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ORIGINAL RESEARCH

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Enhancing pediatric comfort: a comprehensive approach to managing molar-incisor hypomineralization with preemptive analgesia and behavioral strategies

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Abstract

Preemptive analgesia is an important strategy used in pediatric dentistry to intercept pain signals in neural pathways early, thus mitigating the perception of pain and enhancing overall patient comfort. Pedodontists often encounter challenges in conducting the therapy and managing uncooperative patients, when addressing enamel defects of the Molar-incisor hypomineralization (MIH) type. The aim of this study is to demonstrate the impact of preemptive analgesia on optimizing behavioral management and restorative treatment strategies for immature permanent molars exhibiting severe MIH and Treatment need index 4 (TNI), through the effective control of pain. This study comprised 27 cases with MIH level 3 Posteruptive breakdown (PEB), indicating post-eruptive enamel breakdown, with initial hypersensitivity scores exceeding 4 on the Wong-Baker Scale, was conducted over 12 months, between January 2023–January 2024. Data on pediatric patients aged between 5 years and 4 months and 7 years and 1 month with varying degrees of sensitivity in their permanent first molars before the completion of the eruption process were collected. Pain intensity was systematically evaluated at six specific time points: before and after the administration of analgesic medication as well as during restorative treatment using the Wong-Baker scale and data from the Face, Legs, Activity, Cry, Consolability index (FLACC). Statistical analysis for Wong-Baker scores and FLACC index indicated statistical significance ($p < 0.05$) for Mann-Whitney and Wilcoxon tests, respectively *t*-test. The comparison of mean scores recorded before and after preemptive analgesia during rotary instrumentation moments for the Wong-Baker index ($4 > 0.29$) and for the FLACC index ($8.47 > 1.71$) indicates the positive influence of administering ibuprofen. In conclusion, preemptive analgesia, alongside standardized anesthesia, significantly improved intraoperative pain management and behavioral outcomes.

Keywords

Molar hypomineralization; Pain measurement; Behavior control; Preemptive analgesia; Dental atraumatic restorative treatment; Analgesia; Patient-controlled

1. Introduction

Molar-incisor hypomineralization (MIH) is characterized by a developmental defect in the enamel structure, with a multifactorial etiology that remains incompletely understood, which often involves general factors such as nutritional deficiencies or inflammatory processes. Recent reports indicate that MIH has a prevalence ranging from 0.48% to 46.6% [1]. This condition can be classified into four categories: mild, moderate, severe and atypical restoration. Patients exhibiting severe demarcated opacities on the enamel, coupled with immediate post-eruptive loss of dental substance like enamel or dentin breakdown, are designated as Grade 3, indicative of post-eruptive enamel breakdown (PEB) [2].

Features associated with Grade 3 PEB usually indicate an urgent need for treatment due to the presence of hypersensitivity.

The correlation between the severity of a case and the necessity for treatment is essential for clinicians and can be assessed using the MIH Treatment Need Index (TNI). This index, also known as MIH-TNI, is used to evaluate the main symptoms of MIH and is based on the Community Periodontal Index of Treatment Needs (CPITN) framework (Cutress *et al.* [3], 1987) alongside the "Don't Hesitate" treatment approach from the University of Zürich (Steffen and van Waes, 2011) [3, 4]. This classification helps identify MIH on teeth, along with

hypersensitivity and enamel damage. TNI 4 can be categorized into the following subgroups:

(1) TNI 4a: When the defect affects less than one-third of the tooth;

(2) TNI 4b: When the defect affects more than one-third but less than two-thirds of the tooth;

(3) TNI 4c: When the defect affects more than two-thirds of the tooth's surface, involves proximity to the pulp, or exhibits atypical restoration.

The current study explores a behavioral control approach for pediatric patients with hypersensitivity associated with permanent first molars showing enamel developmental defects typical of MIH, which often become clinically evident immediately after the onset of eruption in the oral cavity. In this medical context, dental preemptive analgesia refers to administering pain relief medication before dental procedures to prevent or reduce pain sensations that may arise during and after treatment. This approach is particularly relevant for cases of MIH, especially when there is spontaneous hypersensitivity even before molars fully emerge or during procedures involving rotary instruments, where traditional anesthesia methods may not be effective [5].

Vicioni *et al.* [6] conducted the first clinical trial investigating the use of ibuprofen as preemptive analgesia in children with similar MIH characteristics (grade 3, PEB and hypersensitivity) and reported the efficacy of administering ibuprofen 30 minutes before restorative treatment. To evaluate ibuprofen's effectiveness, the study divided participants into two groups: one receiving a placebo and the other receiving ibuprofen, following which the degree of hypersensitivity was assessed using a 10-second air spray after local anesthesia infiltration [6].

The implementation of restorative therapy necessitates the establishment of comprehensive behavioral management strategies tailored to this clinical setting [7], which involves carefully examining and fully understanding both subjective and objective signs and symptoms. Thus, the patient's subjective symptoms related to the incompletely erupted first permanent molar, as well as their level of comfort and cooperation, can be assessed using the Wong-Baker scale (self-reporting method) and FLACC scale (evaluation method) [8, 9].

The Wong-Baker FACES Pain Rating Scale is a visual assessment tool used to assist individuals, particularly children, in expressing and quantifying their pain levels. It comprises a range of faces, from a smiling face (representing "no pain") to a crying face (indicating "maximum pain"). Patients can indicate the face that matches their current pain level, aiding healthcare providers in comprehending and addressing their discomfort [10, 11].

The FLACC (Face, Legs, Activity, Cry, Consolability) index is a widely recognized and validated pain assessment tool extensively used in pediatric healthcare. It assesses a child's pain by observing behaviors in five categories: facial expression, leg movement, activity level, cry and responsiveness to comfort. Each category is assigned a score, aiding healthcare providers in evaluating and addressing a child's pain and is particularly valuable for pediatric dentists in assessing a patient's discomfort level [12–14].

These tools enable dental professionals to impartially assess the level of pain experienced by children, even if they are nonverbal or face communication challenges due to their young age.

Regarding restorative therapy and the available materials, Zinc Oxide Eugenol (ZOE) is a widely utilized material for temporary restoration, particularly for application over dentinal tissue [15, 16].

Glass-ionomer cement (GIC) is used for restoring atypical coronary morphology because of its durability, mechanical strength, and biocompatibility with dental pulp in young permanent teeth [17, 18].

Until now, a universally applicable clinical protocol for the definitive restoration of molars affected by severe MIH with a TNI of 4 has not yet been established. However, the entire therapy should consider factors such as the patient's age, the onset of mixed dentition, the necessity of treating an immature permanent tooth with hypersensitivity during eruption with incomplete apexogenesis, and the developing stomatognathic system with unstable occlusal relationships due to physiological dental replacement.

Herein, we designed this present study to assess the impact of preemptive analgesia using ibuprofen in young patients with MIH level 3 PEB, TNI 4 index, on behavioral modulation through pain management. The secondary objective is to propose a simple therapeutic regimen for children with severe MIH, focusing on effective pain control through premedication, behavioral, and psycho-emotional management, along with a two-stage restorative therapy approach.

Recognizing the behavioral cues of children alongside pain assessment is vital for identifying their distress and promptly addressing their dental requirements. Children with severe MIH may display avoidance behaviors, such as fear or resistance to dental procedures, due to past painful experiences or anticipated discomfort.

When pain relief cannot be achieved solely through anesthetic methods, the therapeutic method can be improved by differently addressing pain (through the administration of ibuprofen-type anti-inflammatory medication before treatment, along with infiltration anesthesia) and treatment needs in children with severe MIH. By adopting this strategy dental professionals can help enhance their behavior and attitude during dental visits. In this context, preemptive analgesia is presumed to have discernible effects on the reduction of intraoperative pain perception or the modulation of behavioral responses during dental procedures in children when compared to the baseline provided by standardized anesthesia protocols.

2. Materials and methods

This study, involving 27 cases of children with severe MIH and hypersensitivity, it took place over a period of one year, from January 2023 to January 2024. During this period, data were systematically collected for the young patients at the onset of their mixed dentition, who presented at the pediatric dentistry office with complaints of varying levels of hypersensitivity during the eruptive phase of permanent first molars.

Following the initial consultation, the patient's parents or

legal guardians provided informed consent regarding diagnostics, treatment methods suitable for the developmental stage of the affected tooth, treatment stages, and permission for the use and publication of recorded data for scientific purposes. The criteria for case selection were as follows: (1) patients who demonstrated cooperation and positive behavior in previous treatment sessions, (2) sought medical assistance due to pain associated with erupting permanent first molars, (3) had an appropriate body mass index for their age, (4) were not taking any medication, (5) did not have any associated general illnesses, (6) were not allergic to ibuprofen, and (7) meeting the following criteria: MIH level 3 PEB, TNI 4 index, and PEB (Fig. 1), with initial hypersensitivity scores greater than 4 on the Wong-Baker Scale.

A two-stage therapeutic management strategy was chosen based on cooperation and pain indices, utilizing different methods and techniques of behavioral modulation. The cases in this study were treated using a holistic approach, including behavioral management and pre-, during and post-operative pain control. The treatment method consisted of an immediate atraumatic restoration with ZOE, followed by long-term restoration with glass-ionomer cement.

Each treatment session utilized the "tell-show-do" child behavioral modulation, technique, along with signaling methods (such as raising the left hand to interrupt the procedure), positive reinforcement (rewarding positive behavior with a toy and sticker for good attitude), and voice inflections to maintain control over the procedure [19].

Pain intensity in the permanent first molar was assessed at 6 time points: T0—Initial, first appointment at the dentistry office; T1—During the first attempt of treatment with initial anesthesia; T2—At home, 1 hour after Ibuprofen intake; T3—In-office, after the second anesthesia, under ibuprofen; T4—During the second attempt of treatment after anesthesia and after Ibuprofen intake; T5—Day after treatment (Fig. 2).

The Wong-Baker scale was used as a standardized tool to evaluate hypersensitivity reported by the young patients. This visual instrument converts discomfort levels into seven facial expressions, each corresponding to a pain level between 0 and 10. The children were asked to select the facial expression that best represented their current level of discomfort at each stage of the therapy mentioned in Fig. 3.

During the instrumentation phase and removal of altered tissue immediately after anesthesia (in-office—T1 and T4, respectively), the FLACC index was individually tailored to each young patient by two experienced practitioners (Fig. 2). These practitioners remained present throughout the treatment procedure to observe, interpret, and evaluate each aspect mentioned earlier. Both experts underwent prior training, and their scores were unanimous for each assessment.

The puncture area was desensitized using a benzocaine gel 20% (0220289A, Iolite, Dharma Research, Miami, FL, USA), while local anesthesia was administered *via* infiltration using articaine 4%, 1.5 mL Ubistesin, 3010010352/02, 3M Deutschland GmbH, Neuss, Germany.

The two-stage treatment approach involved an initial emergency atraumatic restoration of the coronary cavity using ZOE (PPH CERKAMED, Stalowa Wola, Poland), following the removal of debris and altered tissue using manual instruments (dental spoon excavator) (Fig. 4). This method of cavity preparation was chosen due to inadequate anesthesia effectiveness and the child's loss of cooperation immediately after attempting to use rotary instruments.

The preemptive analgesia protocol with ibuprofen (NUROFEN JUNIOR ORAL Suspension, 3064650, Reckitt Benckiser Healthcare, East Yorkshire, Great Britain) was administered to the patient for two days until the second appointment. The following dosages were utilized for preventive analgesia, con-

FIGURE 1. Various initial clinical presentations of molar-incisor hypomineralization (MIH) grade 3, with treatment need index (TNI) 4, depicting posteruptive enamel breakdown on the first permanent molars.

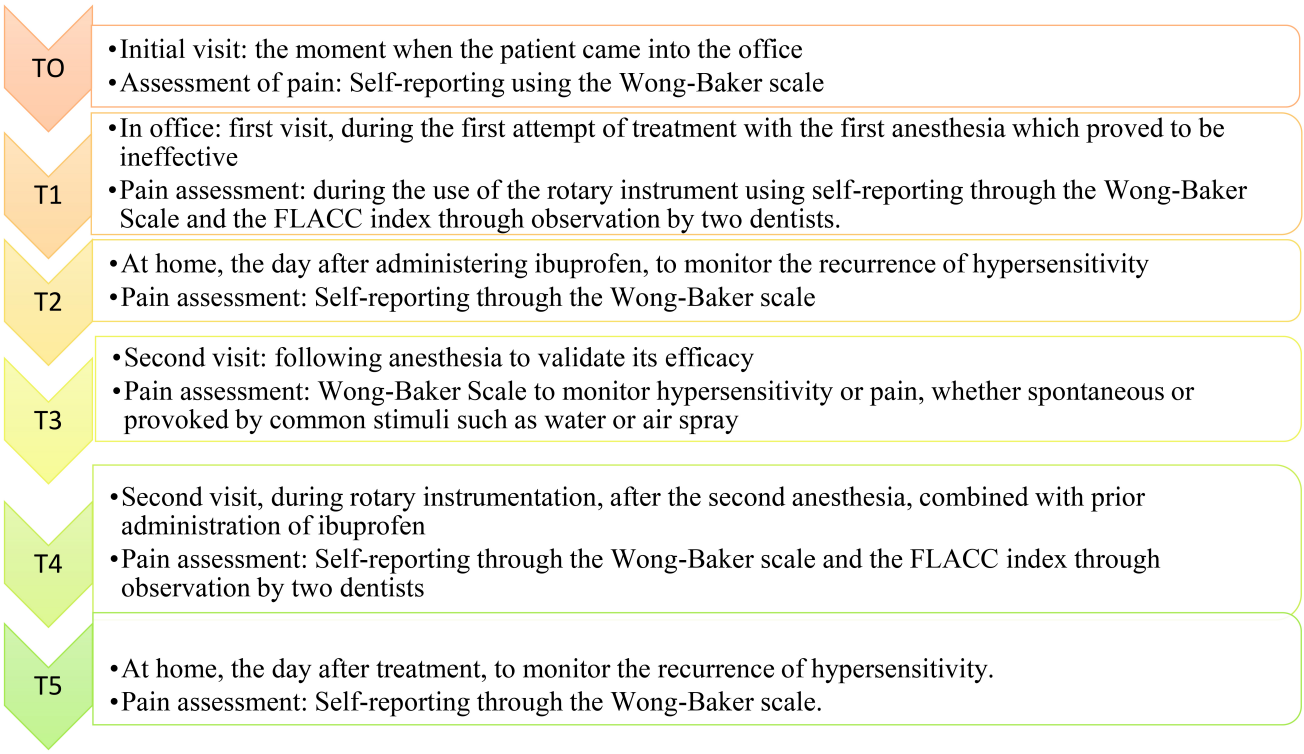

FIGURE 2. Pain assessment diagram: Wong-Baker scale and FLACC index. FLACC: Face, Legs, Activity, Cry, Consolability.

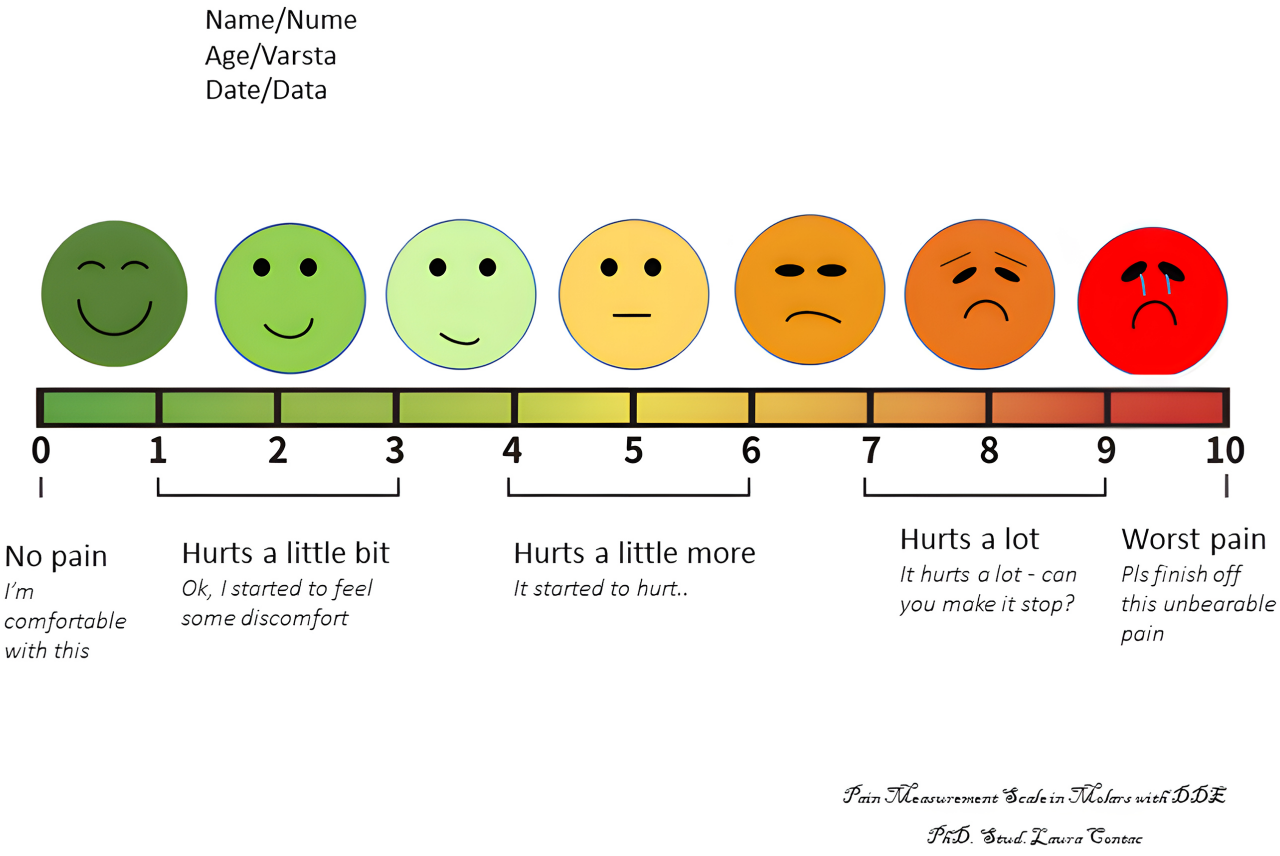

FIGURE 3. Wong-Baker visual scale adapted and explained in simplified terms suitable for children aged 5 to 8 years.

FIGURE 4. Temporary atraumatic restoration using zinc oxide eugenol placed on the first permanent molar before completion of the eruption.

sidering the child's age, weight, general health and underlying medical condition: for patients between 4–8 years old (10.9–15.9 kg), 100 mg twice a day, every 12 hours.

During the second session, the Wong-Baker and FLACC indices were reassessed before and after administering local anesthesia. The efficient onset of anesthesia in the second treatment session, along with patient cooperation, facilitated the removal of the entire altered tissue using rotary instruments. This prepared a cavity optimal for long-term coronary restoration (Fig. 5) with glass-ionomer cement Fuji IX GP powder and liquid (2301251, GC Europe, Leuven, Belgium).

The statistical analysis of the Wong-Baker index and descriptive statistics for the FLACC index was conducted using data from 27 teeth. The acquired data were analyzed using ©2023 GraphPad Software (Version 9.5.1 for Windows, Dotmatics, Boston, MA, USA) with confidence interval set at 95% and involved applying the Kolmogorov-Smirnov test for normality, followed by the Mann-Whitney statistical test and the Wilcoxon test, respectively. For FLACC index analysis, a *t*-test was performed.

3. Results

Of the total 27 new cases collected over a 12-month period, 12 treatments (44.4%) were administered to female patients, while 15 treatments (55.5%) were administered to male patients. The age range of the patients was from 5 years and 4 months to 7 years and 1 month, with a mean age of 6.2 years.

Table 1 below describes the pain evaluation results experienced during the six moments of MIH therapy, using the Wong-Baker scale.

The table below (Table 2) presents the mean scores for the FLACC index during phases T1 and T4 (in-office). A noticeable reduction in discomfort was observed, with the difference between these two phases being clinically significant.

The descriptive statistics (Table 3) for the FLACC index provide data on the clinical relevance, illustrating a significant decrease in discomfort after preemptive analgesia (T1 = 8.47 − the total sum of the means of the indices compared to T4 = 1.71 − the overall sum of the average values of the indices).

The graph below (Fig. 6) illustrates the Wong-Baker scale index during the analysis of the six phases, which indicates a substantial reduction in sensitivity subsequent to the administration of preemptive analgesia. The linear regression suggests a significant reduction in discomfort, demonstrating a strong association between the administration of ibuprofen and diminished discomfort before, during and after the procedure.

The results of the statistical interpretation of the Wong-Baker value using the Mann-Whitney test for phases T1 and T4 were significantly different ($p < 0.0001$). Phases T1 and T4 were considered the most representative moments for pain evaluation as they corresponded to the exact moments of rotary instrumentation after anesthesia. For a clear analysis of the benefits of using preemptive analgesia, Wong-Baker scores from T0 and T5 were taken into consideration, and the Wilcoxon test (a non-parametric before-and-after test) was applied. The resulting *p*-value was 0.0121, which is statistically significant ($p < 0.05$). A statistical analysis was also conducted for the FLACC index using the paired *t*-test at time points T1 and T4, yielding a *p*-value of < 0.0001 (Table 4).

Although the software did not provide the precise value, it is evident that the value is $p < 0.05$, (exact *p*-value < 0.0001) indicating statistical significance.

FIGURE 5. Aspects of the long-term restoration using glass-ionomer.

TABLE 1. The average scores for the Wong-Baker scale at the 6 time periods.

Time	T	Evaluation method	Registered average response index
Initial	T0	Patients' subjective provoked pain report Wong-Baker scale	6.22
During first attempt of treatment with first anesthesia	T1	Subjective report after stimulus Wong-Baker scale	4.00
After ibuprofen	T2	Patients' subjective pain report after stimulus Wong-Baker scale	0.48
After second Anesthesia	T3	Subjective report after stimulus Wong-Baker scale	0.03
During second attempt of treatment with second anesthesia	T4	Subjective report after stimulus Wong-Baker scale	0.29
Day after treatment	T5	Patients' subjective pain report Wong-Baker scale	0.59

TABLE 2. Mean scores with standard deviation for each component of the FLACC index during T1 (first attempt of treatment with initial anesthesia) and T4 (second attempt of treatment with subsequent anesthesia).

Time	Face	Legs	Activity	Cry	Consolability
T1	1.59 ± 0.465	1.82 ± 0.766	1.34 ± 0.039	1.82 ± 0.829	1.90 ± 0.037
T4	0.14 ± 0.170	0.80 ± 0.328	0.30 ± 0.486	0.07 ± 0.181	0.40 ± 0.476

TABLE 3. Descriptive statistics for the FLACC index during the first and second attempts of treatment.

No.	Descriptive statistics FLACC	T1	T4
1	Number of values	27	27
2	Minimum	0.000	0.000
3	Maximum	2.000	1.000
4	Range	2.000	1.000
5	Mean	0.4815	0.2963
6	Total of the means	8.47	2.32
7	Std. Deviation	0.7000	0.4653
8	Std. Error of Mean	0.13470	0.08955

FLACC: Face, Legs, Activity, Cry, Consolability.

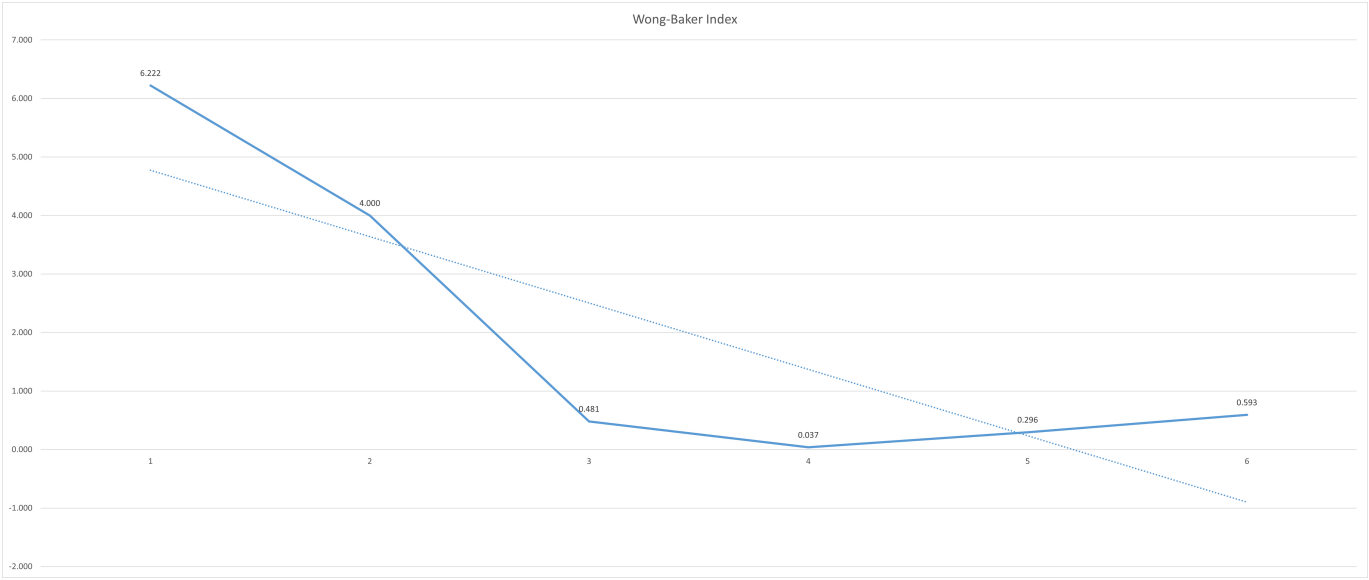

FIGURE 6. Graphical representation of the Wong-Baker scale assessments conducted during the six evaluated periods.

TABLE 4. Summary of statistical tests and for Wong-Baker pain evaluation and FLACC index.

Statistical test	Phase	*p*-value	Significance interval	Statistical significance
Mann-Whitney (Wong-Baker)	T1 *vs.* T4	<0.0001	95%	Yes
Wilcoxon (Wong-Baker)	T0 *vs.* T5	0.0121	95%	Yes
Paired *t*-test (FLACC index)	T1 *vs.* T4	<0.0001	95%	Yes

FLACC: Face, Legs, Activity, Cry, Consolability.

4. Discussion

Preemptive analgesia has been previously utilized in managing reversible pulp inflammation, which includes the MIH entity [20]. The effectiveness of preemptive analgesia in managing post-operative pain and discomfort associated with MIH treatment has garnered interest among clinicians and researchers in recent years [21]. However, justifying the establishment of a preoperative protocol is essential not only to mitigate post-operative pain but also to address intraoperative discomfort experienced by pediatric patients during therapeutic procedures for the restoration of molars with severe MIH. This is important for preventing negative behavior or loss of cooperation from the patient. The level of children's cooperation is directly linked to efficient pain control, and dentists employ various methods to achieve this. These methods range from local or topical anesthesia administration to the use of analgesic medication with different substances [22, 23].

The attitude and behavior of a patient in the dental office are closely related to the pain or discomfort they have previously felt during previous or even current procedures. Children may manifest dental fear following traumatic experiences, resulting in their reluctance to cooperate during subsequent treatments [24]. The detrimental impact of TNI 4 MIH, which is characterized by evident symptoms and enamel loss, on a child's quality of life is well-documented [25], and it is often related to patients' refusal to cooperate during treatment sessions.

Hence, to foster effective collaboration, it is imperative for pain management and behavioral strategies to be aligned and synchronized according to the age of the patient.

When implementing preemptive analgesia in dental treatments, several crucial parameters must be carefully considered. Firstly, timing of administration is paramount, aiming to optimize organism activation levels by impeding signals from dental receptors, thereby forestalling central sensitization [26]. In this study, a two-day administration protocol was employed, clearly delineating the interval between sessions. Secondly, the choice of active ingredient is crucial, with non-steroidal anti-inflammatory drugs (NSAIDs) like ibuprofen being favored for their ability to suppress inflammatory mediator production and reduce pain sensation [27]. Ibuprofen was selected in this study due to its efficacy in addressing pulpal inflammation and its favorable risk-benefit profile [28]. Thirdly, the benefits of preemptive analgesia cannot be understated, as enhancing patient comfort and reducing pain significantly contribute to a positive dental experience for young patients [29]. The efficacy of preemptive analgesia was confirmed through the FLACC index, which showed an increase in patient comfort following its administration. Lastly, customization of the analgesic approach is essential, with the timing, type, and dosage of medication being tailored in collaboration with pediatricians based on the individualized needs of each patient, considering their medical history and the specific nature of the dental procedure involved [30].

In our assessment, we found the dental interventions to be of small amplitude, requiring a minimum dosage for optimal therapeutic effect (100 mg/12 h). In addition, preemptive analgesia was just one aspect of the comprehensive approach

to treating MIH with level 3 PEB severity, which also included local anesthesia and occasional post-operative analgesics to ensure pain control and patient comfort [31].

The anesthesia procedure involved an atraumatic approach, where a gel was used to numb the puncture site before locally infiltrating a standardized amount of articaine solution (1.5 mL) to achieve optimal anesthesia for hypomineralized teeth [32]. Behavioral management is an essential aspect of therapeutic approaches in pediatric dentistry, often involving sophisticated techniques such as tell-show-do and distraction strategies, as well as positive reinforcement, to enhance comfort and relaxation for pediatric patients undergoing dental procedures [33]. These techniques were meticulously implemented in the present study, leading to considerable benefits in terms of psycho-emotional comfort, which is essential for building trust and fostering future collaborations.

Various methods and materials have been utilized in the past to address tooth damage resulting from MIH. An effective approach has been proposed for managing reversible pulp inflammation, which bears similarity to the inflammation observed in MIH. The follow-up times vary depending on the material employed: 18 to 48 months for fissure sealants, 12 to 36 months for conventional glass ionomer cements and resin composite, and 12 to 24 months for resin-modified glass ionomer cements [34]. Some authors have proposed a protocol involving selective removal of decayed tissue, placement of an interim restoration, followed by permanent restoration with composite resins six months later [35].

A two-stage approach, including preemptive analgesia, was decided intra-operatively during the first appointment, where the patient and parents/legal guardians were presented with a treatment strategy option with predictable outcomes. Given the inherent nature of our research design, involving data collection both before and after the intervention, the first appointment can be considered the control group, providing a stable baseline for comparison. However, optimal preparation of the coronary cavity for definitive restoration was not possible during this initial appointment due to the inefficient onset of anesthesia for the proper use of rotary instruments. Loss of patient cooperation during the first contact is frequently encountered in severe MIH, most commonly reported due to anesthesia inefficiency [36].

Pain analysis in this study was conducted using the Wong-Baker scale and correlated with metalinguistic body-language feedback. The evaluation, meticulously performed by experienced and skilled pedodontic practitioners, was further assessed through the FLACC index. However, it is essential to recognize the subjective nature of the Wong-Baker Faces Scale, which relies on the child's interpretation and reporting of their pain and distress [37].

The method of preemptive analgesia using ibuprofen significantly influenced children's behavior during the rotary instrumentation phase unequivocally, by enhancing the effect of infiltrative local anesthesia—an observation also noted by Vicioni *et al.* [6], who, unlike the present study, performed definitive coronal restoration using composite resins, simplifying the protocol. Alternatively, using ZOE as a provisional restoration with medicinal properties offers a viable approach. This dental material is renowned for its analgesic, antibacterial, anti-inflammatory and antiseptic effects, also being valued for its bio-stimulating, sedative properties, affording protection against chemical and physical stimuli [15, 16].

The incorporation of nanoparticle-sized zinc oxide (ZnO) in ZOE cement formulations has the potential to enhance these properties while minimizing adverse effects on surrounding tissues [38]. Despite these qualities, ZOE does not constitute an optimal option for long-term restoration. Among materials commonly utilized for coronal restoration of molars with severe MIH lesions are included GIC, indirect or direct composite resins, and prefabricated metal crowns [39].

GIC efficiently adheres to enamel with developmental defects without adversely affecting pulpal vitality or post-eruptive radicular development and maturation. Additionally, it can be applied to dentine previously in contact with ZOE [17, 18].

In contemporary dental practice, glass ionomer cement (GIC) represents a common choice for managing MIH lesions in posterior teeth, due to its favorable medium to long-term durability. This material is recognized as safe and effective for restoring both permanent and temporary teeth, meeting the necessary mechanical and optical properties [40].

Nevertheless, the selection of appropriate restorative material remains an important decision, aligning with the clinical presentation of each case.

Articaine, when utilized as an anesthetic agent for desensitizing molars affected by MIH, has demonstrated superiority over other anesthetic substances. However, in the presented cases, efficient anesthesia and improved comfort were observed only during the second treatment session, following the administration of preemptive analgesia [41]. Additionally, the anti-inflammatory properties inherent in materials used for provisional atraumatic restoration may influence and enhance the efficacy of preemptive analgesia. Supporting the efficient onset of anesthesia through the application of pre-medicated anti-inflammatories further confirms their benefits [6].

Globally, clinicians recognize the importance of establishing a standardized protocol for managing severe cases of MIH, especially concerning pain control and behavioral management. In certain European regions, dentists often encounter challenges such as difficulty in achieving sufficient local anesthesia (71.4%) and managing behavioral issues in pediatric patients (84.1%), which may interfere with treatment efficacies [42], bringing into discussion the notion that a child's experience with severe MIH during conventional restorative treatment is still not fully understood. In their clinical practice, pedodontists may consider additional variables, including the child's behavioral conduct, physiological indicators, and supplementary assessment instruments, to cultivate a comprehensive understanding of the child's pain experience.

Furthermore, the observed improvements in behavioral outcomes, such as reduced anxiety and increased cooperation during dental procedures in children with MIH, suggest that preemptive analgesia not only addresses pain but also promotes a more positive patient experience, fostering a conducive environment for effective dental treatment.

5. Limitations

Utilizing glass-ionomer cement as a long-term interim restoration is an optimal approach, yet not definitive. Patients in this category require consistent clinical and radiological assessments for follow-up care. These evaluations are essential for monitoring restoration integrity, identifying the need for corrections, assessing vitality, monitoring hypersensitivity levels, ensuring proper masticatory functionality, and observing root development and maturation. Diligent monitoring is crucial to ensure optimal occlusal conditions, facilitating the implementation of more complex coronal restorations such as overlays or crowns. As an innovative approach to addressing hypersensitivity and improving enamel structure through remineralization methods, home dental care is essential. Patients can incorporate additional techniques into their daily routines to alleviate pain and enhance enamel structure. It is worth considering Biomimetic hydroxyapatite-based toothpastes, known for their remarkable effects in reducing hypersensitivity associated with white-spot lesions, compared to commonly used fluoride toothpastes. Additionally, substances such as casein phosphopeptide amorphous calcium fluoride phosphate (CPP-ACFP), which support remineralization, deserve attention [43, 44].

6. Conclusions

In conclusion, the preemptive analgesia method used in this study, which involved 100 mg ibuprofen administration every 12 hours for 2 days, effectively managed pain during restorative therapy for MIH enamel breakdown. When combined with a standardized anesthesia protocol, this approach significantly enhanced behavioral management by ensuring optimal intraoperative pain control. Moreover, the integration of preemptive analgesia with infiltration anesthesia enhanced the comfort of pediatric patients during the use of rotary instruments in cases of recently erupted teeth with MIH defects, particularly those with a TNI of 4, compared to anesthesia alone. However, further research is warranted to investigate the individual impact of preemptive analgesia on anesthesia onset to establish an optimized treatment protocol for MIH restoration and reduce the number of dental visits.

AVAILABILITY OF DATA AND MATERIALS

The datasets utilized or examined in the present study are obtainable from the corresponding author upon a reasonable request.

AUTHOR CONTRIBUTIONS

LRC—methodology, conception and design for treatment protocol, performed treatment procedure, writing. SIP—methodology, conception and design for treatment protocol, involved in Wong-Baker and FLACC evaluation, reviewing and editing. CIB—acquisition of data, reviewing, final approval of the version to be published. All authors read and approved the final form of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All procedures performed in the study were in accordance with the Ethics of Scientific Research Commission of George Emil Palade University of Pharmacy Science and Technologies of Targu-Mures Romania, Ord. No 6/16/26.01.2023 and also with the 1975 Declaration of Helsinki. Written informed consent was obtained from legal guardians.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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