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Complications after dental rehabilitation under general anesthesia in Isfahan during February to May 2016

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ABSTRACT

Background: Children undergoing dental rehabilitations by general anesthesia (GA) commonly experience postoperative symptoms such as pain, fever, sore throat, and sleepiness. The aim of the present study was to investigate the specific complications of pediatric dental GA procedure.
Materials and Methods: In this observational study sample included 72 children attending GA for dental treatment at the School of Dentistry, Isfahan University of Medical Sciences. Children with American Society of Anesthesiologists physical status I and without any communication or mental health problems were included. GA protocol was standardized. A number of complications were recorded by parents via filling a questionnaire for 2 days postoperatively. Data were analyzed using SPSS statistical software by Wilcoxon and Chi-squared test. $P < 0.05$ considered as significant level.
Results: The most postoperative nonpsychological complications were dental pain (59.7 and 47.2% on days 1 and 2, respectively), followed by inability to eat normal (55.6 and 41.7% on days 1 and 2, respectively). All the patients' nonpsychological complaints had significantly decreased from day one to day two ($P < 0.05$). The most postoperative psychological complications were Attachments to parents (70.8 and 65.2% on days 1 and 2, respectively) followed by excessive crying (56.9 and 45.8% on days 1 and 2, respectively). All psychological complaints reduced by day two nonsignificantly except excessive crying which decreased significantly after 48 h ($P = 0.004$).
Conclusion: The most postoperative complications after dental rehabilitation under GA were attachments to parents, dental pain, and inability to eat normal and excessive crying, respectively.

Key Words: Dental care, dentistry, general anesthesia, pediatric dentistry

INTRODUCTION

In developing countries, dental caries remains one of the most prevalent health problems in children.[1,2] Comprehensive dental rehabilitation under general anesthesia (GA) is a treatment option for children who require extensive dental treatment, exhibit acute situational anxiety and emotional or cognitive immaturity, or are medically compromised.[2,3]

There are several advantages of performing dental procedures under GA, including safety, efficiency, convenience, and high-quality restorative

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and preventive dental treatment.[3] GA is often considered the last resort due to its cost, risk-benefit considerations, and availability for parents.[4] Considering the risks associated with GA, mortality is the first. However, death following dental GA in healthy children is relatively unlikely, but morbidity is a much more common problem.[5]

After dental rehabilitation under GA, there is limited contact of dentist with parents and therefore parents are not well oriented how children recover and what are postoperative symptoms during this critical period. Proper advice should be given to the parents by the dentist regarding immediate postoperative care and during the ensuring days.[4]

Several studies have published on morbidity following pediatric dental rehabilitation under GA with a wide range of reports from negligible to more than 90% of patients.[6-8] The most common complication was postoperative pain.[6-8] Sleep alteration was common in the first night after GA in several studies.[6-11] Holt *et al*.[6] reported that 21% and 20% of patients had nausea and vomiting, respectively. Psychological changes such as crying, trouble sleeping, nightmares, and changes in children's ability to eat, reported in different studies.[6-10] In addition, many investigations showed that postoperative epistaxis, sore throat, and hoarseness were not uncommon in children.[6-7,9-13]

Many factors seem to play an effective role in postoperative complications, such as patient age, patient medical status, patient dental needs, and staff experience, premedication used, intubation difficulty, total anesthetic time, and anesthetic medications.[6-10,12,14-17]

The problems of previously reported postoperative complications for pediatric patients under GA were the retrospective designs used to study postoperative complications in most investigations. Hence, the aim of the present study was to determine the specific morbidity data of pediatric dental GA procedure and to investigate the association between children demographics data, anesthetic duration, and dental procedures.

MATERIALS AND METHODS

Study design

This observational study was conducted based on the World Medical Association Declaration of Helsinki. Before the study, the information given to patients and parents as well as informed consent was taken. Data were collected from 2 to 7-year-old children who referred to Isfahan day-stay clinic for dental treatment under GA during a 4-month period (February to May 2016).

Inclusion and exclusion criteria

Only children with the American Society of Anesthesiology I without any communication or mental health problems were selected. The exclusion criteria were not ultimately willing to participate, return for follow-up as well as facing intubation complications during the GA.[18] Eighty children were considered to participate in this study, but 8 children were excluded.

Anesthesia

The following time frames are used in setting the nil per os instructions for a particular patient. Clear liquids up to 2 h, breast milk up to 4 h, infant formula and nonhuman milk up to 6 h, and light meal up to 8 h before surgery. The GA protocol was standardized to ensure that this was not a confounding variable in the study.

Upon arrival in the operating room, standard monitors (including electrocardiogram, pulse oximeter, and blood pressure cuff) were applied to the children. All children received premedication with midazolam (0.4 mg/kg) (Chemidarou, Iran). An IV line was set up and children were induced by the intravenous (IV) agent propofol (5 mg/kg, Pofol, Dongkook, Korea). Anesthesia was maintained with a combination of isoflurane, nitrous oxide, oxygen, and propofol. The anesthesiologist administered 1 μg/kg of IV fentanyl (Caspian Tamin, Iran).

The nasal route was used for intubation in all children. Soft-cuffed nasal tubes were used as appropriate for the patient's age and anatomy. To prevent aspiration of oral secretions and foreign materials an oropharyngeal pack was placed before surgery. Patients were monitored throughout the procedure for blood pressure, oxygenation, carbon dioxide retention, and cardiac functioning. At the end of the dental procedure, residual neuromuscular blockade was antagonized with atropine (DarouPakhsh, Iran) 0.02 mg/kg IV and neostigmine (Caspian Tamin, Iran) 0.05 mg/kg IV. The trachea was extubated when the patient made purposeful movements and had a regular respiratory pattern.

All the dental treatment was performed by one specialist (H. M).

After completion of the surgery, the child was transferred to the recovery area and returned to the day-stay clinic where they remained until discharge. Postoperatively, oral analgesic (15 mg/kg oral paracetamol) (Zahravi, Iran) was prescribed to all of the patients. Ampicillin (DarouPakhsh, Iran) (50 mg/kg b. w.) and in cases of allergy to Penicillin, Clindamycin (20 mg/kg b. w.) (DarouPakhsh, Iran) were administered to all children.

Questionnaire

Two structured questionnaires; the first one consisted of demographic variables, medical history, length of the GA, and dental treatment performed (number of mean treated teeth and different types of treatment), which were filled by a dental assistant. The second questionnaire was designed for parents. Parents assessed their children's complications by filling the questionnaire on the 1st and 2nd day after GA. The questionnaire consisted of the following items: Whether the child had pain, bleeding with the dental origin, sore throat, fever, vomiting, inability to eat, sleepiness, nausea, and psychological changes such as attachment to parents, excessive crying, dread of being left alone, poor sleep, unspecified fear, being afraid of the dark, involuntary urination and nail biting.[2]

The validity of the questionnaire was confirmed by two pediatrics dentists and an anesthesiologist. For determining the reliability, a pilot study was carried out using 20 children. In this order, the questionnaire was given to parents and 1 week later, the same questionnaire was asked from parents via lane phone (intraclass correlation coefficient = 0.072). Then these 20 children were excluded from the main study.

Statistical analysis

Data were feed to SPSS 22 statistical software (IBM Corp, Armonk, NY, USA). Wilcoxon was used to compare the postoperation complications between days 1 and 2. The proportions of postoperative complications according to age, gender, and anesthesia duration were analyzed by Chi-squared test. Statistical significance was defined at $P < 0.05$. The intraclass correlation coefficient test was used for the reliability of the questionnaire.

RESULTS

Seventy-two children took part in this study. The demographic characteristics of the patients are shown in Table 1. The children's mean age was 3.32 ± 1.14 years (range = 2–7); 45.8% of them were boys. All the treated children were healthy (100%). The mean anesthesia time was 67.28 ± 22.4 min (range = 30–120 min).

Table 1: Frequency distribution of demographic variables of the sample

Variables	Gender		Age (years)		Anesthesia duration (min)	
	Male	Female	≤3.5	>3.5	<67	≥67
n (%)	33 (45.8)	39 (54.2)	50 (68.7)	22 (31.3)	35 (49.1)	37 (50.9)

The mean number of treated teeth for each patient was 9.63 ± 3.45 (range = 4–20). The most common procedure performed was stainless steel crown (95.8%) and pulp therapy (95.8%), followed by tooth-colored restorations (64.8%) and extractions (52.1%). The least applied dental treatments were amalgam fillings (5.6%).

The most postoperative psychological complications were Attachments to parents (70.8 and 65.2% on days 1 and 2, respectively) followed by excessive crying (56.9 and 45.8% on days 1 and 2, respectively). All psychological complaints reduced by day two nonsignificantly except excessive crying which decreased significantly after 48 h ($P = 0.004$) [Table 2].

The most postoperative nonpsychological complications were dental pain (59.7 and 47.2% on days 1 and 2, respectively) followed by inability to eat normal (55.6 and 41.7% on days 1 and 2, respectively). All the patients' nonpsychological complaints had significantly decreased from day one to day two ($P < 0.05$) [Table 3].

Only sore throat was significantly prevalent in younger children ($P < 0.05$), and nausea was the only compliant which significantly occurred more in females ($P < 0.05$). An increase in the length of the dental rehabilitation was associated with more dental pain, fever, and poor sleep ($P < 0.05$) [Table 4].

DISCUSSION

The aim of the present study was to evaluate the incidence and severity of complications in the first 48-h postoperative procedures in 2–7-year-old healthy children.

All the subjects reported complications during the first 24-h postoperative interval, consistent with

Table 2: The frequency of psychological changes following pediatric dentistry general anesthesia procedure at first and second day postoperatively

Postoperative complication	Attachment to parents	Excessive crying	Dread of being left alone	Poor sleep	Unspecified fear	Being afraid of the dark	Involuntary urination	Nail biting
Day 1, *n* (%)	52 (70.8)	41 (56.9)	26 (36.1)	25 (34.7)	23 (31.9)	12 (16.7)	6 (8.3)	2 (1.8)
Day 2, *n* (%)	48 (65.2)	34 (45.8)	22 (30.2)	20 (28.4)	19 (25.7)	9 (12.5)	5 (6.4)	1 (1.4)
*P**	0.07	0. 03	0.09	0.08	0.1	0.08	0.1	0.1

*Wilcoxon test

Table 3: The frequency of nonpsychological complications following pediatric dentistry general anesthesia procedure at 1st and 2nd day postoperatively

Postoperative complication	Inability to eat normally	Dental bleeding	Dental pain	Sore throat	Fever	Nausea/vomiting
Day 1, *n* (%)	40 (55.6)	21 (29.2)	43 (59.7)	33 (45.8)	33 (45.8)	29 (40.3)
Day 2, *n* (%)	30 (41.7)	16 (22.2)	34 (47.2)	25 (34.7)	20 (27.8)	13 (18.1)
*P**	0.007	0. 039	0.01	0.009	0.012	0.01

*Wilcoxon test

Table 4: Distribution of common postoperative complaints based on age, gender, and anesthetic duration

Postoperative complaints (%)	Age (years)			Gender			Anesthesia duration (min)		
	>3.5	≤3.5	*P**	Male	Female	*P**	>67	≤67	*P**
Inability to eat normally	52.2	57.1	0.08	60.6	51.3	0.1	50	51.7	0.09
Dental bleeding	30.4	33.3	0.07	21.2	35.9	0.09	32.1	31	0.08
Dental pain	56.5	61.9	0.1	69.7	51.3	0.08	50	65.5	0.03
Sore throat	34.8	71.4	0.04	40.6	51.3	0.07	32.1	48.3	0.09
Fever	25.4	22.5	0.06	33.3	56.4	0.07	15.5	37.5	0.04
Nausea	28.3	66.7	0.07	54.4	28.2	0.04	25	44.8	0.06
Poor sleep	37	28.6	0.09	30.3	38.4	0.09	25	34.5	0.03

*Chi-squared test

studies carried out by Holt *et al*.[6] and Farsi *et al*.;[18] however, the incidence of complications in the present study was higher than others.[7,16,19] Such a discrepancy might be attributed to the longer follow-up of patients in the present study compared to previous studies, which might increase the odds of reporting complications. The percentage of complications after 24 h were also higher than that compared to previous studies,[7,11,12] which might be attributed to the number of complications which have been evaluated.

Psychological complications such as phobia, dread of darkness, attachment to parents, nail biting and dread of being left alone, involuntary urination, and excessive crying were seen in 32% and 29% of subjects on the 1st and 2nd days postoperation consecutively. In the present study, the most common psychological complication was the attachment to parents (70.7%) followed by excessive crying (56.9%). Our result was higher than Farsi *et al*.[18] and Bridgman *et al*.[10] findings. It might be because in those studies, psychological changes were only evaluated in the form of bad sleep and cry. The finding of the present study was less than behavioral changes reported in children following day case general surgery.[20]

We also found a high incidence of sleepiness in our study (58.3%), approximately similar to Needleman *et al*.[4] (43%,), Holt *et al*.[6] (45%), but lower than Atan *et al*.[11] and Farsi *et al*.[18] in which the percentage of feeling sleepy after the procedure were84% and 71%, respectively.

It has previously been reported that for each 10-min increase in the duration of anesthesia, there is a 15% increase in sleepiness.[11] The mean duration of GA in the present study was 67 min, which might justify the higher rate of sleepiness in the subjects in comparison with the study of Farsi *et al*.[18]

The most common nonpsychological complication on the 1st and 2nd postoperative days was dental pain, which was reported by 59.7% of patients on the 1st day and in 47.2% of patients on the 2nd day. Pain was also a common finding in the majority of other studies investigating postoperative pain in children after receiving dental care under GA. The incidence

of which ranged between 36% and 93%.[6,11,21,22] This incidence of pain was higher than that in previous studies,[7,18,19] but lower than Needleman *et al*.[4] which reported postoperative pain in more than 90% of children; however, like Needleman *et al*.,[4] Atan *et al*.[11] and Farsi *et al*.[18] the incidence decreased significantly with time. It is important to note again when comparing these studies that there is great variability among the study designs, such as method and time(s) of pain assessment, age and medical status of the children, and the quantity and types of procedures performed. Use of proper analgesics during anesthesia and after it might help minimize reporting of pain. Considering the fact that in the present study systemic analgesics were administered to all the patients for two postoperative days and opioids were used during GA, the high prevalence of pain might be attributed to other reasons. It appears the number and nature of dental procedures carried out during GA might influence the rate of reporting postoperative pain.

In the present study, since a relatively high tooth number (mean of 9 teeth) underwent dental procedures in each patient and the subjects underwent extensive dental procedures, the high rate of postoperative pain is justified. In the present study, there was a significant association between dental pain and an increase in the length of GA, which might be attributed to an increase in the number of teeth undergoing dental procedures with an increase in the duration of GA. In addition, there was a statistically significant association between pulp therapy, as the second most common dental procedure, and pain.

There was no statistically significant association between gender of the children and pain. Needleman *et al*.[4] and Atan *et al*.[11] also evaluated gender as a variable and failed to find an association with postoperative pain.

In the present study, fever was reported in 45.8% of subjects on the 1st day, which is similar to Chuang *et al*.,[23] but higher than other studies.[4,9,18] These complications might be attributed to the fasting state of the children, before anesthesia, resulting in their dehydration and consequently postoperative fever. Previous studies have reported a strong relationship between dehydration and the incidence of fever.[24,25] Additionally intubation, especially cuffed intubation, during the anesthetic procedure might be another reason for the incidence of fever.[23] Other factors involved in higher body temperature after anesthesia are trauma to tissues and tissue destruction, environmental temperatures during the surgical procedure, administration of certain drugs, and bacteremia.[23] In the present study, a significant association was revealed between fever and duration of GA.

In the present study nausea and vomiting after dental rehabilitation occurred in 40.3% of children, which is higher than other studies.[19,23,26] In our study, fentanyl was administered to patients who exhibited emergence agitation before entering the postanesthesia care unit for recovery. This may have accounted for some of nausea, since several studies have reported that administering opioids can increase the occurrence of postoperative nausea and vomiting.[4,27] Nausea and vomiting could be also due to a number of other issues, including the site and nature of the procedure (e.g., the swallowing of blood), the drugs used pre/intra and postoperatively (e.g., opioids), and oral intake of food or fluids pre or postoperatively.[4] In the present study, there was no association between vomiting and patient's age and gender which is similar to Farsi *et al*.[18] and contrary to the results of previous studies.[7,28] In the present study, there was a significant association between nausea and gender, with a higher incidence rate in females.

Inability to eat was reported as a common complication in 55.6% of children in the first 24-h postoperative period. It was similar to previous reports,[6,19] but lower than Farsi *et al*.[18] findings who reported 85.5% of children were unable to eat a normal meal. The main reason for this complication could be due to dental pain, sleepiness, sore throat, fever, and nausea during the first postoperative day. However, similar to the study by Holt *et al*.[6] and Farsi *et al*.[18] inability to eat significantly decreased during the 2nd day and the child generally returned to the normal feeding habits. The dental practitioners should advise the parents and children to continue a normal diet regimen.

Approximately half of the patients complained of sore throat on the 1st day, twice than that reported by other studies which reported sore throat between 27% and 34%.[4,18,19] Trauma due to repeated intubations, use of cuffed tubes and use of throat double packs by some physicians have been reported the main etiological factors contributing to a sore throat. Therefore, to decrease the incidence of sore throats, efforts should be made to carry

out intubations with precision and with the least possible trauma. In the present study, the incidence of sore throats decreased significantly with age.

This prospective study was planned to be a baseline for morbidity in the Isfahan day-clinic. Recording immediate postoperative complaints can be count as strength of this article compare with similar top articles. However, the limitations of the present study should be considered. Applying the self-administered questionnaire without checking any biomarkers as well as small sample size, which might effect on the outcomes, could be considered as limitations of the present study. Further studies with larger number of cases which evaluating both immediate and delay postoperative complications are recommended.

CONCLUSION

This study's findings can help dentists who perform dental rehabilitations on children under GA advice their parents what children experience postoperatively. Based on this study's results, the following conclusions can be made regarding postoperative sequel for children undergoing dental rehabilitations:

1. The most postoperative nonpsychological complications were dental pain followed by inability to eat normally
2. The most postoperative psychological complications were attachments to parents followed by excessive crying.

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Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial in this article.

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