

A Retrospective Evaluation of Patients Who Had Dental Treatments Under General Anesthesia

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Abstract

Aim: This retrospective study aimed to evaluate the demographic and operational data of uncooperative healthy individuals and individuals with special needs who underwent dental treatments under sedation and general anesthesia.

Methods: Data of 458 patients with special needs and 77 healthy noncooperative patients who were examined at Cukurova University Faculty of Dentistry between January 2022 and May 2023 and underwent dental treatments under general anesthesia were examined retrospectively. Demographic data of the patients, American Society of Anesthesiologists (ASA) scores, mallampati (MP) scores, disability status, if they have systemic diseases, type of anesthesia (sedation/general anesthesia), anesthetic agents and analgesia used, operation duration and dental treatments, were evaluated.

Results: The average age of 535 patients who received dental treatment was 13.5±9.9 years and 58.1% (n=311) of the patients were male and 41.9% (n=224) were female. According to ASA scores, the distribution was 15.7% ASA I, 77.6% ASA II, and 6.7% ASA III. While 14.4% of the patients were systemically healthy, 16.7% had epilepsy, 12.9% had cerebral palsy, 12.1% had mental retardation, and 7.1% had Down syndrome. Of 7.1% had various comorbidities such as cardiological problems. Sedation was applied to 7.3% (n=39) of the patients, and general anesthesia was applied to 92.7% (n=496). The average anesthesia duration was 74.5±34.6 minutes. While the average restorative treatment applied to the patients was calculated as 6.45±3.9, tooth extraction 5.25±4.3, fissure sealant 2.44±2.5, pulp treatment 1.62±0.9; Trauma splint was applied to 3 patients.

Conclusions: While pre-anesthesia evaluation is very important in determining the risks in dental general anesthesia and sedation applications, the operating conditions and the general and oral health of the patients are effective in the dental treatment decision.

Keywords: Dental treatments, general anesthesia, patient with special needs, sedation

1. Introduction


General anesthesia is a method that requires a hospital environment, an anesthesiologist and a team, and causes depression in the motor and sensitive areas of the body, causing loss of pain sensation, muscle relaxation and loss of consciousness.¹ In pediatric dentistry, general anesthesia is frequently used as day hospitalization despite its risks in terms of optimization of treatment by both the physician and the patient.^{2,3}

In patient groups examined for pediatric dental examination and treatment, the patient's cooperation, anxiety level, treatment duration and type, dental treatment indication, patient's medical condi-

tion and many other factors are effective in determining the patient's indication for general anesthesia.

According to the American Academy of Pediatric Dentistry; People with severe fear and anxiety, mental or physical illness, situations that require urgent treatment such as many decayed teeth, dental trauma, severe abscess-cellulitis, acute pain, local anesthesia is not possible due to allergies and anatomical variations, improvement in behavior and dental compatibility. General anesthesia is indicated in patients who are expected to not recover in a short time and whose medical risks must be minimized⁴.

Pre-anesthesia evaluation, anesthesia management and dental treatment plan become important in order to minimize complications and prevent the need for new general anesthesia in healthy and special needs individuals who are planned to undergo dental general anesthesia and cannot be cooperated. In this study, it was aimed to retrospectively examine the characteristics, treatments, pre-anesthesia evaluations, anesthesia practices and pain management of the patients who applied to Cukurova University Faculty of

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Dentistry, Department of Pediatric Dentistry and underwent dental treatments under sedation and general anesthesia, and to evaluate them in the light of literature knowledge.

2. Materials and methods

The present study was carried out following the ethical rules of the Declaration of Helsinki and was approved by the Cukurova University Non-Interventional Clinical Research Ethics Committee with decision no. 53 on 05.05.2023. The data of 458 special needs and 77 systemically healthy noncooperative patients who were examined at Cukurova University Faculty of Dentistry between January 2022 and May 2023 and underwent dental treatments under general anesthesia were retrospectively examined. Patient records are archived both in the classical file system and electronically, and both archives were used for the study. Demographic data of the patients, American Society of Anesthesiologists (ASA) scores, mallampati (MP) scores, disability status if they have systemic diseases, type of anesthesia (sedation/general anesthesia), anesthetic agents and analgesia used, operation duration and dental treatments were evaluated.

Dental treatment procedures include tooth extraction (permanent and primary teeth), restorative treatment (amalgam restoration, composite restoration, glass ionomer restoration and stainless steel crown), pulp therapy (root canal treatment of permanent and primary teeth, amputation of permanent and primary teeth), fissure sealant. and trauma splint.

2.1. Statistical Analysis:

SPSS (Statistical Package for the Social Sciences) 25.0 package program was used in the statistical analysis of the data. Categorical measurements are summarized as numbers and percentages, and continuous measurements are summarized as mean and standard deviation (median and minimum-maximum where necessary).

3. Results

The average age of 535 patients who received dental treatment was 13.5±9.9 years old, and 58.1% (n=311) of the patients were male and 41.9% (n=224) were female. The distribution according to ASA scores was 15.7% ASA I, 77.6% ASA II, and 6.7% ASA III. MP score could be evaluated in 12.5% (n=67) of the patients before anesthesia, 47.8% (n=32) was MP 1, 40.3% (n=27) was MP 2, 10.4% was MP 2. (n=7) were found to be MP 3, and 1.5% (n=1) were found to be MP 4. While 14.4% of the patients were systemically healthy, 16.8% had epilepsy, 12.9% had cerebral palsy, 12.1% had mental retardation, 7.1% had down syndrome, and 7.1% had cardiological problems. Sedation was applied to 7.3% (n=39) of the patients and general anesthesia was applied to 92.7% (n=496). The average anesthesia duration was 74.5±34.6 minutes, 32.8±12.9 minutes in those subjected to sedation and 77.7±33.6 minutes in those subjected to general anesthesia. Only 1 of the patients who underwent general anesthesia had a tracheostomy, and 495 patients underwent oral intubation. It was determined that 15 (3.03%) of the patients had intubation difficulties. While the average restorative treatment applied to the patients was calculated as 6.45±3.9, tooth extraction 5.25±4.3, fissure sealant 2.44±2.5, pulp treatment 1.62±0.9; A trauma splint was applied to 3 patients. While local anesthesia was applied to 97 of the patients for analgesia, paracetamol was administered to 438 of them. Endocarditis prophylaxis was applied to 26 patients. Among anesthetic agents, the remifentanyl-propofol combination was used in 257 patients who underwent general anesthesia, while sevoflurane-oxygen combination was used in 237 patients. Midazolam-ketamine combination was admin-

istered to 39 patients who were sedated. The general characteristics of the patients are in table 1, the operation-related features are in table 2, the medical status of the patients is in table 3, and the treatments applied are in table 4.

Table 1

General data of the participants

Age (Mean±SD)	13.5±9.9
Male (n(%))	311 (58.1)
Female (n(%))	224 (41.9)
ASA (n(%))	
• 1	84 (15.7)
• 2	415 (77.6)
• 3	36 (6.7)
Mallampati score(n=67) (n(%))	67 (12.5)
• 1	32 (47.8)
• 2	27 (40.3)
• 3	7 (10.4)
• 4	1 (1.5)

SD: standard deviation

Table 2

Characteristics of the operations

Operation time (min) (Mean±SD)	74.5±34.6
General Anaesthesia (min) (Mean±SD)	77.7±33.6
Sedation (min) (Mean±SD)	32.8±12.9
Anesthetic procedure (n(%))	
• General Anesthesia	496 (92.7)
• Sedation	39 (7.3)
Intubation difficulty (n=496) (n(%))	15 (3.03)
Endocarditis prophylaxis (n(%))	26 (4.9)
Anesthetic agent (n(%))	
• Remifentanyl-Propofol	257(48)
• Sevofluran-Oksijen	237(44.3)
• Desflurane	2(0.4)
• Midazolam-Ketamine	39(7.3)
• Analgesia (n(%))	
• Infiltration Anesthesia	97(18.1)
• Paracetamol	438(81.9)
• Intensive Care Follow-up (n)	4

SD: standard deviation

Table 3

Medical conditions of the patients (n(%))

Epilepsy	90 (16.8)
Systemically healthy	77 (14.4)
Cerebral Palsy	69 (12.9)
Other	65 (12.1)
Mental Retardation	65 (12.1)
Autism	44 (8.2)
Down Syndrome	38 (7.1)
Cardiological disorders	38 (7.1)
Haematological disorders	19 (3.6)
Psychiatric disorders	14 (2.4)
Hydrocephalia	10 (1.9)
Immun deficiency disorders	6 (1.2)

Other: Hearing impairment, Williams syndrome, Sturge-Weber syndrome, cystic fibrosis, Gaucher disease, Kabuki make-up syndrome, Lesch-Nyhan syndrome, Fanconi Bickel syndrome, biliary atresia, Cornelia de Lange syndrome, Rotor syndrome, Ataxia telangiectasia, Prader Willi syndrome HIVEP2 gene-associated intellectual disability, medulloblastoma, mucopolysaccharidosis type 3, microcephaly, Wilms tumour, cleft palate, Turner syndrome, fibrosarcoma, Apert syndrome, Beckwith-Wiedemann syndrome, Rett syndrome, Aicardi-Goutieres syndrome, osteogenesis imperfecta, epidermolysis bullosa, muscular dystrophy, Goldenhar syndrome, dandy-walker syndrome, neurofibromatosis,

Table 4
Dental procedures

Treatments	Mean±SD
• Restorative treatment (Mean±SD)	6.45±3.9
• Tooth extraction (Mean±SD)	5.25±4.3
• Fissure sealant (Mean±SD)	2.44±2.5
• Pulp treatment (Mean±SD)	1.62±0.9
• Trauma splint (n(%))	3 (0.6)

SD: standard deviation

4. Discussion

General anesthesia and sedation are safely applied on a daily basis in the dental treatment of uncooperative healthy individuals of all age groups and individuals with special needs.⁵ Gender disproportionality has been noticed in many studies, but it has not been clearly stated why men so consistently outnumber women.^{6,7} Studies conducted with individuals with special needs have shown that patients have a wide age range ranging from 1 to 50 years old.^{8,9} This study population was found to be comprised of the majority of males and a wide age range ranging from 2 to 53 years. Systemically healthy individuals were found to be between the ages of 2-12. From these data, it can be seen that men are more compliant with dental treatments.

Priority should be given to dental treatments for individuals with special needs who have high-risk medical conditions, congenital heart diseases, and immunodeficiency manifested by signs and symptoms of dental treatment needs.¹⁰ In this retrospective study, 85.6% of the individuals who received dental treatments were individuals with special needs and 14.4% were systemically healthy individuals. Mallineni and Yiu recently published a retrospective study on dental treatment provided to individuals with special needs in Hong Kong and found that the population consisted of 60% of individuals with neurological problems, 12% with cardiovascular problems and 11% with various syndromes.⁷ The main underlying problems of individuals with special needs are 16.7% epilepsy, 12.9% cerebral palsy, 12.1% mental retardation, 7.1% Down syndrome, 7.1% cardiological problems. In this study, 84.3% of the patients who received dental treatments were evaluated as ASA 2, 3, while 15.7% were evaluated as ASA 1.

An MP score of 3 or 4 should suggest that there may be difficulty in intubating the patient.⁵ With a good pre-anesthesia examination, difficulties that the patient may experience during intubation can be predicted. However, intubation difficulties cannot be detected due to the lack of cooperation with individuals requiring special care during the examination.¹¹ In this study, the MP score could be evaluated in 67 patients, and the number of patients with an MP score of 3 or 4 was eight. However, the number of patients with intubation difficulties is fifteen. In individuals with special needs, there may be reasons such as some syndrome-related craniofacial anomalies, obesity, scoliosis, the size of the anatomical structures in the neck area and the frequent occurrence of respiratory diseases.¹²

Depending on the patient and the operation, sedation or general anesthesia is preferred. Indications for dental general anesthesia include patients with craniofacial anomalies who need dental treatment, orofacial trauma or jaw fractures, patients who are too young to cooperate or have special needs, patients with serious systemic diseases (epilepsy, haematological diseases, cardiological diseases, allergies, etc.), patients and patients whose dental treatments are planned to be performed in a single session.^{4,13,14} In this study, all dental treatments of individuals with special needs and uncooperative healthy young children were performed in a single session. The average operation time was 74.5±34.6 minutes, 77.7±33.6 minutes

in patients under general anesthesia and 32.8±12.9 minutes in patients under sedation. It was observed that 92.7% of the patients were administered general anesthesia. The long operation time, depending on the number of teeth to be treated, was a major factor in deciding on general anesthesia.

For patients with cardiological problems, necessary precautions should be taken to prevent the risk of infective endocarditis that may occur during dental treatments. However, the high probability of cardiological problems in patients with Down syndrome should not be overlooked in the pre-anesthesia evaluation of patients¹⁵. In this study, cardiology consultation was requested for every patient with cardiological problems and Down syndrome, and in line with the recommendations of cardiologists, antibiotic prophylaxis for infective endocarditis was administered to 26 patients, and no complications developed.

Dental treatments performed using general anesthesia and sedation are planned on a daily basis. Since there is a strong relationship between discharge and operation time, the operation time is limited to 90 minutes in outpatient treatments¹⁶. In this study, the average operation time was 74.5±34.6 minutes and all but 4 patients were treated on a daily basis. Four patients who were followed up in postoperative intensive care had muscular dystrophy. In these patients, sensitivity to sedatives, anesthetics and muscle relaxants, respiratory and cardiovascular complications may occur during and after the operation, and recovery after anesthesia may be prolonged.¹⁷

The selection of anesthetic agents is very important to adjust the postoperative recovery time in daily dental treatments planned under general anesthesia. While intravenously administered agents such as propofol, ketamine, thiopental and midazolam are generally preferred as anesthetic agents, sevoflurane is the most preferred among inhalation agents.¹⁸ However, short-acting opiates such as alfentanil and remifentanil are recommended for analgesia during the operation.¹⁹ In this study, the remifentanil-propofol combination was the most preferred anesthetic agent among the intravenous anesthetic agents, while the sevoflurane-oxygen combination was used among the inhalation agents.

When the dental treatments performed in this study were evaluated, it was seen that restorative treatments and tooth extraction were more common than other treatments, while fissure sealant and pulp treatments were less frequent. A review stated that restorative treatment and tooth extractions are more common in dental procedures performed under general anesthesia than other treatments.⁷ In a similar study, it was observed that restorative treatment and tooth extraction were more preferred.²⁰ In a study evaluating dental treatments performed under general anesthesia, it was observed that restorative and endodontic treatments were preferred²¹. However, in this study, pulp treatments, which may have a high risk of post-operative complications and failure and may require patients to undergo re-anesthesia, were less preferred than other treatments. In a study, it was reported that in cases where fissure sealant, which is one of the preventive applications, is used less frequently, the need for dental treatment under general anesthesia arises again.²² In this study, fissure sealant was used less frequently than other treatments. This can be explained by the fact that the majority of patients are individuals with special needs and cavitations often occur in the teeth along with poor oral hygiene.

The use of analgesia after dental treatments are performed under sedation and general anesthesia varies depending on the type and size of the treatment. While local infiltration anesthesia was sufficient for analgesia in 18.1% of the patients, paracetamol was used together with infiltration anesthesia in 81.9%. There is a risk of toxicity when a sufficient dose of local infiltration anesthesia is used in patients undergoing multiple tooth extraction. To avoid this risk, an-

algnesia management was performed using paracetamol.

5. Conclusion

Dental general anesthesia and sedation applications, which have become increasingly popular lately, allow all treatments to be performed successfully in a single session. In order to minimize the risk of anesthesia in young children and individuals with special needs, pre-anesthesia evaluation and planning should be done in detail. When we look at dental treatments, it is seen that physicians are torn between radical and conservative approaches and there is no consensus on this issue in the literature. In this case, dental treatment approaches should be decided by taking into consideration the operating conditions, the general and oral health of the patient, and the wishes of the parents.

Conflict of interest statement

The authors wish to state that they have no financial interests related to the content of this report.

Statement of ethics

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and was approved *Cukurova University Hospital Ethics Committee for this study (Decision No: 2023-133-53)*

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

References

- 1.Savanheimo N, Sundverg SA, Virtanen JI, et al. Dental care and treatments provided under general anaesthesia in the Helsinki Public Dental Service. *BMC Oral Health*. 2012; 12(45): 2-8.
<https://doi.org/10.1186/1472-6831-12-45>
- 2.Silva CC, Lavado C, Areias C, et al. Conscious sedation vs general anesthesia in pediatric dentistry—a review. *MedicalExpress*. 2015;2:M150104.
<https://doi.org/10.5935/MedicalExpress.2015.01.04>
- 3.Enever GR, Nunn JH, Sheehan JK. A comparison of post-operative morbidity following outpatient dental care under general anaesthesia in paediatric patients with and without disabilities. *International journal of paediatric dentistry*. 2000; 10(2):120-5.
<https://doi.org/10.1046/j.1365-263x.2000.00180.x>
- 4.American Academy of Pediatric Dentistry. (AAPD). Behavior Guidance for the Pediatric Dental Patient. Available from: <https://www.aapd.org/research/oral-health-policies--recommendations/behavior-guidance-for-the-pediatric-dental-patient/> (accessed on 23 November 2018).
- 5.Özkan AS, Erdoğan MA, Şanlı M, et al. Genel Anestezi Altında Dental Tedavi Uygulamasının Retrospektif Değerlendirilmesi. 2015;43:332-6.
- 6.Peretz B, Spierer A, Spierer S, et al. Dental treatment of patients with systemic diseases compared to patients with developmental disabilities under general anesthesia. *Special Care in Dentistry*. 2012; 32(1): 21-5.
<https://doi.org/10.1111/j.1754-4505.2011.00226.x>
- 7.Mallineni SK, Yiu CKY. Dental treatment under general anesthesia for special-needs patients: analysis of the literature. *Journal of Investigative and Clinical Dentistry*. 2016; 7(4): 325-31.
<https://doi.org/10.1111/jicd.12174>

- 8.Stanková M, Buček A, Dostálová T, et al. Patients with special needs within treatment under general anesthesia-meta-analysis. *Prague Med Rep*, 2011; 112(3): 216-25.
- 9.Machuca-Portillo MC, Hanje Herrero R, del Lopez Valle L, et al. General anesthesia: as a challenge and treatment need option in pediatric dentistry. *Puerto Rico Health Sciences Journal*. 2005; 24(4): 291-6.
- 10.Ciftci V, Yazicioglu I. A retrospective comparison of dental treatment under general anesthesia provided for uncooperative healthy patients and patients with special health care needs. *Journal of Clinical Pediatric Dentistry*. 2020; 44(3):196-201.
<https://doi.org/10.17796/1053-4625-44.3.11>
- 11.Çagiran EY, Efeoğlu C, Balcıoğlu T, et al. Mental Retarde Hastalarda Dental Tedavi: Retrospektif İnceleme/Dental Treatment in Patients with Mental Retardation: A Retrospective Study. *Türkiye Klinikleri Journal of Medical Sciences*. 2011;31(4): 830-6.
- 12.Michalek P, Hodgkinson P, Donaldson W. Fiberoptic intubation through an I-gel supraglottic airway in two patients with predicted difficult airway and intellectual disability. *Anesthesia & Analgesia*. 2008; 106(5): 1501-1504.
<https://doi.org/10.1213/ane.0b013e31816f22f6>
- 13.Alcaino E, Kilpatrick NM, Smith ED. Utilization of day stay general anaesthesia for the provision of dental treatment to children in New South Wales, Australia. *International Journal of Paediatric Dentistry*. 2000; 10(3): 206-12.
<https://doi.org/10.1046/j.1365-263x.2000.00193.x>
- 14.Carson P, Freeman R. Dental caries, age and anxiety: factors influencing sedation choice for children attending for emergency dental care. *Community Dentistry and Oral Epidemiology*. 2001; 29(1): 30-36.
<https://doi.org/10.1034/j.1600-0528.2001.029001030.x>
- 15.Faria PF, Nicolau JAZ, Melek M, et al. Association between congenital heart defects and severe infections in children with Down syndrome. *Revista Portuguesa de Cardiologia (English Edition)*. 2014;33(1):15-18.
<https://doi.org/10.1016/j.repce.2013.05.008>
- 16.Smith I, Skues M, Philip BK. Ambulatory (outpatient) anesthesia. Miller's Anesthesia, 8th ed (Ed RD Miller) 2612-45. Philadelphia: Elsevier Saunders, 2015.
- 17.Kocum A, Sener M, Caliskan E, et al. Anesthetic management for a child with unknown type of limb-girdle muscular dystrophy. *Pediatrics International*. 2010; 52(1):e37-e38.
<https://doi.org/10.1111/j.1442-200x.2009.02984.x>
- 18.Şimşek T, Yılmaz M. Çocuk Hastalardaki Dental Girişimlerde Genel Anestezi ile Sedasyon Tekniğinin Retrospektif Karşılaştırılması. *Kocaeli Tıp Dergisi*. 2017;6(1):59-62.
- 19.Karacalar S, Aykaç B. Dental girişimlerde genel anestezi uygulamaları. *Marmara Medical Journal*. 2010; 23(3):400-7.
- 20.Sari M, Ozmen B, Koyuturk AE, et al. A retrospective comparison of dental treatment under general anesthesia on children with and without mental disabilities. *Nigerian Journal of Clinical Practice*, 2014;17(3):361-365.
<https://doi.org/10.4103/1119-3077.130243>
- 21.Bulut M, Gönenç N. 1-12 yaş grubu çocukların genel anestezi altında yapılan dental tedavilerinin incelenmesi: bir retrospektif çalışma. *Türkiye Klinikleri Journal of Dental Sciences*. 2022; 28(1):79-85
- 22.Guidry J, Bagher S, Feleban O, et al. Reasons of repeat dental treatment under general anaesthesia: A retrospective study. *Eur J Paediatr Dent*. 2017; 18(4):313-8.
<https://doi.org/10.23804/ejpd.2017.18.04.09>