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Analysis of Dental Treatment Under General Anesthesia in Special Health Care Needs and Uncooperative Healthy Children

Özel Gereksinimli Çocuklar ve Kooperasyon Sağlanamayan Sağlıklı Çocuklarda Genel Anestezi Altında Diş Tedavisinin İncelenmesi

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Abstract

Objective: This retrospective study aimed to evaluate the characteristics and treatment modalities under general anesthesia (GA) in cases involving children with special health care needs (SHCN) and uncooperative healthy children (UHC).

Materials and Methods: Data regarding children's age, gender, health status, and type of dental treatment were collected, GA and analgesic drugs used, and the results were statistically evaluated. Demographic data were analyzed descriptively, and results were reported as mean ± standard deviation.

Results: Out of 225 cases of scheduled GA, 131 were children who presented with SHCN and 94 were UHC. We found that children with SHCN required more restorative treatments than uncooperative children. There was a statistically significant difference in the American Society of Anesthesiologists scores in children with SHCN.

Conclusion: In general, our study concludes that the medical history of patients can affect dental treatment scenarios and the post-operative approach.

Keywords: Special health care needs, cooperation, dental treatment, general anesthesia

Öz

Amaç: Bu retrospektif çalışma, Özel Bakım Gerektiren Çocuklar (ÖBGÇ) ve dental tedavi için yeterli kooperasyon sağlanamayan sağlıklı çocuklarda genel anestezi altında yapılan dental tedavileri ve genel anestezi prosedürlerini değerlendirmeyi amaçlamıştır.

Gereç ve Yöntemler: Çocukların yaşı, cinsiyeti, sağlık durumu, diş tedavisi türü, genel anestezi ve analjezik için kullanılan ilaçlar ile ilgili veriler toplanmış ve sonuçlar istatistiksel olarak değerlendirilmiştir. Demografik veriler analiz edildi ve sonuçlar; ortalama, ± standart sapma olarak bildirilmiştir.

Bulgular: Toplam 225 planlı genel anestezi olgusundan 131'i ÖBGÇ'den oluşurken, 94'ü yeterli kooperasyon sağlanamamış sağlıklı çocuklardan oluşmaktadır. ÖBGÇ'nin, kooperasyon sağlanamayan çocuklara göre daha fazla restoratif tedaviye ihtiyaç duyduğu gösterilmiştir. ÖBGÇ'de; Amerikan Anestezi Uzmanları Derneği skorlamasında istatistiksel olarak anlamlı bir yükseliş olduğu bulunmuştur.

Sonuç: Genel olarak çalışmamızda; hastaların tıbbi geçmişinin, diş tedavi senaryolarını ve ameliyat sonrası yaklaşımı etkileyebileceği sonucuna varılmıştır.

Anahtar Kelimeler: Özel Bakım Gerektiren Bireyler, kooperasyon, dental tedavi, genel anestezi

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Introduction

Dental treatment under general anesthesia (GA) is often required to complete safe and pain-controlled dental treatment for some patients (1). One of these situations is the population with special needs. Individuals with special health care needs (SHCN) are prone to have inadequate oral hygiene therefore they need comprehensive dental treatments. However, SHCN patients show high anxiety levels and inadequate cooperation (2).

Managing very young children with dental caries in the conventional care setting is extremely difficult (3). Frequently, during the treatment of severe and urgent dental caries in non-cooperative children, GA or sedation is required due to the fact that they fear or cannot endure these procedures in the dental chair.

Even though; GA is a frequent technique for uncooperative and SHCN patients, there are no certain protocols for receiving dental treatment under GA (4). Most of the studies on the provision of dental treatment for SHCN and uncooperative children under GA are retrospective and the majority of them did not clearly address the protocol following dental treatment under GA. All necessary interventions can be created and completed at just one visit under GA (2).

It is necessary to analyse and evaluate the benefits and risks that the patients will receive from GA in preliminary assessment appointments.

It is important to analyse and describe the risks and efficacy, for individuals receiving dental treatments under GA, in preliminary assessment appointments. The primary aim of this study is to compare the different patient categories that come for dental treatment while the secondary aim is to evaluate the characteristics and treatment modalities performed under GA for SHCN and uncooperative healthy children (UHC).

Materials and Methods

The study was reviewed and approved by The Ethics Committee of Marmara University Faculty of Dentistry (protocol no: 169/2018, date: 05.04.2018).

Patients with incomplete records and lack of paperwork information were excluded.

The following data were extracted from patient files

a. Patients demographics

b. Patient's medical condition

- SHCN
- Uncooperative children (5)
- Consultation process

c. Dental treatments under GA

d. American Society of Anesthesiologist's (ASA) Classification (6)

e. Anesthesia duration

- Duration of anesthesia is classified as short (30-60 min), medium (60-180 min), long (>180 min).

f. Information of GA

- Anesthetic drugs
- Analgesic agents
- Types of intubation
- Complications due to anesthesia
- Postoperative pain management

Statistical Analysis

Demographic data were reported as mean ± standard deviation. Mann-Whitney U test was applied and for categorical data, Pearson chi-square test was used to compare in subgroups. Significance level was set at p=0.05.

Results

The database of this study involved 233 records of pediatric dental treatments done under GA. Out of these, 8 records were incomplete and were hence excluded, leaving a total of 225 patient records that were used in the study.

The study group (n=225) was divided into two groups as group SHCN (n=131/58%) and as UHC (n=94/42%). The differences in age and gender between the groups was not statistically significant (p>0.05) (Table 1).

Table 1. General characteristics of the groups: age, gender, weight

		SHCN n=131	UHC n=94	Total n=225	p-value
Mean age		7.25±3.39	6.32±2.78	6.87±3.18	0.079
Mean weight		24.28±10.55	25.41±10.41		0.54
Gender	Girls n=89 (39.5%)	7.08±3.08 n=45 (34%)	6.51±2.72 n=44 (47%)	6.80±2.91	0.072
Total	Boys n=136 (60.5%) 225 (100%)	7.35±3.07 n=86 (66%)	6.16 ± 2.85 n=50 (53%)	6.91±3.36	

SHCN: Special health care needs, UHC: Uncooperative healthy children

Table 2 shows the distribution of treatments in terms of the teeth and jaws. SHCN had significantly more restorative treatments than UHC children ($p<0.05$) (Table 3).

Of all individuals, 13 (UHC=5, SHCN=8) patients received GA twice.

The distribution of ASA scores are summarized in Table 4. A higher frequency 102 (78%) of ASA physical status grade II was observed in children with SHCN. The highest score was in children with DS (50%). Forty patients (17.8%) underwent inhaled induction with sevoflurane, while 2 patients (0.89%) underwent intramuscular induction with ketamine (Table 5). Most of the patients (81.3%) underwent intravenous anesthesia with propofol (2-2.5 mg/kg) (Table 5). Anesthesia team able to access an intravenous line before anesthesia induction because all patients were given oral/intravenous/intramuscular premedication with midazolam. Balanced anesthesia was maintained with sevoflurane and remifentanil under nasal intubation. All patients had smaller sized tracheal tubes and nasotracheal intubation. Opioid analgesics (fentanyl 0.05 mg/kg added to induction drugs and remifentanil 0.125 mcg/kg/hour infusion for balanced anesthesia) were used in addition to local anesthesia for all patients. Systemic analgesia was with conventional pediatric doses of paracetamol (77.8%) and tenoxicam (7.56%). No serious post-operative complications were noted.

Discussion

American Academy of Paediatric Dentistry has listed the indications for GA for children and adolescents who

Table 2. Distribution of treatments across the groups

Total children n=225	SHCN n=131 mean ± SD	UHC n=94 mean ± SD	p-value
Restored teeth	7.15±4.742	5.30±4.80	0.008
Extracted teeth	4.24±4.044	3.80±3.40	0.056
Pulpotomy	1.198±1.9431	1.484±2.0783	0.259
Root canal treatment	0.146±0.5151	0.15±0.51	0.781
Pit and fissure sealants	0.93±2.44	0.28±1.01	0.003

SHCN: Special health care needs, UHC: Uncooperative healthy children, SD: Standard deviation

Table 3. Types of teeth under GA across the groups

	Extraction n=934	Restorations n=1433	Pulpectomy n=300	Root canal n=33
Primary teeth	850	940	289	10
Maxillary molar	164			
Mandibular molar	235			
Permanent teeth	84	483	11	23
Maxillary molar	18			
Mandibular molar	26			

Table 4. GA duration, ASA classification, and analgesic agents used

Duration of GA (min) mean duration of anaesthesia 140.51±68.25 (range: 20-280)		SHCN n=131	UHC n=94	p-value
		146.89±62.89 range: 25-280	132.67±74.48 range: 20-280	0.00
ASA (n=225)	ASA1	9	42	
	ASA2	102	52	
	ASA3	20	0	
	p-value	0.027	0.00	

GA: General anesthesia, ASA: American Society of Anesthesiologist, SHCN: Special health care needs, UHC: Uncooperative healthy children

Table 5. General anesthesia induction			
Anesthesia induction	**SHCN (n=131)**	**UHC (n=94)**	**Total (n=225)**
Inhalational anesthesia with sevoflurane	24 (18.8%)	16 (17.02%)	40 (17.8%)
Ketamine intramuscular	1 (0.76%)	1 (1.06%)	2 (0.88%)
Propofol intravenous	106 (80.9%)	77 (81.9%)	183 (81.3%)
SHCN: Special health care needs, UHC: Uncooperative healthy children			

cannot cooperate due to lack of psychological or emotional maturity and/ or mental, physical, or medical disability (7). A full mouth comprehensive dental treatment under GA is an effective method for treating multiple destructive dental caries of very young children (8) and SHCN (2) both.

According to our retrospective study data, a total of 131 (58%) SHCN patients received dental treatment under GA of which 21 (16%) had autism, 20 (15%) had mental retardation, 16 (12%) had epilepsy, 8 (6%) had cerebral palsy, 7 (5%) had attention deficit hyperactivity disorder, and 6(4%) had Down syndrome (DS). The remaining 53 (40%) patients of SHCN had underlying medical conditions. Özkan et al. (9) observed autism in 6% and mental retardation in 24.4% and DS in 2.4% of the cases that received dental treatment under general anaesthesia. Akpinar (10) reported 620 cases with complicated medical story and 120 DS cases who received dental treatment under GA in the retrospective study. Sevekar et al. (11) showed the distribution of the patients who received GA for dental treatment as flowing 45.46% with cooperation problems and 54.34% with SHCN which included only 1 patient with DS and 2 patients with Autism. The main reason for dental treatment under GA was behaviour problems.

Ethnic differences, genetic variations, and medical conditions could be related of the variability in the composition of selected study populations (12). Although the age range of the patients included in our study varied between 1.5 and 15, the intensity was between 6-11. Özkan et al. (9) reported the mean age and 16.78±12 years, and Baygin et al. (13) reported aged 3 to 15 years in their retrospective data. The gender disproportion was emphasized in many studies, but it has not been clearly stated why men outnumber women (2). Similarly; male patients constituted 60.5% of the population included in our study.

Unfortunately, there is lack of information is available guiding dental treatment protocols to be followed under GA. Dental procedures provided by different teams across the world vary to different degrees and dental treatment under GA has been mainly associated with oral surgery and tooth extraction (14). The modalities of caries management for those children differ in dentitions. In addition, medical restrictions affect the occurrence of differences in treatment indications. Ciftci and Yazicioglu (12) showed that although there were no statistically differences in the total number of restored teeth according to the groups, in group healthy and group SHCN <6-year age categories had received a greater number of restorative treatments compared to the 6-12-year age categories. There was a trend to be extraction and restorative treatments in our study similar to Sari et al. (15), and pit-fissure sealants were performed more in SHCN. Özkan et al. (9) also reported 239 (51.2%) extraction in their study. Sevekar et al. (11) showed a higher number of children with special needs had higher frequency of extraction. In conclusion extraction could be preferred because of faster, cheaper, and often provides a short waiting list for GA procedure (16).

Recurrence of the GA for receiving dental treatment is an important point for some situations regarding side effects coming from GA procedure complications and cost-effectiveness to thehealth insurance system. Landes and Bradnock (17) reported that children who had received GA for baby bottle syndrome; had to undergo repeated GA within one year. Therefore they recommend aggressive dental treatment plans including more extraction (17). In our study, 13 children received GA twice to treat recurrent caries and infections after a while getting the first GA.

An effective anesthetic preoperative examination is the basic procedure to medically optimize the patient (18). Detailed medical, social, and anesthetic history, a physical examination focusing on both general health and dentition, and any further diagnostic tests relevant to either the planned dental procedure or anesthesia should be included in preoperative assessments (19). Thus, the risks of anesthesia are reduced and the quality of care and treatment received from anesthesia is increased. ASA physical status classification system, assess the risk associated with the patients' medical history (6). The use of GA is considered relatively safe, and it has been widely described as a useful modality for the treatment of patients with special needs. Patients with certain syndromes may present with associated underlying disease (20). If necessary, a consultation and agreement with a specialist of the coexisting disease should be received. The consultations have a ratio of 100% in SHCN and 55% in all patients, and ASA score was higher in children with SHCN, this score was statistically significant in children with DS in our results.

After the patient's arrival to the hospital the morning of the operation, the respective pediatric dentist and anesthesiologist did a last preoperative visit to order premedication drugs. All of our patients received premedication via intravenous or oral route. Akpinar (10)

also explained the premedication and GA protocols and post-op follow-up and discharge conditions in his retrospective study on the principles of dental treatment under GA in patients with special needs.

Anesthesia and operative durations are discussed with postoperative complications (21) in which 40% of our patients had operating times that were over 180 min. The United States Food and Drug Administration announced in its December 14, 2016 statement that exposure to certain sedatives and general anesthetics, particularly during procedures longer than 3 hours, may affect the brain development of children under the age of 3 (22).

Propofol was used in 81.3% of the cases for intravenous anesthesia in the study. Akpinar (10) reported in detail that pental sodium and propofol were used 77.4% and 22.6% cases undergoing intravenous induction of GA respectively.

Since our patients were scheduled for outpatient anesthesia previous problem-free anesthesia history meant a lot for unintended airway for intubation problems. Many complications can be occurred in patient with SHCN after receiving GA including extended emergence time from anesthesia, difficult airway management and cardiac problems (20,23). While there were reported complications in a total of 4 patients, Campbell et al. (1) mentioned at a rate of 1.1%. No serious postoperative complications were noted in our study and all cases were discharged with safely.

Postoperative pain control is quite important for SHCN children. Postoperative pain will mimic the epileptiform activity, especially in cases of epilepsy (24,25). Most of the analgesics were applied before the end of dental treatment and anesthesia. Acetaminophen of 1-1.5 mg/kg was mostly preferred, but if the patient's weight was over 30 kg, tenoxicam and pethidine were added in the regimen. SHCN patients cannot properly describe their pain and, younger children sometimes complained about the sensation of anesthesia caused by the local anesthetic agent. Therefore, standard regimen was recommended for all patients. Eventually, post-operative pain was seldom reported. Özkan et al. (9) also reported that 66.6% of cases had paracetamol and 30.2 cases had local anesthesia during the treatment for pain control.

All patients had nasotracheal intubation which is used in mostly of the dental procedures. Özkan et al. (9) reported 82 (17.6 %) cases with classical nasal intubation, on the other hand Akpinar (10) reported that oral intubation mostly preferred. Tracheal tube size is also important in SHCN children. They need smaller sized tubes.

GA is becoming frequently preferred method for patients with SHCN. The medical history and risks should be evaluated in detail. In addition, it is recommended that the dental treatment plan should not cause repetitive treatment needs of the patient.

Conclusion

Special needs may affect the dental treatment provided under GA. Medical history of patients may affect dental treatment scenarios and post op rehabilitation approach.

Ethics

Ethics Committee Approval: The study was reviewed and approved by The Ethics Committee of Marmara University Faculty of Dentistry (protocol no: 169/2018, date: 05.04.2018).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: M.A.Y., G.B., B.K., Design: M.A.Y., G.B., B.K., Data Collection or Processing: M.A.Y., G.B., M.Ö., S.B.K., Analysis or Interpretation: M.Ö., B.K., Literature Search: M.A.Y., M.Ö., S.B.K., B.K., Writing: M.A.Y., G.B., M.Ö., B.K.

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