

Which one is the most preferred anesthesia type in dental treatments of patients with special needs: sedation or general anesthesia?

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ABSTRACT

Aim: Patients with special needs, who have mental, physical or medical disabilities, were reported to have worse oral hygiene than their healthy peers. Disabled patients are usually uncooperated, and dental treatments of these patients are completed under several anesthesia types. Our aim was to compare anesthesia types in dental treatments of patients with special needs.

Material and Method: The study included review of uncooperated patients, who had physical or mental disabilities, between June 1, 2021 and June 1, 2022. Patients were divided into three groups due to their anesthesia types; sedation (Group S), laryngeal mask airway (LMA) (Group L), and nasotracheal intubation (Group N).

Results: In total 80 patients were analyzed; 4 patients excluded, 45 patients were in Group S, 19 patients were in Group L, and 12 patients were in Group N. Anesthesia times were significantly different between groups; 20 min in Group S, 25 min in Group L, and 45 min in Group N. Propofol use was significantly low ($p < 0.001$) and ketamine use was significantly high in Group S ($p = 0.002$). Number of tooth extractions was not significantly different between groups, but number of filling tooth was significantly high in Group N ($p = 0.002$).

Conclusion: Sedation was the most preferred anesthesia type in dental treatment of patients with special needs. Although all three types of anesthesia can be used safely in dental treatments, we suggest that sedation can be considered as the first choice in tooth extraction in patients deemed appropriate by the anesthesiologist and dentist.

Keywords: Anesthesia, general anesthesia, dentistry, tooth, disabled persons

INTRODUCTION

Patients with special needs, who have mental, physical or medical disabilities, were reported to have worse oral hygiene than their healthy peers (1). Disabled patients are usually uncooperated, and dental treatments of uncooperated patients need to be completed under anesthesia (2). Dental anesthesia includes both sedation and general anesthesia. The decision to treat patients under sedation or general anesthesia has still further considerations, including the overall health of the patient, the preferences of the carers, the indicated procedures, operator/ facility-related factors or the cost (3). Even general anesthesia provides a relatively safe option for the dental treatment of patients, it is at higher risk of perioperative complications due to the presence of medical comorbidities. Unlike the healthy population, special needs patients are more likely to have medical comorbidities that can complicate the anesthesia (4-6). Therefore, preoperative assessments are essential

to reduce risk of peri-operative and post-operative complications (7).

During the preoperative anesthesia assessment ASA Physical Status Classification System is often used. The literature has suggested that patients classified as ASA III should be treated in hospital facilities (4). Even dental practitioners often prefer nasotracheal intubation for the dental treatment, anesthesiologists should be aware of any alterations in airway anatomy (5).

Guidelines for the pre-operative assessment of patients with special needs are also limited (3, 8-10). The British Society for Disability and Oral Health consensus (8) recommends that pre-operative assessments and consents should be conducted by both treating dental surgeon and anesthesiologist. In some cases, carers are not direct family members, and they may not be familiar with the patient's history. This can present difficulty to obtain suitable information regarding patient's

history and previous anesthetic experience, in addition preoperative instructions like fasting or medication dosage, or postoperative instructions (11-13).

Ultimately, the purpose of dental anesthesia is to allow total oral rehabilitation, which consists of tooth extraction, tooth filling or tooth cleaning in a single session. Past studies of dental anesthesia in patients with special needs have resulted in conflicted results. The objective of this study was to compare anesthesia types in dental treatments of patients with special needs.

MATERIAL AND METHOD

The study was carried out with the permission of Sancaktepe Şehit Prof. Dr. İlhan Varank Training and Research Hospital Ethics Committee (Date: 17.06.2022, Decision No: 46059562-020-566). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

In this retrospective study, we analyzed records of patients, who underwent dental treatment, including tooth extraction, tooth surface cleaning and tooth filling, under anesthesia between June 1, 2021 and June 1, 2022. All uncooperated ASA III patients with mental, physical or mental disability, and those who received dental treatment under anesthesia, were included in our study. Patients who were healthy or did not receive anesthesia for dental treatment were excluded. Peri-operative anesthetic management is standardized at our department. Anesthesiologist assessed the patient's general condition before the procedure.

According to anesthesiology department's protocol, intravenous (i.v.) cannula placement of patients was done at the floor, and patients came with an i.v. cannula to the preoperative area, where patients received a dose of 0.05 mg.kg⁻¹ i.v. midazolam for premedication. In the operating room, electrocardiography, non-invasive blood pressure, and oxygen saturation were measured in every patient.

The decision of which anesthesia type would be used was determined by the anesthesiologist in consultation with the dentist. Anesthesiology department's protocol included nasal oxygen administration in all patients, who were planned to apply sedation during the treatment. Administered anesthetic agents were changed due to the anesthesiologist' preference including ketamine, propofol and fentanyl. The protocol suggested to monitor the sedation level with Ramsay Sedation Scale (RSS) and the procedure was not started before the patient had RSS of 5. If the procedure maintained with general anesthesia, which included laryngeal mask airway (LMA) and nasotracheal intubation, rocuronium (0,6 mg.kg⁻¹) and sevoflurane (MAC=1) in a mixture of 50% oxygen and 50% air with 2 l.kg⁻¹ flow rate were added to induction agents, which

were ketamine, propofol and/or fentanyl as written in the protocol. Lungs were ventilated with a tidal volume of 6-8 ml.kg⁻¹ and with a positive end-expiratory pressure of 5 cm H₂O. End-tidal carbon dioxide was maintained at between 35 and 40 mmHg by adjusting the respiratory rate.

Patient sex, age, weight, and disabilities were recorded as demographic variables. Peri-operative data included the anesthesia types, anesthesia time, anesthesia drugs, numbers of tooth extraction, tooth filling and tooth surface cleaning, and hospital length of stay (LOS). Patients were divided into three groups due to their anesthesia types: sedation (Group S), LMA (Group L), and nasotracheal intubation (Group N). The peri-operative data from three groups were analyzed. In post-operative data; patients' hospital length of stay was recorded.

Statistical Analysis

Mean, standard deviation, median, minimum, maximum value frequency and percentage were used for descriptive statistics. The distribution of variables was checked with kolmogorov-simirnov test. Kruskal-wallis test and mann-whitney U test were used for the comparison of quantitative data. Chi-Square test was used for the comparison of the comparison of qualitative data. SPSS 28.0 was used for statistical analyses.

RESULTS

The study included 80 patients, who underwent dental treatment with anesthesia between June 1, 2021 and June 1, 2022. Four patients were excluded due to the missing anesthesia records. Seventy-six patients were enrolled to the study (**Figure**). Demographic variables of patients were presented in Table 1. Of all 76 patients, the median age was 14 (8-23) years with 29 (38%) female patients, and the median weight was 45 (25-69) kilograms (kg). The most common disabilities were mental retardation (28%), cerebral palsy (26%), and epilepsy (24%). In peri-operative variables of all patients, the median anesthesia time was 25 (18-34) minutes, the median fentanyl dose was 0.2 (0-1) microgram/kg, the median propofol dose was 1.5 (0,6-2) mg/kg, and the median ketamine dose was 0 (0-1) mg/kg. Seventy (92%) patients had tooth extraction, 20 (26%) patients had tooth filling, and 10 (13%) patients had tooth surface cleaning.

Patients were divided into 3 groups according to their anesthesia types. Forty-five patients received (60%) sedation (Group S) and 31 (40%) patients received general anesthesia during dental treatments. Under general anesthesia there were 2 groups with 19 patients (25%), who received LMA (Group L), and 12 patients (15%), who received nasotracheal intubation (Group N). There was no significant difference in the demographic variables except cerebral palsy disability between the three groups (**Table**

1). Group L had significantly higher cerebral palsy patients than other groups. ($p=0.035$). In 2 group comparisons, Group L had significantly high cerebral palsy patients than Group S ($p=0.044$) and Group N ($p=0.024$). Anesthesia times were significantly different between groups. ($p<0.001$) Median anesthesia time was 20 (15-29) minutes in Group S, 25 (20-30) minutes in Group L, and 45 (3-54) minutes in Group N. In 2 group comparisons, Group N was significantly longer anesthesia time than Group S ($p<0.001$) and Group L ($p=0.002$).

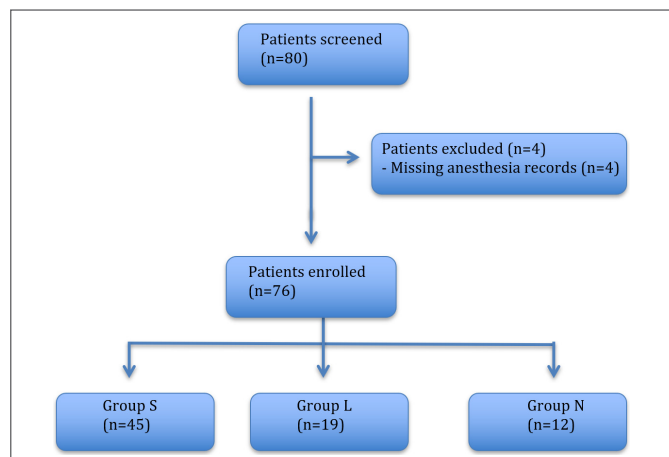


Figure. Flow chart

Propofol use was significantly low ($p<0.001$) and ketamine use was significantly high in Group S ($p=0.002$). In 2 group comparisons, Group S had significantly lower propofol use than Group L ($p<0.001$) and Group N ($p<0.001$); and significantly higher ketamine use than Group L ($p=0.007$) and Group N ($p<0.006$). In Group S ($n=45$); 12 patients did not receive propofol, 17 patients did not receive ketamine, and 23 patients did not receive fentanyl. In Group L ($n=19$); 1 patient did not receive propofol, 16 patients did not receive ketamine and 8 patients did not receive fentanyl. In Group N ($n=12$); 9 patients did not receive ketamine and 6 patients did not receive fentanyl.

Number of tooth filling patients and number of tooth were significantly high in Group N. ($p=0.002$) In 2 group comparisons, Group N had significantly higher tooth fillings patients than Group S ($p=0.001$) and Group L ($p=0.011$); and significantly higher tooth fillings than Group S ($p=0.001$) and Group L ($p=0.017$) (Table 2). There was no peri-operative adverse events including vomiting, pulmonary aspiration, laryngospasm or apnea in the current study. All patients were discharged from the hospital at the same day with procedure.

Table 1. Demographic variables

Variables	Total (n=76)	Group S (n=45)	General Anesthesia		P value
			Group L (n=19)	Group N (n=12)	
Age, yr	14 (8-23)	13 (7-22)	11 (8-27)	18 (9-23)	0.525
Gender					0.066
Female	28 (37)	14 (31)	6 (32)	8 (66)	
Male	48 (63)	31 (69)	13 (68)	4 (34)	
Weight, kg	45 (25-69)	40 (21-57)	43 (27-70)	62 (34-80)	0.119
Disability					
Mental retardation	21 (27)	13 (29)	5 (26)	3 (25)	0.954
Cerebral palsy	20 (26)	10 (22)	9 (47)	1 (8)	0.035
Epilepsy	18 (23)	10 (22)	5 (26)	3 (25)	0.934
Autism	17 (22)	12 (27)	3 (26)	2 (17)	0.555
Down syndrome	14 (18)	8 (18)	3 (16)	3 (25)	0.800
Psychosis	2 (3)	1 (2)	0 (0)	1 (8)	1.000
Microcephaly	1 (1)	1 (2)	0 (0)	0 (0)	1.000

Data are presented as medians (interquartile ranges) or absolute numbers (percentages).

Table 2. Peri-operative variables of patients

Variables	Total (n=76)	Group S (n=45)	General Anesthesia		P value
			Group L (n=19)	Group I (n=12)	
Anesthesia time, min	25 (18.34)	20 (15-30)	25 (20-30)	45 (31-54)	<0.001
Anesthetic agents, mg/kg					
Propofol	1.5 (0.6-2)	1 (0-1.6)	2 (1.5-2.6)	2.1 (1.26-2.5)	<0.001
Fentanyl	0.2 (0-1)	0 (0-0.6)	0.5 (0-1.2)	0.35 (0-1)	0.359
Ketamine	0 (0-1)	0.7 (0-1.4)	0 (0-0)	0 (0-0.23)	0.002
Rocuronium	0 (0-0)	0 (0-0)	0 (0-0)	0.4 (0.23-0.5)	<0.001
Tooth extraction					
Number of patients	70 (92)	43 (96)	17 (90)	10 (83)	0.630
Number of tooth	4 (3-6)	4 (2-5)	5 (3-10)	3.5 (2-7)	0.111
Tooth filling					
Number of patients	20 (26)	8 (18)	4 (21)	8 (67)	0.002
Number of tooth	0 (0-1)	0 (0-0)	0 (0-0)	0 (0-2.75)	0.002
Tooth cleaning					
Number of patients	10 (13)	3 (7)	3 (16)	4 (33)	0.759

Data are presented as medians (interquartile ranges) or absolute numbers (percentages).

DISCUSSION

The results of this study indicate that sedation was more preferred anesthesia type than general anesthesia in dental treatments of patients with special needs in daily practice. In our study 60% of patients underwent dental treatments with sedation. Our data are consisted with the literature, which suggested to consider general anesthesia only where other techniques have failed, due to the inherent risks, costs, and complications associated with treatment under general anesthesia (14-17). In addition, Infante et al. (18) emphasized the importance of ambulatory anesthesia with shortened waiting lists, patient satisfaction, and good quality of care. In our study LMA was more preferred than nasotracheal intubation with shorter anesthesia times. Similar to our results, Kim et al. (19) showed LMA had been preferred to use when short-term dental treatment was expected.

We showed no significant difference in the disabilities of patients between anesthesia types, except cerebral palsy. Cerebral palsy patients were mostly underwent dental treatments under general anesthesia. Our findings on the relationship between the disability and anesthesia type agree with those reported by Loyola-Rodriguez et al. (20), who assessed 38 cerebral palsy patients, and they mostly applied general anesthesia compared to sedation (57% vs. 24%). Unlike Hulland et al. (21), we observed no significant relationship between autism, epilepsy, and dental treatment under general anesthesia.

Our study showed that propofol was mostly preferred in general anesthesia than sedation. Moreover, ketamine was the most preferred agent in sedation with 0,7 mg/kg dosage. The reason for the preference of ketamine in sedation may be the reason that it does not cause respiratory depression. Our data differ from Loyola-Rodriguez et al. (20) study, which showed propofol preference for sedation. Likewise our patients distribution, Ouchi et al. (22) study had a population including epilepsy, autism, and cerebral palsy. Also, they showed higher propofol dosages, which was approximately 7 mg/kg, than our study, which we found 1,5 mg/kg in all patients.

Our other result was relevant to the anesthesia times. Even there was no significant difference in number of extracted tooth between groups, general anesthesia group, in particular Group N, had longer anesthesia times than sedation group (45 min vs. 20 min, $p < 0.001$). Tooth extraction was a painful procedure, and patients with sedation did tolerate the procedure with shorter anesthesia times. Also, anesthesia times in our study were significantly shorter than other studies. Literature showed longer anesthesia times, which were 50 and 120 minutes, than our study (20,21). Keles et al. (23) compared nasotracheal intubation and LMA in pediatric patients,

and likewise our study they found shorter anesthesia time in LMA group than nasotracheal intubation group.

In dental treatments, tooth extraction was the most applied treatment, which was performed in 92% of patients, and followed by tooth filling, which was performed in 26% of patients in the current study. There was not a significant difference between groups in extracted tooth numbers. Similar to our results, Keles et al. (23) found no significant difference in extracted tooth numbers between LMA and nasotracheal intubation group. In our study, tooth filling was mostly applied under general anesthesia. Contrary to Keles & Kocaturk study (23), we showed a significant difference between LMA and nasotracheal intubation in tooth filling. In addition, unlike Campbell et al. (24) study, which showed 95% of uncooperative pediatric patients underwent dental treatments under general anesthesia and the mean number of dental treatments were mostly consisted of 8 including crowns, fillings, and extractions, which we observed the mean number of extracted tooth number was 4.

Our study had several limitations. First, we did not record patients' daily medications, which can affect anesthesia agent doses. Second, we did not record the anesthesia emergence and post-operative care unit time.

CONCLUSION

Sedation was the most preferred anesthesia type in dental treatments of patients with special needs. Durations of sedation and general anesthesia in dental treatments were significantly different. Tooth filling treatment was mostly performed under general anesthesia. Although all three types of anesthesia can be safely used for dental treatments, we suggest that sedation can be considered as the first choice in tooth extraction in patients deemed appropriate by the anesthesiologist and dentist. As our cohort was limited with the dental anesthesia of patients with special needs, the results further suggest assessing sedation for dental treatments of patients. Additional studies are needed to confirm safety and applicability of sedation in dental treatment.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Sancaktepe Şehit Prof. Dr. İlhan Varank Training and Research Hospital Ethics Committee (Date: 17.06.2022, Decision No: 46059562-020-566).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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