersensation) at baseline and pos-anesthesia (-2.41 (4.55) and 2.75 (6.64), respectively;  $p < 0.05$ , (supplemental figure 1). In addition, a second analysis was performed for relative difference comparing both periods of assessment. However, no significant differences were observed ( $p > 0.05$ , supplemental table 2 and figure 2).

### **3.5 Pain descriptors**

Overall, patients with referred pain reported a higher pain rating index (PRI) and number of pain descriptors (number of words chosen, NWC) from McGill pain questionnaire when compared to patients with no referred pain (PRI: 40.21 (10.39) and 26.91 (16.41), respectively;  $p < 0.05$ ; NWC: 16.17 (2.67) and 12.66 (5.22), respectively;  $p < 0.05$ ; table 3). In particular, patients with referred pain described a higher number of descriptors for the sensory, affective, and evaluative major groups (7.91 (1.62), 4.34 (1.26) and 1.00 (0.00);  $p < 0.05$ ). For the miscellaneous group, there was not a significant difference between groups ( $p > 0.05$ ). Supplemental figure 3 shows the proportions of the most reported descriptors from McGill pain questionnaire according to different pain dimensions (major groups): sensory, affective, evaluative, and miscellaneous for both groups.

**Table 3.** Mean, standard deviation (SD) and 95% confidence interval (CI) of mean for McGill descriptors according to different pain dimensions (major groups) and pain rating index (sum of the rank values) of patients with and without referred pain and symptomatic irreversible pulpitis.

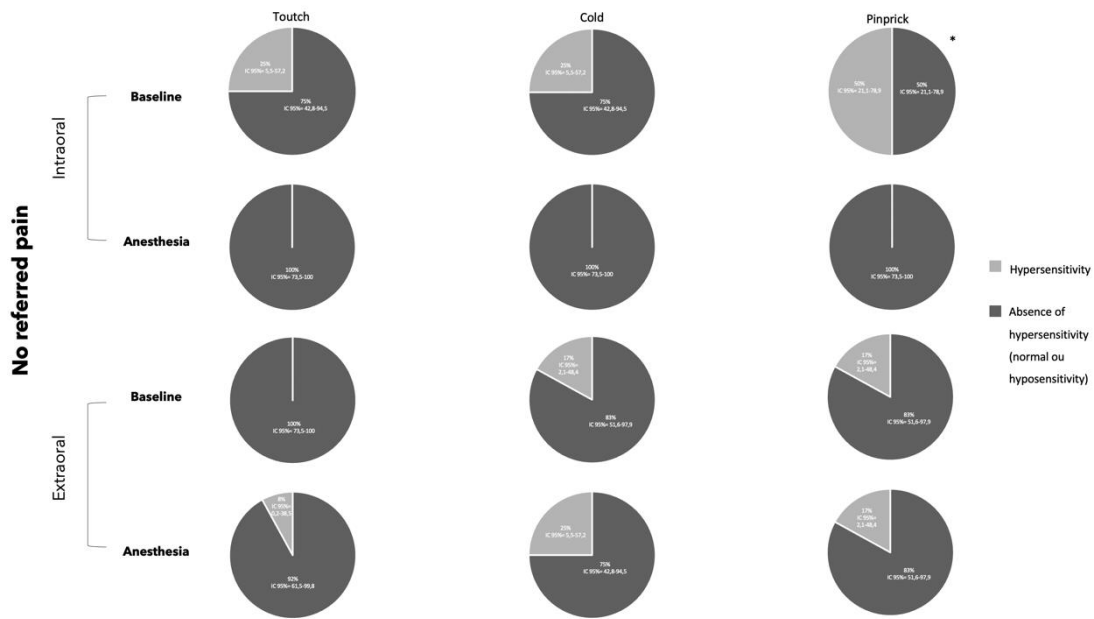
*McGill pain questionnaire*

	No referred pain		Referred Pain	
	Mean (SD)	CI 95%	Mean (SD)	CI 95%
<b>Sensory</b>	6.58 (2.02)	5.29-7.86	7.91 (1.62)*	7.21-8.61
<b>Affective</b>	2.83 (1.74)	1.72-9.94	4.34 (1.26)*	3.80-4.89
<b>Evaluative</b>	0.83 (0.38)	0.58-1.08	1.00 (0.00)*	1.00-1.00
<b>Miscellaneous</b>	2.50 (1.56)	1.50-3.49	3.04 (0.97)	2.62-3.46
<b>NWC</b>	12.66 (5.22)	9.34-15.98	16.17 (2.67) *	15.01- 17.33
<b>PRI</b>	26.91 (16.42)	16.47- 37.35	40.21 (10.39) *	35.72- 44.71

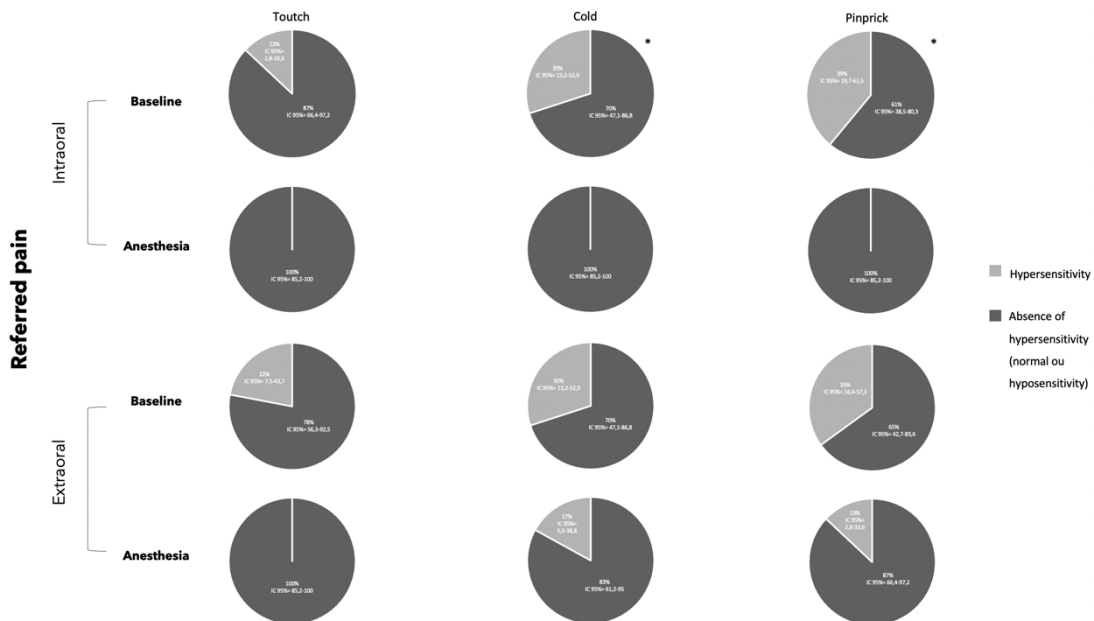
SD, standard deviation; CI confidence interval; NWC, number of words chosen; PRI, pain rating index. \* Represents a significant difference between groups ( $p < 0.050$ ).

### 3.6 Somatosensory Assessment

Overall, there were no significant differences for the somatosensory assessment between patients with and without referred pain when considering both sites (intraoral and extraoral) and periods of evaluation (baseline and pos-anesthesia), ( $p > 0.05$ , supplemental figure 4 and 5). On the other hand, for the within-group analysis, patients with no referred pain reported higher intraoral mechanical hypersensitivity at baseline ( $p < 0.05$ , figure 1). Likewise, patients with referred pain reported higher intraoral thermal and mechanical hypersensitivity in the baseline evaluation ( $p < 0.05$ , figure 2). A second analysis within-group was performed comparing the intraoral and extraoral sites for both periods of evaluation, and no significant differences was observed within groups ( $p > 0.05$ , supplemental figure 6 and 7).



**Figure 1.** Proportions and 95% confidence interval of patients with no referred pain and symptomatic irreversible pulpitis with absence (normal or hyposensitivity) or presence of hypersensitivity to touch, cold, and pinprick stimuli considering both sites (intraoral and extraoral) and periods of evaluation (baseline and anesthesia). \* Represents a significant difference within group ( $p < 0.050$ ).



**Figure 2.** Proportions and 95% confidence interval of patients with referred pain and symptomatic irreversible pulpitis with absence (normal or hyposensitivity) or presence of hypersensitivity to touch, cold, and pinprick stimuli considering both sites (intraoral and extraoral) and periods of evaluation (baseline and anesthesia). \* Represents a significant difference within group ( $p < 0.050$ ).

### 3.7 Other assessments

Data related to use of medication, pain relief, and complementary anesthesia was collected. Significant within-group differences were observed only for patients with referred pain ( $p < 0.05$ ; supplemental figure 8).

## 4. Discussion

This study aimed at comparing patients with symptomatic irreversible pulpitis with and without referred pain considering general clinical aspects that could contribute to early diagnosis and subsequent treatment. The main finding was that patients with referred pain presented a worse clinical condition, i.e., greater dental pain intensity and worse outcomes for the pain descriptors and the pulp sensibility tests of the contralateral tooth.

Establishing an accurate diagnosis is the first step to success in endodontic therapy. In addition, when a patient has referred pain, it is essential to proceed carefully with investigations before carrying out treatment that could be inappropriate (15). The present study focuses on the importance of characterizing the patients, and highlights that there are significant and relevant clinical differences between symptomatic irreversible pulpitis patients with and without referred pain. These findings can be used for better patient management and preoperative pain control.

Previous studies have drawn the attention to the importance of differential toothache diagnosis to prevent erroneous and unnecessary dental treatments and highlighted that different referred patterns can be observed in toothache (9, 10). Also, orofacial referred pain can be frequently observed due to convergence of different nociceptive afferent inputs from superficial and deep tissues into the trigeminal brainstem (9, 10). The present study found a large percentage of symptomatic irreversible pulpitis patients referring pain to orofacial regions as ear, head, upper and inferior jaw, left face and masseter. The convergence mechanisms of cutaneous, tooth pulp, visceral, neck and muscle can explain our findings (5). In agreement, a previous study showed an association between incompletely fractured teeth with diffuse long-lasting orofacial pain and highlighted the importance of an appropriate diagnosis and specific treatment (14).

Overall, patients with referred pain reported higher pain intensity considering the 'average of the last 24 hours' when compared with patients without referred pain. However, this was not observed for pain intensity 'at the moment'. Such difference can

be explained by the confounding effect of acute medications that may mask some possible differences for the pain 'at the moment'. This study also found that most of patients with referred pain took analgesic medication in the last hours prior to the exam, confirming the absence of significant difference in the pain intensity 'at moment'. Although no significant differences between groups were found for the pain 'at the moment', it was possible to observe within-group differences, i.e., patients with referred pain showed a greater difference between pain intensity 'at moment' and considering the 'average of the last 24 hours'. On the other hand, this pattern was not observed for patients without referred pain.

Likewise, patients with referred pain reported a higher pain rating index (PRI) and number of pain descriptors (NWC) of the McGill questionnaire. This indicates that patients with symptomatic irreversible pulpitis and referred pain probably describe the toothache and referred pain as a single pain experience, meaning that they do not separate the local pain from referred pain. This association also contributed to a higher number of pain descriptors, i.e., number of words chosen to explain the pain, observed in patients with referred pain. However, the pain experience of toothache and referred pain are possibly perceived differently in terms of quality, which increased the number of descriptors used. Furthermore, describing referred pain with a large number of descriptors including some related to other orofacial pain conditions as neuropathic, musculoskeletal, and neurovascular pain, perhaps lead to an additional diagnostic challenge and contribute to misinterpretation (32, 33).

Moreover, the proportion of individuals that reported previous use of analgesic medication in the last 24 hours and required complementary anesthesia was significantly higher only for the patients with referred pain. Such findings are highly relevant for the clinical management since the literature shows an overall low anesthetic efficacy in patients with irreversible pulpitis (34, 35). Thus, the presence of referred pain might be important to help characterizing those patients who will possibly need a more comprehensive anesthetic protocol.

A major part of the diagnostic process for pulp disease is the use of pulp sensibility tests (36). Generally, these tests are performed in the affected tooth and the contralateral healthy tooth is used as parameter for comparison. The present study demonstrated that patients with referred pain presented a higher pain intensity and a longer aftersensation for the contralateral teeth when compared with patients without

referred pain. Interestingly, these differences were not observed after the local anesthesia of the affected tooth. A recent study demonstrated that patients with moderate to severe toothache, mechanical allodynia may manifest in the contralateral tooth due to central sensitization (CS) (18). As such, the presence of referred pain might be associated with central sensitization in patients with symptomatic irreversible pulpitis and that peripheral inputs are relevant contributors. In addition, a previous study observed the presence of mechanical allodynia in healthy teeth adjacent and contralateral to endodontic disease teeth after percussion testing (19). These findings reinforce the importance of evaluating the contralateral teeth to characterize patients before carrying out the treatment. Furthermore, despite the absence of significant difference, it was observed that the time of aftersensation for the affected tooth was long and varied, i.e., wide confidence interval at baseline. Thus, this pattern can contribute to characterize those patients before the beginning of the endodontic intervention.

Regarding psychosocial aspects, no significant differences were found between the groups. This result was already expected since pulpitis is an acute condition and previous studies have shown a stronger relationship between psychosocial factors as a predictor in the transition from acute to chronic pain (37-41). Indeed, the psychosocial factor is a risk factor for chronic persistent pain conditions (42). Furthermore, a previous study has shown that acute orofacial pain can lead to prolonged changes in pain components (43). These findings reinforce the importance of early management of all painful conditions with an emphasis on psychosocial aspects.

This study has some limitations that should be highlighted. As this is a study with secondary analyses, the limitations related to the primary study must also be considered (25). This means that a replication of these findings is necessary. Furthermore, the sample size is also a limitation of the present study. A total of 35 patients with symptomatic irreversible pulpitis was calculated to test the hypothesis of the previously published work (25). This relatively small sample size may explain the lack of significant differences for some variables. However, our findings are sufficient to indicate – to some extent – a worse clinical condition in patients with irreversible pulpitis and referred pain. Moreover, the number of patients was not equally distributed between groups. Thus, investigations with bigger samples and a balanced distribution are required to reproduce these preliminary findings and to establish the extent of the differences between symptomatic irreversible pulpitis with and without referred pain.



In conclusion, patients with referred pain and symptomatic irreversible pulpitis present relevant alterations mainly related to clinical and evoked pain. Therefore, the presence of referred pain can contribute to a better characterization and clinical assessment of patients with symptomatic irreversible pulpitis with important management implications.

### **Acknowledgements**

Supported by São Paulo Research Foundation (grant nos. 2015/09913-4, 2017/18741-0, and 2019/06035-7).

### **Conflict of interest**

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

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## Supplemental material

**Table S1.** Mean, standard deviation (SD) and 95% confidence interval (CI) of mean of clinical pain characteristics and duration of patients with and without referred pain and symptomatic irreversible pulpitis considering the affected and the contralateral teeth.

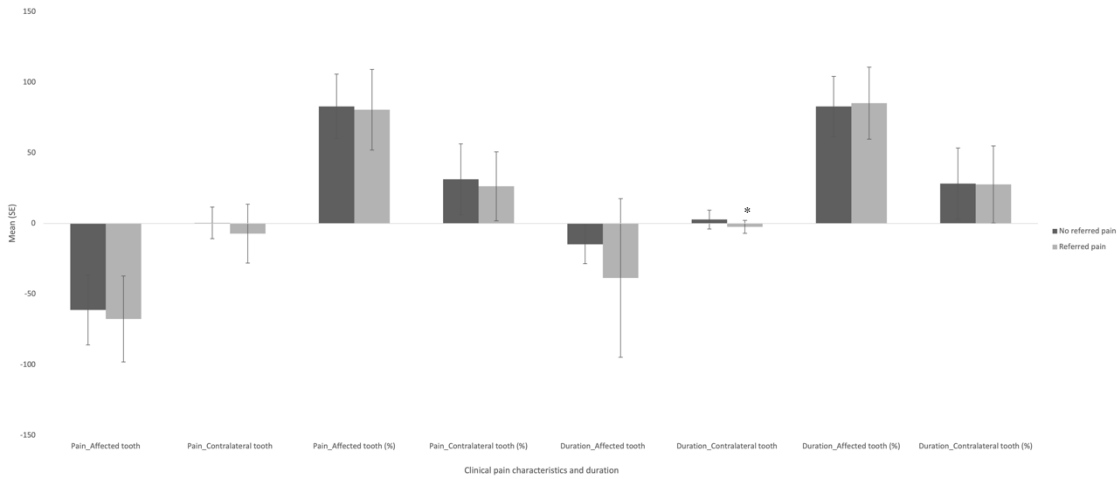
	No referred pain				Referred Pain			
	Affected tooth		Contralateral tooth		Affected tooth		Contralateral tooth	
	Mean (SD)	95% CI	Mean (SD)	CI 95%	Mean (SD)	CI 95%	Mean (SD)	CI 95%
Pain_Vitality_ Baseline	74.16 (21.93)	60.24-88.10	17.25 (12.27)	9.44-25.05	84.34 (21.49)	75.05-93.64	37.17 (28.31)	24.94-49.41
Pain_Vitality_ Anesthesia	12.91 (16.63)	2.34-23.48	17.66 (12.64)	9.63-25.70	16.73 (26.65)	5.12-28.26	30 (24.07)	19.58-40.41
Pain_Relative difference	-61.25 (24.80)	-77.01 - -45.48	0.41 (11.17)	-6.68 - 7.51	-67.60 (30.40)	-80.75 - -54.45	-7.17 (20.87)	-16.20 - 1.85
Pain_Relative difference (%)	82.93 (22.81)	68.44 - 97.42	31.25 (25.15)	15.26 - 47.23	80.53 (28.58)	68.17 - 92.89	26.32 (24.42)	15.56 - 36.88
Duration_ Baseline	19.75 (16.95)	8.97-30.52	6.83 (2.94)	4.96-8.70	43.21 (57.09)	18.52-67.90	10.34 (6.05)	7.72-12.96
Duration_ Anesthesia	5 (6.45)	0.90-9.09	9.58 (7.54)	4.78-14.38	4.59 (7.72)	1.25-7.93	7.93 (4.24)	6.09-9.77
Duration_ Relative difference	-14.75 (13.76)	-23.49 - -6.00	2.75 (6.64)	-1.47 - 6.97	-38.62 (56.15)	-62.90 - -14.34	-2.41 (4.55) *	-4.38 - -0.44
Duration_ Relative difference (%)	82.83 (21.37)	69.24 - 96.41	28.30 (25.21)	12.28 - 44.32	85.14 (25.51)	74.10 - 96.17	27.60 (27.36)	15.77 - 39.44

SD, standard deviation; CI, confidence interval; Vita, vitality; Ba, Baseline; An, anesthesia. \* Represents a significant difference between groups ( $p < 0.050$ ).

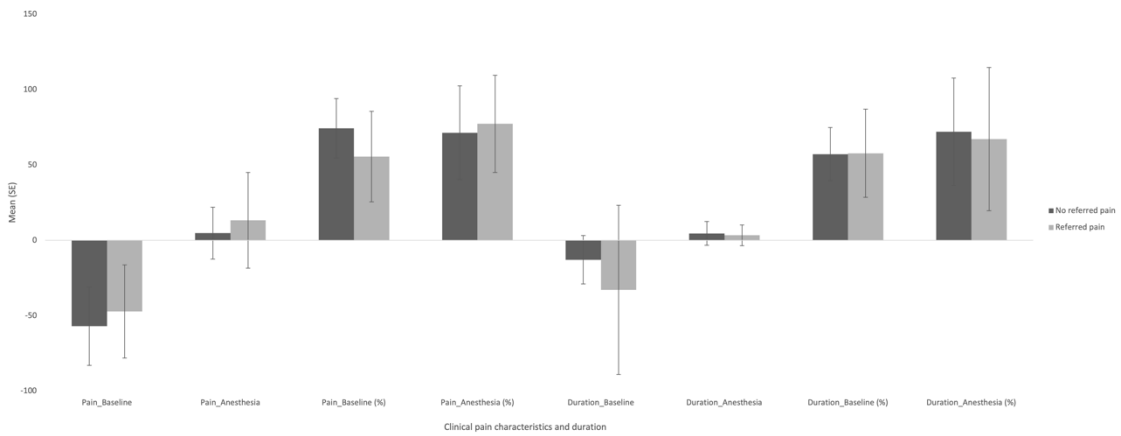
**Table S2.** Mean, standard deviation (SD) and 95% confidence interval (CI) of mean of clinical pain characteristics and duration of patients with and without referred pain and symptomatic irreversible pulpitis considering both periods of evaluations: baseline and pos-anesthesia.

	No referred pain				Referred Pain			
	Baseline		Anesthesia		Baseline		Anesthesia	
	Mean (SD)	CI 95%	Mean (SD)	CI 95%	Mean (SD)	CI 95%	Mean (SD)	CI 95%
Pain_Vitality_ Affected	74.16 (21.93)	60.24-88.10	12.991 (16.63)	2.34-23.48	84.34 (21.49)	75.05-93.64	16.74 (26.65)	5.12-28.26
Pain_Vitality_ Contralateral	17.25 (12.28)	9.44-25.05	17.66 (12.64)	9.63-25.70	37.17 (28.31)	24.94-49.41	30 (24.07)	19.58-40.41
Pain_Relative difference	-56.91 (25.99)	-73.43 - -40.39	4.75 (17.15)	-6.14 - 15.64	-47.17 (30.92)	-60.54 - -33.80	13.26 (31.75)	-0.46 - 26.99
Pain_Relative difference (%)	74.30 (19.75)	61.75 - 86.85	71.36 (31.13)	51.58 - 91.14	55.58 (30.04)	42.59 - 68.57	77.27 (32.31)	63.30 - 91.25
Duration_ Affected	19.75 (16.95)	8.97-30.52	5 (6.45)	0.90-9.09	43.21 (57.09)	18.52-67.90	4.59 (7.72)	1.25-7.93
Duration_ Contralateral	6.83 (2.94)	4.96-8.70	9.58 (7.54)	4.78-14.38	10.34 (6.05)	7.72-12.96	7.93 (4.24)	6.09-9.77
Duration_ Relative difference	-12.91 (16.07)	-23.13 - -2.70	4.58 (7.89)	-0.43 - 9.59	-32.86 (56.17)	-57.16 - -8.57	3.34 (6.84)	0.38 - 6.30
Duration_ Relative difference (%)	57.20 (17.61)	46.01 - 68.40	72.01 (35.65)	49.35 -94.67	57.77 (29.19)	45.14 - 70.39	67.16 (47.55)	46.59 - 87.72

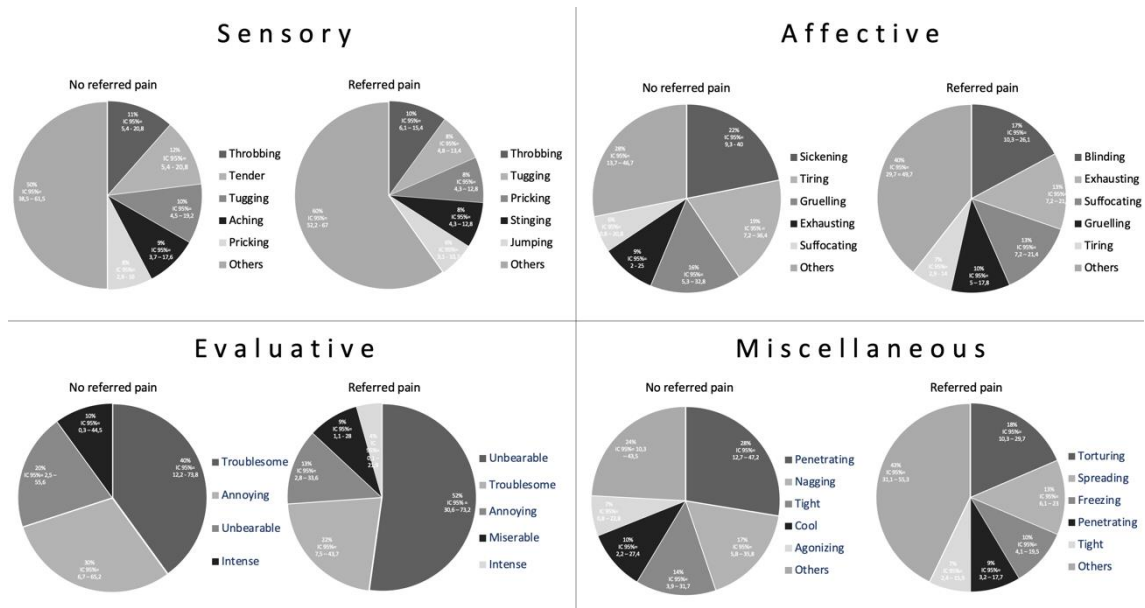
SD, standard deviation; CI, confidence interval; Vita, vitality; Ba, Baseline; An, anesthesia.



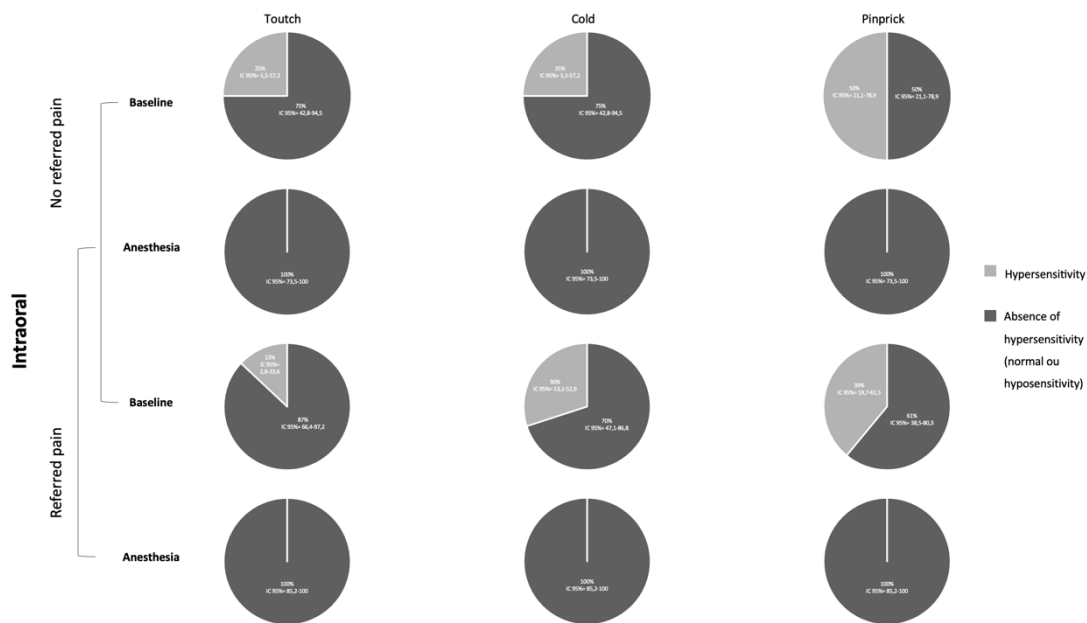
**Figure S1.** Graphical representation of mean and standard error (SE) of clinical pain characteristics and duration of patients with and without referred pain and symptomatic irreversible pulpitis considering the affected and the contralateral teeth. \* Represents a significant difference between groups ( $p < 0.050$ ).



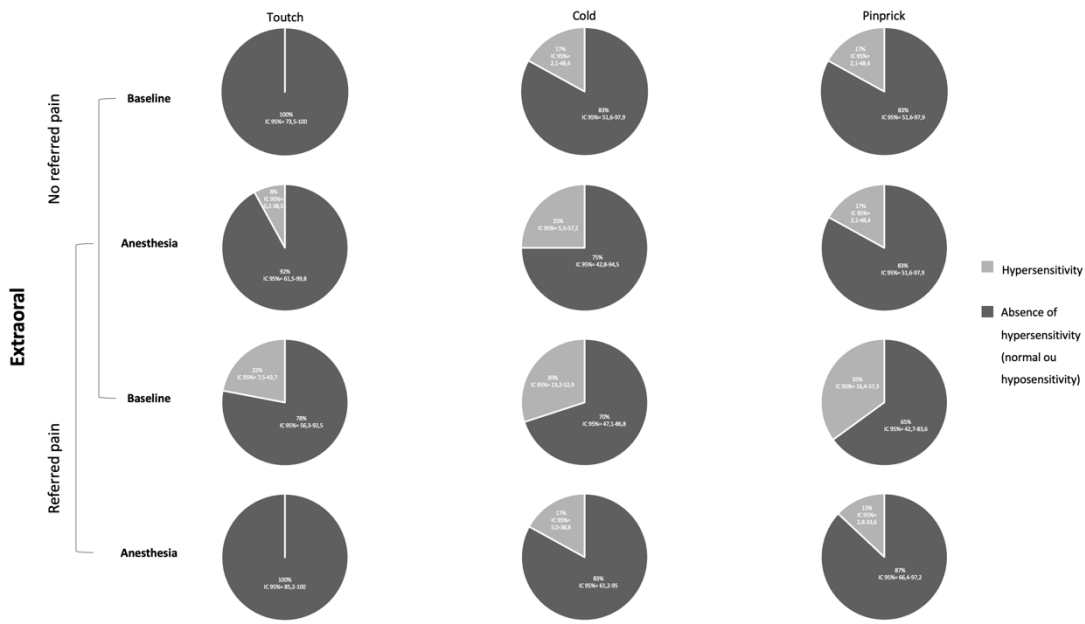
**Figure S2.** Graphical representation of mean and standard deviation (SD) of clinical pain characteristics and duration of patients with and without referred pain and symptomatic irreversible pain considering both periods of evaluations: baseline and pos-anesthesia.



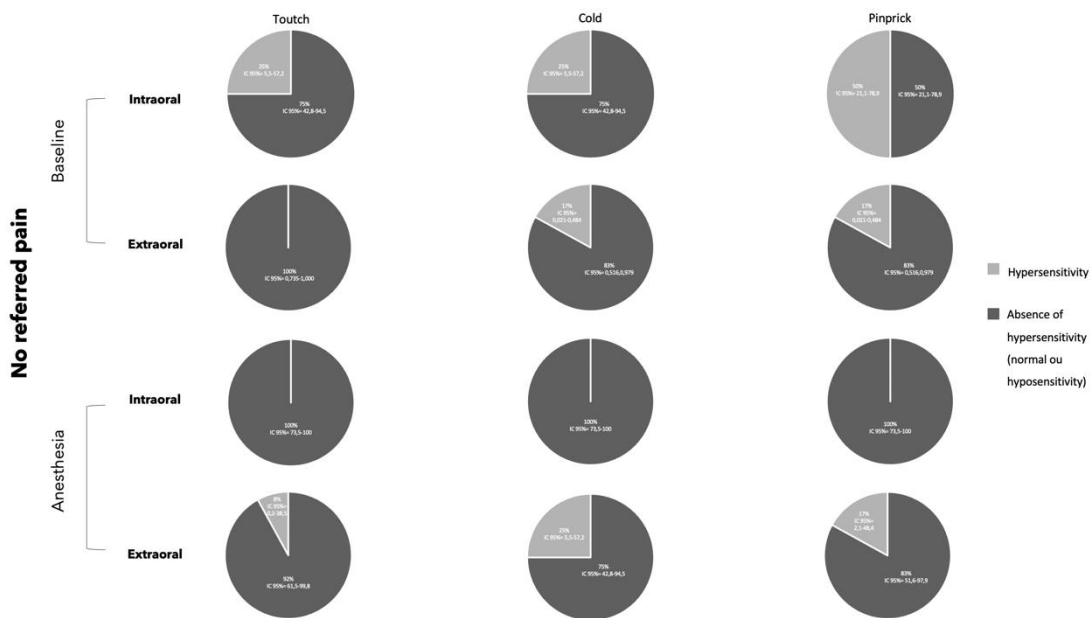
**Figure S3.** Proportions and 95% confidence interval of the most reported descriptors from McGill pain questionnaire according to different pain dimensions (major groups): sensory, affective, evaluative, and miscellaneous of patients with and without referred pain and symptomatic irreversible pulpitis.



**Figure S4.** Proportions and 95% confidence interval of patients without and with referred pain and symptomatic irreversible pulpitis with absence (normal or hyposensitivity) or presence of hypersensitivity to touch, cold, and pinprick stimuli considering both periods of evaluation (baseline and pos-anesthesia) for the intraoral region.

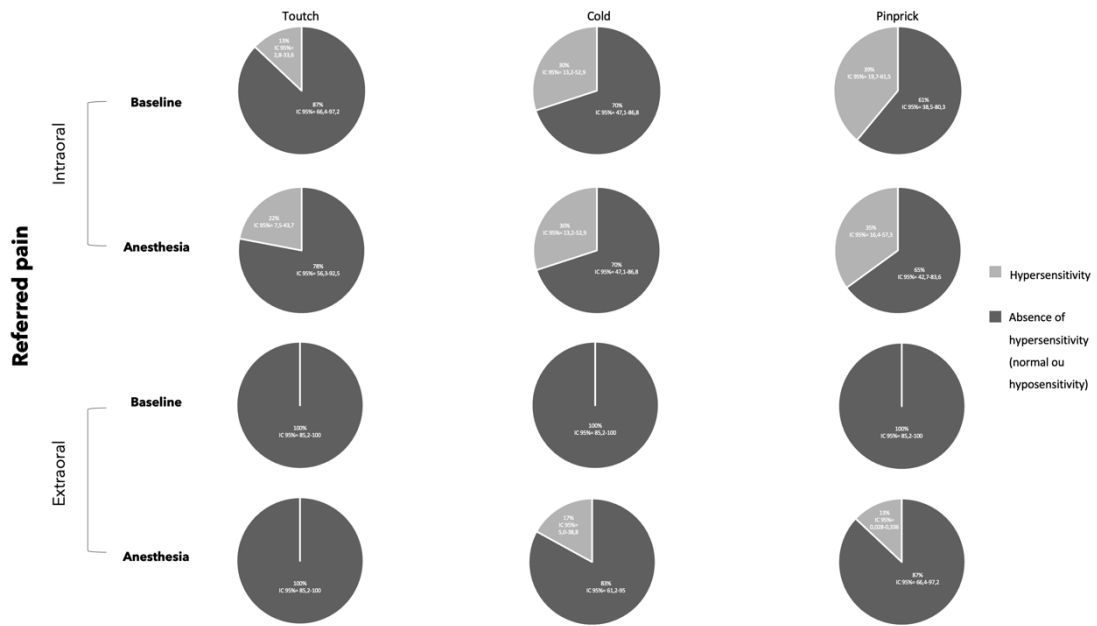


**Figure S5.** Proportions and 95% confidence interval of patients without and with referred pain and symptomatic irreversible pulpitis with absence (normal or hyposensitivity) or presence of hypersensitivity to touch, cold, and pinprick stimuli considering both periods of evaluation (baseline and pos-anesthesia) for the extraoral region.

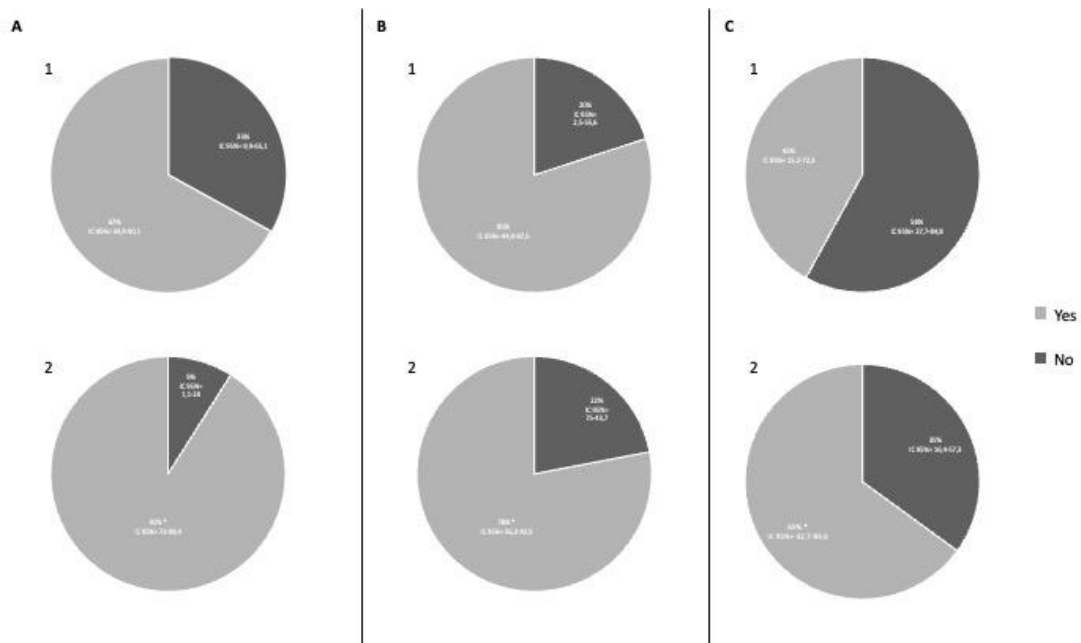


**Figure S6.** Proportions and 95% confidence interval of patients without and with referred pain and symptomatic irreversible pulpitis with absence (normal or hyposensitivity) or presence of hypersensitivity to touch, cold, and pinprick stimuli both sites (intraoral and extraoral) and periods of evaluation (baseline and pos-anesthesia).





**Figure S7.** Proportions and 95% confidence interval of patients without and with referred pain and symptomatic irreversible pulpitis with absence (normal or hyposensitivity) or presence of hypersensitivity to touch, cold, and pinprick stimuli both sites (intraoral and extraoral) and periods of evaluation (baseline and pos-anesthesia).



**Figure S8.** Proportions and 95% confidence interval of patients without (1) and with (2) referred pain and symptomatic irreversible pulpitis considering the use of medication (A), pain relief (B) and complementary anesthesia (C). \* Represents a significant difference within group ( $p < 0.050$ ).





# 3

## DISCUSSÃO





### 3 DISCUSSÃO

Este estudo teve como objetivo comparar pacientes com pulpite irreversível sintomática com e sem dor referida, considerando aspectos clínicos gerais que possam contribuir para o diagnóstico precoce e posterior tratamento. O principal achado foi que os pacientes com dor referida apresentaram uma pior condição clínica, ou seja, maior intensidade de dor dentária e piores resultados para os descritores de dor e para os testes de sensibilidade pulpar do dente contralateral.

Estabelecer um diagnóstico preciso é o primeiro passo para o sucesso na terapia endodôntica. Além disso, quando o paciente referir dor como queixa principal, é essencial proceder com cautela nas investigações antes de realizar um tratamento que possa ser inadequado<sup>15</sup>. O presente estudo enfoca a importância da caracterização dos pacientes e destaca que existem diferenças clínicas significativas e relevantes entre pacientes com pulpite irreversível sintomática com e sem dor referida. Esses achados podem ser usados para um melhor manejo do paciente e controle da dor pré-operatória.

Estudos anteriores chamaram a atenção para a importância do diagnóstico diferencial da dor de dente para prevenir tratamentos odontológicos errôneos e desnecessários e destacaram que diferentes padrões de dor referida podem ser observados em pacientes com dor de dente<sup>9,10</sup>. Além disso, a dor referida orofacial pode ser frequentemente observada devido à convergência de diferentes nociceptores aferentes de tecidos superficiais e profundos para o complexo trigeminal no tronco encefálico<sup>9,10</sup>. O presente estudo encontrou um grande percentual de pacientes sintomáticos com pulpite irreversível referindo dor em regiões orofaciais como orelha, cabeça, mandíbula, maxila, face esquerda e masseter. Os mecanismos de convergência cutânea, pulpar, visceral, cervical e muscular podem explicar nossos achados<sup>5</sup>. Em concordância, um estudo prévio mostrou uma associação entre dentes incompletamente fraturados com dor orofacial difusa de longa duração e destacou a importância de um diagnóstico adequado e tratamento específico<sup>14</sup>.

No geral, os pacientes com dor referida relataram maior intensidade de dor considerando a 'média das últimas 24 horas' quando comparados aos pacientes sem dor referida. No entanto, isso não foi observado para a intensidade da dor 'no momento'. Tal diferença pode ser explicada pelo efeito de confusão das medicações analgésicas que podem mascarar algumas possíveis diferenças para a dor "no

momento”. Este estudo também constatou que a maioria dos pacientes com dor referida fez uso de medicação analgésica nas últimas horas anteriores ao exame, confirmando a ausência de diferença significativa na intensidade da dor ‘no momento’. Embora não tenham sido encontradas diferenças significativas entre os grupos para a dor 'no momento', foi possível observar diferenças intragrupo, ou seja, pacientes com dor referida apresentaram maior diferença entre a intensidade da dor 'no momento' e considerando a 'média de últimas 24 horas'. Por outro lado, esse padrão não foi observado para pacientes sem dor referida.

Da mesma forma, pacientes com dor referida relataram um maior índice de classificação de dor e número de descritores de dor de acordo com o questionário McGill. Isso indica que pacientes com pulpite irreversível sintomática e dor referida provavelmente descrevem a dor de dente e a dor referida como uma única experiência de dor, o que significa que eles não separam a dor local da dor referida. Essa associação também contribuiu para um maior número de descritores de dor, ou seja, número de palavras escolhidas para explicar a dor, observada em pacientes com dor referida. No entanto, a experiência dolorosa da dor de dente e a dor referida possivelmente são percebidas de forma diferente em termos de qualidade, o que aumentou o número de descritores utilizados. Além disso, descrever a dor referida com um grande número de descritores, incluindo alguns relacionados a outras condições de dor orofacial como dor neuropática, musculoesquelética e neurovascular, pode trazer um desafio diagnóstico adicional e contribuir para interpretações errôneas<sup>20,21</sup>.

Ainda, a proporção de indivíduos que relataram uso prévio de medicação analgésica nas últimas 24 horas e necessitaram de anestesia complementar foi significativamente maior apenas para os pacientes com dor referida. Tais achados são altamente relevantes para o manejo clínico, uma vez que a literatura mostra uma baixa eficácia anestésica geral em pacientes com pulpite irreversível<sup>22,23</sup>. Assim, a presença de dor referida pode ser importante para auxiliar na caracterização daqueles pacientes que possivelmente necessitarão de um protocolo anestésico mais abrangente.

Uma parte importante do processo de diagnóstico da doença pulpar é o uso de testes de sensibilidade pulpar<sup>24</sup>. Geralmente, esses testes são realizados no dente afetado e o dente hígido contralateral é utilizado como parâmetro de comparação. O presente estudo demonstrou que pacientes com dor referida apresentaram maior intensidade de dor e uma maior duração da dor para os dentes contralaterais quando



comparados com pacientes sem dor referida. Curiosamente, essas diferenças não foram observadas após a anestesia local do dente com pulpíte. Um estudo recente demonstrou que em pacientes com dor de dente de moderada a severa, alterações clínicas do tipo alodinia mecânica, podem se manifestar no dente contralateral devido à processos de sensibilização central<sup>18</sup>. Como tal, a presença de dor referida pode estar associada à sensibilização central em pacientes com pulpíte irreversível sintomática. Além disso, um estudo anterior observou a presença de alodinia mecânica em dentes hígidos adjacentes e contralaterais a dentes com doença endodôntica após o teste de percussão<sup>19</sup>. Esses achados reforçam a importância de avaliar os dentes contralaterais para caracterizar os pacientes antes de realizar o tratamento endodôntico. Apesar da ausência de diferença significativa, observou-se que o tempo de duração da dor após o teste de sensibilidade pulpar para o dente com pulpíte foi longo e variado. Assim, esse padrão pode contribuir para caracterizar esses pacientes antes do início da intervenção endodôntica.

Quanto aos aspectos psicossociais, não foram encontradas diferenças significativas entre os grupos. Esse resultado já era esperado, pois a pulpíte irreversível é uma condição aguda e estudos anteriores mostraram uma relação mais forte entre fatores psicossociais como preditor na transição da dor aguda para crônica<sup>25-29</sup>. Por certo, o fator psicossocial é um fator de risco para condições de dor crônica persistente<sup>30</sup>. Além disso, um estudo anterior mostrou que a dor orofacial aguda pode levar a alterações prolongadas nos componentes da dor<sup>31</sup>. Esses achados reforçam a importância do manejo precoce de todas as condições dolorosas com ênfase nos aspectos psicossociais.

Este estudo apresenta algumas limitações que devem ser destacadas. Por se tratar de um estudo com análises secundárias, também devem ser consideradas as limitações relacionadas ao estudo primário<sup>32</sup>. Isso significa que uma replicação desses achados é necessária. Além disso, o tamanho da amostra também é uma limitação do presente estudo. Um total de 35 pacientes com pulpíte irreversível sintomática foi calculado para testar a hipótese do trabalho publicado anteriormente<sup>32</sup>. Esse tamanho de amostra relativamente pequeno pode explicar a falta de diferenças significativas para algumas variáveis. No entanto, nossos achados são suficientes para indicar, até certo ponto, uma pior condição clínica em pacientes com pulpíte irreversível e dor referida. Além disso, o número de pacientes não foi distribuído igualmente entre os grupos. Assim, investigações com amostras maiores e distribuição equilibrada são

necessárias para reproduzir esses achados preliminares e estabelecer a extensão das diferenças entre pulpite irreversível sintomática com e sem dor referida.

Em conclusão, pacientes com dor referida e pulpite sintomática irreversível apresentam alterações relevantes principalmente relacionadas à dor clínica e provocada. Portanto, a presença de dor referida pode contribuir para uma melhor caracterização e avaliação clínica de pacientes com pulpite irreversível sintomática com importantes implicações no tratamento endodôntico.

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## REFERÊNCIAS

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**ANEXO**





## ANEXO PARECER COMITÊ DE ÉTICA

USP - FACULDADE DE  
ODONTOLOGIA DE BAURU DA  
USP



Continuação do Parecer: 2.112.024

cronograma e quaisquer outras mudanças que sejam significativas deverão ser previamente comunicadas a este CEP sob risco de não aprovação do relatório final. Quando da apresentação deste, deverão ser incluídos todos os TCLEs e/ou termos de doação assinados e rubricados, se pertinentes.

**Este parecer foi elaborado baseado nos documentos abaixo relacionados:**

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_916742.pdf	16/05/2017 18:52:51		Aceito
Folha de Rosto	folhaderosto.pdf	16/05/2017 18:52:07	Leonardo Rigoldi Bonjardim	Aceito
Projeto Detalhado / Brochura Investigador	Projeto_QualQST_Pulpite.docx	08/05/2017 12:41:57	Leonardo Rigoldi Bonjardim	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE_CEP_2017_JARA.doc	08/05/2017 12:39:06	Leonardo Rigoldi Bonjardim	Aceito
Outros	QuestionarioTecnicoPesquisador_CEP_2017.pdf	08/05/2017 12:38:49	Leonardo Rigoldi Bonjardim	Aceito
Outros	CartaEncaminhamentoTermodeAquiescencia.pdf	08/05/2017 12:38:25	Leonardo Rigoldi Bonjardim	Aceito
Declaração de Pesquisadores	DeclaracaoCompromissoPesquisadorResultadosPesquisa.pdf	08/05/2017 12:36:02	Leonardo Rigoldi Bonjardim	Aceito

**Situação do Parecer:**

Aprovado

**Necessita Apreciação da CONEP:**

Não

BAURU, 09 de Junho de 2017

Assinado por:  
Ana Lúcia Pompéia Fraga de Almeida  
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