Pain-related complaints of paediatric patients after dental treatment under general anaesthesia



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Abstract

Aim To identify factors related to postoperative pain and to recognise strategies to reduce this pain after dental treatment under general anaesthesia.

Methods Cross-sectional observational study. Children treated under general ansesthesia reported pain daily using the Wong Baker FACES® Pain Rating Scale. Their parents/caregivers filled in a related Yes/No questionnaire during hospitalisation and the first postoperative week. The duration and severity of pain were evaluated in relation to various factors.

Results Postoperative intravenous opioid administration was more effective (all: $p = 0.02$; extraction: $p = 0.04$) than NSAIDs (all: $p = 0.74$; extraction: $p = 0.78$) in pain management. Compared to younger patients, older patients reported increased pain during the postoperative week (duration: $p = 0.04$; severity: $p = 0.04$). Treatment time (pain duration all: $p < 0.01$; extraction: $p < 0.01$, pain severity all: $p = 0.01$; extraction: $p < 0.01$), airway management (pain duration all: $p = 0.02$; extraction: $p = 0.02$) severity (all: $p = 0.02$; extraction: $p = 0.02$), and class of extracted primary teeth (anterior extraction only, severity of pain ($p = 0.03$) significantly influenced pain during the postoperative week. Questionnaires to parents revealed prolonged pain among females.

Conclusion A well-established protocol is indicated to reduce operation time. Patients and their parents should be informed about the possibility of constantly subsiding postoperative pain that may last for a week. As additional local anaesthesia during general anaesthesia (GA) does not provide postoperative pain reduction in deciduous tooth extraction cases, its administration could be omitted.

KEYWORDS Postoperative pain, General anaesthesia, Children, Analgesics.

Introduction

Early childhood caries is a severe problem in Hungary affecting 15% of children younger than 36 months [Radácsi et al., 2021]. Comprehensive treatment positively affects the oral health-related quality of life of children [Park et al., 2018]. Dental interventions under general anaesthesia (DTGA) are routinely and safely performed for patients of younger ages, when outpatient dental treatment cannot be accomplished [AAPD, 2018a]. Nevertheless, several complications and complaints are associated with DTGA, which may be distressing for patients and their families [Lim and Borromeo, 2017]. While complications related to general anaesthesia (GA) are rare [Lee et al., 2013], morbidity (e.g., pain, bleeding, nausea, and vomiting) frequently occurs in relation to GA or dental interventions, with pain being one of the most widely reported complaints [Atan et al., 2004], [Farsi et al., 2009]. The prevalence, severity, and duration of pain have been demonstrated in the current literature, revealing conflicting results [Needleman et al., 2008]. Pain management is pivotal in paediatrics; yet postoperative pain is widely underreported and mismanaged by parents and healthcare professionals [Valizadeh et al., 2016].

To reduce intraoperative and postoperative pain, systemic analgesics such as opioid derivatives, non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen are mostly administered. For local anaesthesia (LA), lidocaine and articaine are most used; however, the intraoperative use of local anaesthesia (LA) during DTGA is controversial. While LA may reduce postoperative pain, numbness caused by conventional LA infiltration may increase the occurrence of cheek, lip, or tongue biting, resulting in painful traumatic ulceration [Townsend et al., 2014; Becker and Reed, 2006; Townsend et al., 2009]. As there is substantial clinical heterogeneity in intraoperative and postoperative pain management in the literature, further assessment is required to establish treatment protocols.

Therefore, we aimed to determine factors contributing to postoperative pain after DTGA and to specify the circumstances that can reduce the incidence, severity, and duration of pain to provide applicable propositions for postoperative pain management. Furthermore, we compared the presence of pain registered by children and their parents. As part of our research, other complaints and complications will be discussed in a subsequent paper.

Materials and Methods

Patients

Our cross-sectional observational study was approved by the local ethics committee of the university (Regional Research Ethics Committee, Clinical Center, University Pecs, Hungary, No. 6823). All methods were performed in accordance with the relevant guidelines and regulations. Children who underwent DTGA at our division (Paediatric Dentistry, Department of Dentistry, Oral and Maxillofacial Surgery, Medical School and Clinical Center, University of Pecs, Hungary) in the form of day-care surgery voluntarily participated in our study; informed consent

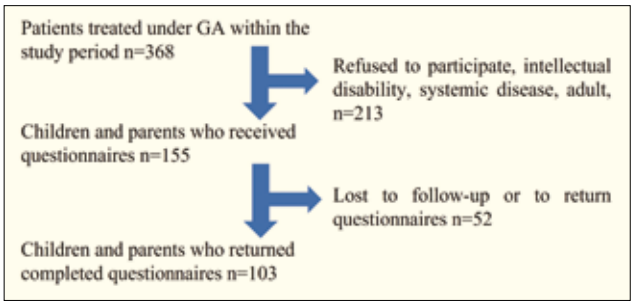


FIG. 1 Flowchart of patient selection. GA, general anaesthesia

was obtained from their parents/guardians. The total number of treated patients in the study period, number of excluded patients, and patient attrition are shown in a flow chart (Figure 1). Indications for DTGA included lack of cooperation (where other behavioural management was unsatisfactory), extensive treatment owing to multiplex caries lesions, and, less commonly, dental trauma and its inflammatory consequences. None of the patients had any mental disabilities or notable general diseases; they were assigned to ASA Class 1. The patients were treated by qualified paediatric dentists and anaesthesiologists. Inter-operator variability was tested for the personnel in relation to postoperative pain. After surgery, the patients were monitored in the ward for at least 6 h before discharge (observation period).

Level of experienced pain

Two questionnaires were distributed to volunteers. The children received a standard Wong-Baker FACES® Pain Rating Scale (WBS) questionnaire for pain evaluation on a scale from 0 to 10. To determine the baseline pain (before premedication and surgery), we explained the scale to the children and asked them to color the first WBS figure. For children under the age of 3 years, further evaluation was needed to ensure that they understood the task. A second Yes/No answer sheet was provided to the parents. Complaints were assessed during hospitalisation (right after awakening and 3 hours and 6 hours later) and once a day for the following 7 days. The parental questionnaire included the presence of oral and nasal pain, sore throat, and numbness experienced by the patients. Questionnaires were returned to the office at the follow-up appointment.

Other parameters

Parameters that may affect the pain levels of the patients were collected from a consistently applied medical record. These included age, gender, length of surgery, airway device (laryngeal mask airway-LMA, nasotracheal intubation-NTI), number and forms of interventions (focusing on the amount, type, and class of tooth extracted), and the use of preoperative, intraoperative, and postoperative medications (Table 1). LA (infiltration), antibiotics, and intraoperative analgesia were administered only in extraction cases at the operating team's discretion. Patients and parents were not aware of the intraoperative medications administered.

Statistical analysis

The analysis was performed using SPSS (IBM Corporation, Armonk, USA, v25.0). Results were considered statistically significant if $p < 0.05$. Oral pain reported by children and guardians was analysed for all cases and for extraction cases only. Owing to the non-normal distribution of the data, all

	Type of medication	Active agent	Trade name, specification	Route of admin. †	Unified/ Optional
Pre-operative	Sedative	midazolam syrup	compounded medication: 1mg/ml	p.o.	Unified
	Systemic analgesics	ibuprofen	Nurofen® suspension, 20 mg/ml Reckitt Benckiser, Budapest, Hungary	p.o.	
Intra-operative	General anesthetic	sevoflurane	Sevorane®, AbbVie S.r.l., Campoverde di Aprilia (LT), Italy	inhalation	
	Opioids	fentanyl	Fentanyl-Richter® 50 µg/ml, Richter Gedeon, Budapest, Hungary	i.v.	Optional
		nalbuphine hydrochloride	Nalbuphine Serb®, 20 mg/2 ml, Serb Laboratoires, Paris, France	i.v.	
	LA	lidocaine-adrenaline	Lidocaine-adrenalin® 20 mg/0,01 mg/ml, EGIS, Budapest, Hungary	sm. inflitr.	
	Antibiotics	amoxicillin-clavulanic acid	Augmentin® 500mg/100mg, Biopharma S.r.l., Rome, Italy	i.v.	
	Anti-hemorrhagic	etamsylat	Dicynone® 125 mg/ml solution	i.v.	
Post-operative	Opioids	nalbuphine hydrochloride	Nalbuphine Serb®, 20 mg/2 ml, Serb Laboratoires, Paris, France	i.v.	
	NSAIDs	ibuprofen	Nurofen® suspension, 20 mg/ml Reckitt Benckiser, Budapest Hungary	p.o.	
		diclofenac	Cataflam®-suspension, 15 mg/ml Novartis Hungaria, Budapest, Hungary	p.o.	
	Antibiotics	amoxicillin-clavulanic acid	multiple manufacturer	p.o.	
	Antiemetics	ondansetron	Emetron® 2 mg/ml, Richter Gedeon, Budapest Hungary	i.v.	

† Route of administration: LA, local anaesthesia; NSAID, non-steroidal anti-inflammatory drug; p.o., per os; i.v., intravenous; sm. infiltr., submucosal infiltration. Optional administration was left to the operator's discretion.

TABLE 1 Medications administered to patients receiving dental treatment under general anaesthesia.

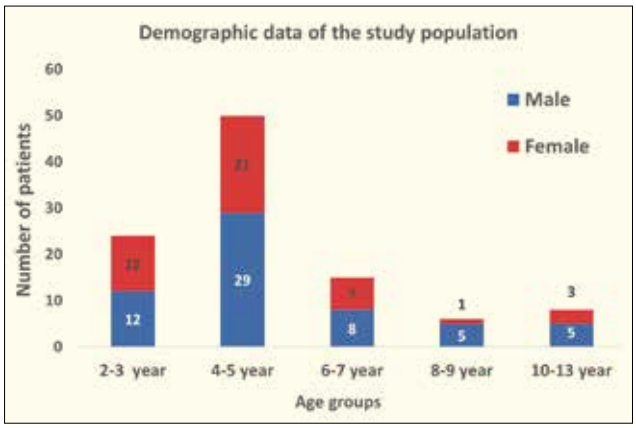


FIG. 2 Age distribution of patients.

analyses were carried out with non-parametric tests: Mann-Whitney U-test was used to compare differences between two groups, while Kruskal-Wallis tests with Mann-Whitney *post hoc* analysis and Bonferroni type 1 error correction were applied in cases of several groups. Spearman's rho correlation analysis, chi-square tests, or Fisher tests were used to examine correlations between two variables. McNemar's test was used to examine the overlap between the presence of pain reported by parents/guardians and children.

Results

In total, 103 patients were enrolled in the study. The age distribution of the patients is shown in Figure 2. Patient and intervention related data are presented in Table 2. No significant interoperator variability was observed.

Questionnaires

Of the 103 WBS questionnaires, three were not returned or were partially completed; therefore, 100 questionnaires were deemed suitable for evaluation. Data on pain reported by the parents/guardians during the hospitalisation period and postoperative week were summarised.

	Patient-related parameters		
	Male	Female	Average age (years) ± SD
	59	44	5.07 ± 2.55
	Operation-related parameters		
	Length of operation		96.41 ± 43.63 minutes
Dental interventions for all cases	Primary tooth filling		309
	Permanent tooth filling		20
	Primary tooth pulpotomy		35
	Permanent tooth root canal treatment		2
	Primary tooth extraction		459
	Permanent tooth extraction		15
Medication for all cases	Administered intraoperative LA		52
	Intraoperative systemic analgesia		96
	Postoperative systemic analgesia during hospitalisation		73
Airway device for all cases	LMA		8 cases (only extraction(s))
	NTI	Only restorative treatment	13
		Restorative treatment and extraction(s)	68
		Only extractions	14

SD: standard deviation; LMA: laryngeal mask airway; NTI: nasotracheal intubation

TABLE 2 Data on patients and interventions conducted during dental treatment under general anaesthesia.

Results of WBS patient questionnaires

The prevalence of pain (regardless of severity) was 38% preoperatively and 66% in the postoperative observation period. The frequency of pain (regardless of severity) during the postoperative week decreased continuously from 43% to 6% (Figure 3).

As there were many data gained, only statistically significant results will be highlighted in this chapter.

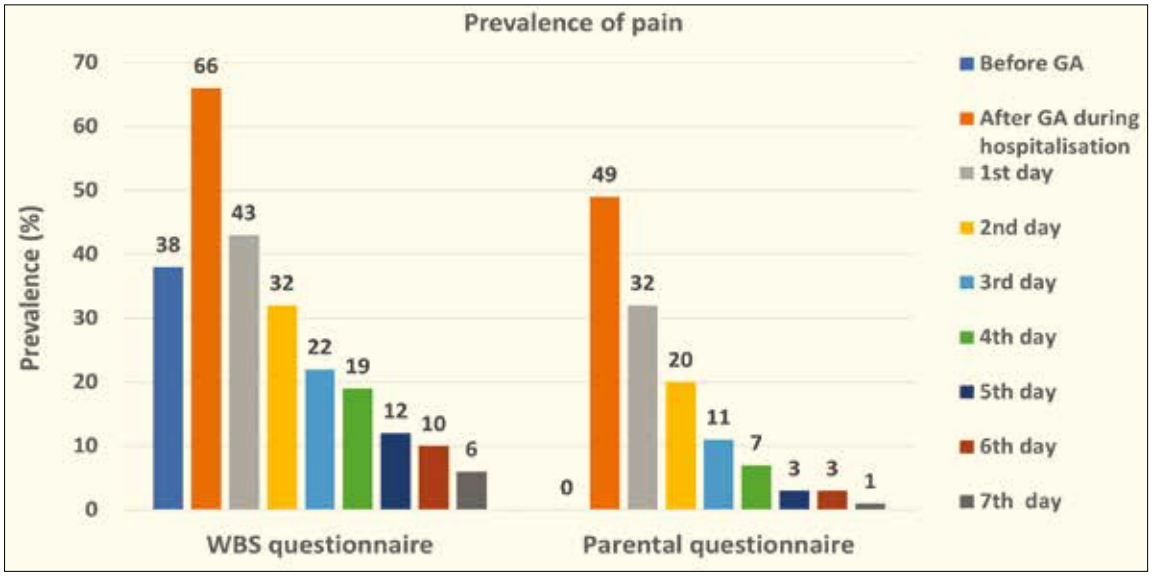


FIG. 3 Prevalence of pain reported by children and parents. At any given time, guardians reported pain less frequently. GA, general anaesthesia; WBS, Wong Baker FACES® Pain Rating Scale

Increasing age correlated positively with the duration of pain in days (rho = 0.20, p = 0.04) and with the average severity of pain during the postoperative week (rho = 0.21, p = 0.04) among all cases.

A significant positive correlation was found between the length of the operation and the duration (all: rho = 0.29, p < 0.01; extraction: rho = 0.26, p < 0.01) and severity of pain during the postoperative week (all: rho = 0.36, p = 0.01; extraction: rho = 0.34, p < 0.01) (Table 3).

Compared to LMA, NTI was associated with significantly longer (all: p = 0.02; extraction: p = 0.02) and more severe (all: p = 0.02; extraction: p = 0.02) pain during the postoperative week (Table 3).

LA did not influence pain (frequency: p = 0.67; severity: p = 0.14) during the hospitalisation period. Surprisingly, of the children who did not received LA, 16% complained of numbness (Fig. 4, Table 3).

While the class and number of primary tooth extractions (anterior, molar, or both) did not affect the duration of pain (p = 0.06 and p = 0.78 respectively), in cases where only anterior tooth extractions were performed, the average severity of pain during the postoperative week was significantly lower (p = 0.03) (Suppl. Table 1).

The severity of pain during hospitalisation was significantly lower in cases where opioids were administered intravenously (all: p = 0.02; extraction: p = 0.04). NSAIDs did not affect the severity of pain (all: p = 0.74; extraction:, p = 0.78) (Suppl. Table 2).

The severity of pain during hospitalisation positively correlated with the duration of pain in the postoperative week (all: rho = 0.45, p < 0.01; extraction: rho = 0.40, p < 0.01). It also influenced the severity of pain in the postoperative week (all: rho = 0.44, p < 0.01; extraction: rho = 0.39, p < 0.01). The average severity of pain was highest after the intervention, and it gradually decreased during the postoperative week (Table 4). The average pain score declined below the average initial pain sensation on the second postoperative day.

The severity of pain during hospitalisation was significantly higher (p = 0.01) than baseline pain. On the first 4 days, patients did not experience a significant difference in the pain level compared to the baseline pain (p = 1.00 for days 1–3, and p = 0.22, day 4). A significantly lower average pain was reported

Length of operation (minutes)											
		reported					did not report				
		min	Q1	Q2	Q3	max	min	Q1	Q2	Q3	max
WBS	Presence of postoperative pain during hospitalisation for all cases/extraction cases	10/ 10	63.75/ 65	97.5/ 105	136.25/ 140	205/ 205	5/ 5	65/ 60	92.5/ 90	120/ 120	145/ 145
PQ	Oral pain during hospitalisation among all cases*/ extraction cases*	25/ 25	88.75/ 86.25	117.5/ 120	146.25/ 147.50	205/ 205	5/ 5	60/ 55	90/ 90	120/ 126.25	180/ 180
	Sore throat (all cases)*/nasal pain (all cases)	40/15	70/60	120.0/ 75	145/120	205/205	5/5	60/65	90/ 95	120/ 130	180/ 180
Airway management											
		NTI					LMA				
WBS	Presence of postoperative pain during hospitalisation for all cases/extraction cases	68%/ 71%					43%/ 38%				
		min.	Q1	Q2	Q3	max.	min.	Q1	Q2	Q3	max.
	Severity of postoperative pain during hospitalisation for all cases/extraction cases	0/ 0	0/ 0	2.67/ 2.67	4/ 4	8.67/ 8.67	0/ 0	0/ 0	0/ 0	3.33/ 3.33	5.33/ 5.33
	Duration of postoperative pain in days for all cases*/ extraction cases*	0/ 0	0/ 0	0/ 0	2.5/ 2	7/ 7	0/ 0	0/ 0	0/ 0	0/ 0	0/ 0
	Severity of pain during postoperative week for all cases*/ extraction cases*	0/ 0	0/ 0	0/ 0	1.21/ 1.14	5.14/ 3.71	0/ 0	0/ 0	0/ 0	0/ 0	0/ 0
PQ	Sore throat (all cases)/nasal pain (all cases)	33%/11%					0%/13%				
Administration of local anesthetic (extraction cases only)											
		with LA					without LA				
WBS	Presence of postoperative pain during hospitalisation	68%					82%				
		min	Q1	Q2	Q3	max	min	Q1	Q2	Q3	max
	Severity of postoperative pain during hospitalisation	0	0	2.00	4	8.67	0	0.5	2.67	4.67	7.33
PQ	Presence of oral pain during hospitalisation	40%					28%				

*WBS: Wong-Baker FACES® Pain Rating Scale; PQ: parental questionnaire; NTI: nasotracheal intubation; LMA: laryngeal mask airway; LA: local anaesthesia; Q1: first quartile, 25th percentile; Q2: second quartile, median; Q3 third quartile, 75th percentile; * significant (p < 0.05)*

TABLE 3 Statistical data on the length of operation, type of airway device, administration of local anaesthetic as factors influencing postoperative pain.

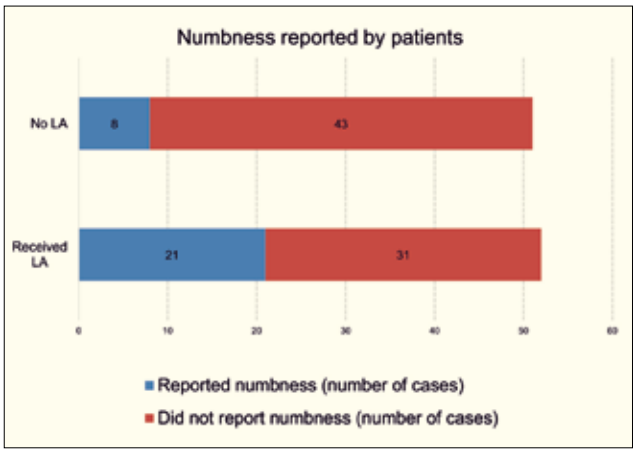


FIG. 4 Numbness reported postoperatively by patients. LA, local anaesthesia.

Gender					
	Minimum	Q1	Q2	Q3	Maximum
Morning of operation (baseline)	0	0	0.0	10	10
Hospitalization (day 0)	0	0	2.5	10	10
1st day	0	0	0.0	8	8
2nd day	0	0	0.0	6	6
3rd day	0	0	0.0	10	10
4th day	0	0	0.0	10	10
5th day	0	0	0.0	6	6
6th day	0	0	0.0	4	4
7th day	0	0	0.0	10	10

Q1: first quartile, 25th percentile; Q2: second quartile, median; Q3: third quartile, 75th percentile

TABLE 4 Pain severity reported by children before dental treatment under general anaesthesia (on the morning of the intervention), during the hospitalisation period, and daily in the week post operation.

from the fifth day onwards (day 5, p = 0.01; day 6, p < 0.01; day 7, p < 0.01). Furthermore, the severity of pain on day 1 was not significantly different from that recorded during hospitalisation (p = 0.37). From day 2 onwards, it significantly declined (day 2, p < 0.01; day 3–7, p < 0.01) (Table 4).

Results of parental questionnaires

During hospitalisation: in 33% of cases, oral pain was reported, but there was no significant difference between the extraction and non-extraction cases (p = 0.21). Oral pain positively correlated with age (all, p < 0.01; extraction, p = 0.01) and duration of treatment (all: p = 0.01; extraction: p = 0.02). The administration of LA did not affect the frequency of pain (p = 0.25) (Table 3, 5), and 16 children had solely oral pain.

During the postoperative week: 31% of the parents reported pain in the children (regardless of duration). Significantly more prolonged pain was reported in females (all: p = 0.01; extraction: p < 0.01) than in males (Table 6).

Sore throat reported during hospitalisation (30%) positively correlated with age (all: p < 0.01) and length of treatment (all: p = 0.01). In 11 cases, sore throat was the only reported pain. (Table 3, 5).

Nasal pain reported during hospitalisation (10%) positively correlated with age (all: p = 0.02), (Table 5). One responder reported nasal pain only, which may have originated from the NTI.

Nasal-throat pain and nasal-oral pain were reported in 2 cases each, and oral-throat pain occurred in 10 cases. All three areas were affected in 6 cases.

The frequency of postoperative pain reported by parents and children was significantly different during hospitalisation for

Age (year)											
		Reported					Did not report				
		min	Q1	Q2	Q3	max	min	Q1	Q2	Q3	max
PQ	Oral pain during hospitalisation among all cases*/ extraction cases*	2/2	4/4	5/5	7.25/7	13/13	2/2	3/3	4/4	5/5	11/11
	Sore throat (all cases)/Nasal pain (all cases)	2/2	5/5	5/7	8/10	13/13	2/2	3/3	4/4	5/5.75	13/13

*PQ: parental questionnaire; Q1: first quartile, 25th percentile; Q2: second quartile, median; Q3 third quartile, 75th percentile; * significant (p < 0.05)*

TABLE 5 Statistical data on age as a factor influencing postoperative pain.

Gender											
		Male					Female				
PQ	Presence of postoperative oral pain during hospitalisation for all cases/extraction cases	30%/29%					36%/42%				
	Presence of sore throat (all cases)/nasal pain (all cases)	25%/10%					36%/11%				
		min.	Q1	Q2	Q3	max.	min.	Q1	Q2	Q3	max.
PQ	Duration of postoperative pain in days for all cases*/ extraction cases*	0/0	0/0	0/0	0/0	4/3	0/0	0/0	0/0	2/2	v

*PQ: parental questionnaire; Q1: first quartile, 25th percentile; Q2: second quartile, median; Q3 third quartile, 75th percentile; * significant (p < 0.05)*

TABLE 6 Statistical data on gender as a factor influencing postoperative pain.

all cases ($p < 0.01$) and extraction cases ($p < 0.01$). Among all cases, 42 pairs of parents and children did not agree with the presence of pain. Parents reported pain less frequently than children: 37 children reported pain when their parents did not. For extraction cases, 38 disagreements were found; in 33 cases, the child reported pain and the parent did not (Figure 3).

Discussion

Postoperative pain related to DTGA is common and may be overwhelming for patients, their families, and the dental team [AlQhtani and Pani, 2019]. However, a study by Rodd et al. [2014] showed that pain may be less relevant than other complaints such as nausea, hunger, and tiredness. Numerous factors influence the pain experience. In our study, we investigated unalterable (age and gender) and alterable (length of treatment, airway device, and intraoperative and postoperative pain management) factors, and we observed several correlations between these factors and the severity and duration of postoperative pain.

Postoperative pain was significantly more common and more intense than baseline pain (Figure 2, Table 4); this finding is in accordance with the results reported by Wong et al [2015]. Our investigation revealed postoperative pain to have a higher incidence (66%) than that reported in the pilot study by Fung et al. (57%), but lower than that reported by Atan et al. (74%) and Hu et al. (82%) [Atan et al., 2004; Fung et al., 1993; Hu et al., 2018]. Several studies have shown that postoperative pain following DTGA is associated with extractions; however, previously, the class of teeth extracted was not evaluated in relation to the duration of pain [Wong et al., 2015; Fung et al., 1993; O'Donnell et al., 2007]. We observed longer-lasting pain during the postoperative week in patients with primary molar extractions than in patients with anterior extractions alone. Understandably, molar extractions leave a larger wound surface and require a prolonged healing time. Furthermore, by the time of primary incisor extraction, the roots can be partially or completely resorbed, resulting in shorter pain duration.

Interestingly, older age showed a positive correlation with both the duration and severity of pain. This may be related to the increased number of interventions/extractions with age, or it may be an individual subjective variable among patients. Earlier, Hu et al. [2018] showed that dental pain was significantly associated with the number of teeth treated, but a correlation could not be proved between age and postoperative dental morbidity. This contradiction may be due to the wider age range and higher number of participants in our study. Needleman et al. suggested that older children require more analgesics postoperatively than younger children, which supports our results on the pain-age correlation [Needleman et al., 2008]. According to parental questionnaires, the duration of pain after DTGA was greater in females. This was not corroborated by the self-reported WBS questionnaires, and it is possible that parents have different perceptions regarding the pain of their children based on their gender. In contrast to our findings, Fung et al. showed that younger age was a predictive factor for postoperative pain (self-reported), and it occurred more frequently in male patients than in female patients [Fung et al., 1993]. Their pilot study also revealed that one of the main factors influencing postoperative pain is the relationship between the patient and the accompanying person. Children comforted by their mothers at the hospital complained more about postoperative pain than children accompanied by other relatives. In the present study, we did not investigate this matter.

The length of treatment and the airway device used were alterable influencing factors for the severity and duration of pain in the postoperative week. Patients experienced less severe and shorter lasting pain in the postoperative week, if treatment time was shorter and/or when LMA was applied (shorter operative time, few extractions). Lengthened operative time may result in prolonged and increased pain related either to the higher number of interventions or pain derived from the surrounding tissues/organs or the temporomandibular joints (buccal retraction, sustained and strained mouth opening) [Hawkins and Durham, 2016]. Atan et al. [2004] also concluded that a reduction in treatment time has the potential to reduce postoperative pain. These findings suggest that dental professionals should decrease the duration of treatment under GA and maintain GA through a laryngeal mask instead of nasotracheal intubation whenever possible [Tsukamoto et al., 2017]. However, these results might be misleading, as the type of airway device used is also related to the interventions and the treatment time; these factors cannot be separated from each other. Non-oral pain, sore throat, and nasal pain reported by parents are most likely due to NTI anaesthesia with a pharyngeal pack. The use of LMA could prevent these complaints; however, due to the incapability of isolation against aspiration and the limited access to the oral cavity, comprehensive treatment usually requires NTI [Tsukamoto et al., 2017].

The treatment time should be shortened by careful treatment planning, especially when deciding on the fate of the primary tooth. For precise planning, where possible, a radiographic examination is recommended prior to GA [Lawson et al., 2017]. The treatment approach may fall under exodontia, where extractions are carried out solely, or under comprehensive care, where a wide range of treatments are offered. Many factors may influence this choice, such as parental wishes, medical conditions, care facilities, and clinically related factors, including restorability and oral hygiene. Exodontia is the least expensive treatment option, as less time and equipment are required for the intervention. Moreover, a radical treatment plan may decrease the treatment time and decrease the chance of need for repeated DTGA. Nevertheless, the trend worldwide is to provide comprehensive treatment, as long-term consequences of premature primary tooth loss should also be considered [Law, 2013].

It is recommended to carry out a comprehensive DTGA in a single appointment. Postponing restorations for future outpatient treatment can lead to a high rate of repeated DTGA [Harrison and Nutting, 2000]. Restoring teeth with questionable outcomes should be avoided, as opposed to single DTGA. Although permanent tooth endodontic therapy in DTGA revealed a high success rate according to Cousson et al. [2014] in primary dentition, tooth extraction is recommended, where treatment success is doubtful [Ramazani, 2016].

Numerous studies support the use of LA as a supplementary medication to reduce postoperative pain, but its use remains controversial [Kaufman et al., 2005; Townsend et al., 2014, Ramazani, 2016]. Sammons et al. [2007] reported less pain when intraligamental anaesthesia was applied, but this difference was only apparent in the first postoperative hour. In our study, we found that LA administration before extraction did not affect postoperative pain; however, the local numbness might be unpleasant. Those who oppose the use of LA have reported self-inflicted soft tissue trauma of the lips, cheeks, or tongue due to loss of sensation [Townsend et al., 2009; Townsend et al., 2014]; however, we did not observe any of these injuries

during follow-up appointments. The beneficial anaesthetic effect of LA or the occurrence of soft-tissue injuries may have been absent because the patients fully regained consciousness by the time the LA wore off. In addition, extractions at the site of numbness reduce the risk of soft tissue trauma. Surprisingly, 16% of the patients who did not receive LA complained of numbness (Figure 3). As numbness may be difficult to describe for children who have never received LA before, some of our patients might not have been able to provide reliable feedback. The use of epinephrine-containing LA can interfere with the control of bleeding, as delayed secondary bleeding may occur owing to the relaxation of the blood vessels [Czembirek et al., 2014]. Drug interactions with opioids and possible complications of epinephrine-containing anaesthetics must also be taken into consideration when deciding upon the use of LA [Becker and Reed, 2006].

In our study, the severity of pain reported by patients receiving intravenous opioid analgesics (nalbuphine) during hospitalisation was significantly lower compared to that reported by patients who received NSAIDs only. Intraoperative and postoperative medications may influence the choice of postoperative pain management. Where postoperative pain is associated with inflammation, NSAIDs are considered as first-line agents by the American Academy of Pediatric Dentistry [AAPD, 2018b]. Based on our experience and supported by several studies, the use of ibuprofen compared to acetaminophen was superior in postoperative dental pain management.

We highlighted several important correlations, but we must also acknowledge the limitations of this research. First, as the limited number of certain complaints (nasal pain, sore throat) hampered reliable analysis, we merged subgroups (medications). Second, self-reporting questionnaires always imply a risk of subjectivity (reporting bias). Third, no previous randomisation was applied. Fourth, the necessary treatment was determined by the operator, and the medications administered were based on the choice of the medical team.

Conclusion

Awareness of factors influencing postoperative pain with respect to dental treatment is indispensable for treatment planning. Based on our study, the pain experience during the week after paediatric dental treatment under GA correlates with the length of intervention, which indicates the need for a well-established protocol (treatment plan) to be developed by the care providers to reduce operation time. Patients and parents should be informed about the possibility of constantly subsiding postoperative pain that may last for a week.

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Conflicts of Interest statement

The authors declare that there is no conflict of interest.

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Authors contributions

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Amount of primary tooth extractions																
		reported					did not report									
		min	Q1	Q2	Q3	max	min	Q1	Q2	Q3	max					
WBS	Presence of postoperative pain during hospitalisation for extraction cases	1	2	4	7	13	1	1	4	7	19					
PQ	Oral pain during hospitalisation among extraction cases*	1	2	4	9	19	1	2	4	7	20					
Class of primary tooth extraction																
		Anterior					Molar					Both				
WBS	Presence of postoperative pain during hospitalisation for extraction cases	70%					71%					67%				
PQ	Presence of oral pain during hospitalisation for extraction cases	21%					35%					39%				
		min	Q1	Q2	Q3	max	min	Q1	Q2	Q3	max	min	Q1	Q2	Q3	max
WBS	Severity of postoperative pain during hospitalisation for extraction cases	0	0	3.33	4.67	5.33	0	0	2.50	4	8.67	0	0	2.00	4	6.67
	Duration of postoperative pain in days for extraction cases	0	0	0	0	6	0	0	0.50	2	5	0	0	0	2	7
	Severity of postoperative pain in days for extraction cases*	0	0	0	0	1.57	0	0	0.29	1.14	3.43	0	0	0	1.14	3.71
PQ	Duration of postoperative pain in days for extraction cases	0	0	0	0	2	0	0	0	1	4	0	0	0	1	7

*WBS: Wong-Baker FACES® Pain Rating Scale; PQ: parental questionnaire; Q1: first quartile, 25th percentile; Q2: second quartile, median; Q3 third quartile, 75th percentile; * significant (p<0.05)*

SUPPL. TABLE 1 Statistical data on class and number of primary tooth extractions as factors influencing postoperative pain

Postoperative systemic analgesia																					
		NSAID										Opioid									
		administered					not administered					administered					not administered				
WBS	Presence of postoperative pain during hospitalisation for all cases	66%					66%					33%					68%				
	Presence of postoperative pain during hospitalisation for extraction cases	68%					71%					40%					70%				
PQ	Presence of oral pain during hospitalisation for all cases	34%					30%					17%					34%				
	Presence of oral pain during hospitalisation for extraction cases	37%					27%					20%					39%				
		min	Q1	Q2	Q3	max	min	Q1	Q2	Q3	max	min	Q1	Q2	Q3	max	min	Q1	Q2	Q3	max
WBS	Severity of postoperative pain during hospitalisation for all cases (opioids*)	0	0	2.00	4	10	0	0	3.33	4	10	0	0	0	0.83	2	0	0	2.67	4	10
	Severity of postoperative pain during hospitalisation for extraction cases (opioids*)	0	0	2	4.33	10	0	0	3.33	4	10	0	0	0	1	2	0	0	2.67	4.17	10

*WBS: Wong-Baker FACES® Pain Rating Scale; PQ: parental questionnaire; NSAID: non-steroidal anti-inflammatory drug; Q1: first quartile, 25th percentile; Q2: second quartile, median; Q3 third quartile, 75th percentile; * significant (p<0.05)*

SUPPL. TABLE 2. Statistical data on postoperative systemic analgesia as factors influencing postoperative pain

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