

CLINICAL RESEARCH / KLİNİK ÇALIŞMA

## A RETROSPECTIVE ANALYSIS OF DENTAL PROCEDURES PERFORMED UNDER GENERAL ANESTHESIA

### GENEL ANESTEZİ ALTINDA DENTAL TEDAVİ YAPILAN HASTALARIN RETROSPEKTİF ANALİZİ

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#### SUMMARY

**Objective:** This study is an evaluation of the records of the patients who underwent dental treatment under sedation/general anesthesia.

**Method:** The data of 549 patients who underwent dental treatment under sedation/general anesthesia in Samsun Oral and Dental Health Hospital between 1st January 2013 and 31st December 2013 were evaluated retrospectively. Demographic data of the patients, indications for the dental treatment under anesthesia, type of treatment, anesthetic method, duration of surgery, duration of anesthesia, intubation method, duration of recovery and complications caused by anesthesia were recorded.

**Results:** Dental treatment under sedation/general anesthesia was mostly performed on pediatric patients (49.4%) and on patients with mental illnesses (26.9%) due to inadequate cooperation. In 76% of the patients, dental treatment was performed under general anesthesia, in 17.1%, under deep sedation and in 6.9%, under conscious sedation. The most common dental treatments performed under anesthesia were tooth extraction (62.3%), filling therapy (37.2%) and compacted tooth extraction (20.9%). It was observed that the recovery duration from anesthesia in mentally-disabled patients was longer than mentally normal patients, and it was statistically significant.

**Conclusion:** Due to the lack of cooperation, dental treatment under general anesthesia is mostly preferred in pediatric or in mentally-disabled patients. Against all negative aspects, dental treatment under general anesthesia is inevitable for many patients, and its outcomes are satisfactory.

**KEY WORDS:** Dental treatment, General anesthesia, Mental disability

#### ÖZET

**Amaç:** Bu çalışmada, sedasyon/genel anestezi altında dental tedavileri yapılan tüm hastaların kayıtları değerlendirilerek demografik özelliklerinin, anestezi altında tedavi olma endikasyonlarının, yapılan tedavilerin ve tercih edilen anestezi yöntemlerinin ortaya konulması amaçlanmıştır.

**Yöntem:** Çalışmamızda 01.01.2013- 31.12.2013 tarihleri arasında Samsun Ağız ve Diş Sağlığı Hastanesi ameliyathanesinde sedasyon/genel anestezi altında dental tedavisi yapılan 549 olgunun verileri retrospektif olarak değerlendirildi. Hastaların demografik özellikleri, dental tedavinin anestezi altında yapılma endikasyonu, yapılan tedavi, anestezi yöntemi, cerrahi süre, anestezi süresi, entübasyon yöntemi, uyanma süresi ve anestezi komplikasyonları bilgileri kaydedildi.

**Bulgular:** Sedasyon/genel anestezi altında dental tedavinin en fazla kooperasyonu yeterli olmayan çocuk hastalarda (%49.4) ve mental hastalıklarda (%26.9) uygulandığı görüldü. Hastaların dental tedavileri %76 genel anestezi, %17.1 derin sedasyon ve %6.9 bilinçli sedasyon ile gerçekleştirildi. Anestezi altında en fazla yapılan işlemler çekim (%62.3), dolgu (%37.2) ve gömülü diş çekimi (%20.9) oldu. Genel anestezi verilen mental engelli hastalar ile mental açıdan normal hastaların uyanma zamanları karşılaştırıldığında mental engelli hastaların istatistiksel olarak anlamlı ölçüde geç uyandığı görüldü.

**Sonuç:** Genel anestezi altında dental tedavi çoğunlukla koopere olamayan çocuk hastalarda ve mental engelli hastalarda tercih edilmektedir. Hasta seçimi yapılırken genel anesteziye ait riskler göz önünde bulundurulmalıdır. Herşeye rağmen genel anestezi altında dental tedavi birçok hasta için kaçınılmazdır ve sonuçları tatmin edicidir.

**ANAHTAR KELİMELELER:** Dental tedavi, Genel anestezi, Mental hastalık

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## INTRODUCTION

Most dental treatments are performed under local anesthesia and a small number of treatments are performed under general anesthesia. Before approving a patient for dental treatment under general anesthesia, the risks of general anesthesia should be evaluated independently (1,2). However, because of a lack of cooperation, general anesthesia may become a necessity in pediatric patients, patients with mental illnesses or dental anxiety and during extensive surgical procedures (3,4). This study aimed to present the demographic features, indications and types of dental treatment and preferred anesthetic methods by evaluating the anesthesia records of patients who underwent dental treatment under sedation/general anesthesia in a local multidisciplinary oral and dental health hospital.

## MATERIALS AND METHODS

The research was carried out after the approval of Samsun Ondokuzmayıs University Ethics Committee (27<sup>th</sup> November 2014, no:871). It was determined that 551 patients had received dental treatment under sedation/general anesthesia between 1<sup>st</sup> January 2013 and 31<sup>st</sup> December 2013 in Samsun Oral and Dental Health Hospital. Of these patients, an adult who had hypertension despite sedation, and a child who developed pneumothorax after intubation were excluded. The data of 549 patients were evaluated retrospectively. Written informed consent was obtained from patients and parents who participated. The data on age, gender, primary indication requiring anesthesia for dental treatment, type of treatment, the clinic where the treatment was performed, method of anesthesia, duration of surgery and anesthesia, method of intubation, duration of recovery and complications of anesthesia were recorded. Heart rate, oxygen saturation, noninvasive arterial blood pressure, anesthesia agents and their dosages and encountered complications were recorded.

### Statistical Analysis

Data was analyzed using SPSS 15.0 (Statistical Package for the Social Sciences, Chicago, USA) software. Quantitative parameters and normal distribution was compared with Kolmogorov-Smirnov Test. The student's t test was employed when comparing the groups whose parameters were in accordance with normal distribution. However, when comparing the groups with discordant parameters, a Mann-Whitney U Test was employed.  $\chi^2$  test was employed in comparing the qualitative parameters. The quantitative data was given in numbers and percentages, and the qualitative data was given in mean  $\pm$  standard deviation.  $p < 0.05$  value was considered statistically significant.

## RESULTS

In 2013, a total of 330.446 outpatients attended the clinics of Samsun Oral and Dental Health Hospital, and 244.551 of patients received dental treatment. Of these patients, 549 received dental treatment under general anesthesia for various reasons. Distribution according to age was as follows: 52.3% (n=287) were children between the ages of 2-12, 8.2% (n=45) were adolescents between the ages of 13-17 and 39.5% were adults between the ages of 18-74 (Table I). It was observed that patients between the ages of 4 and 5 years old had the highest rate for receiving treatment under anesthesia (20.6% and 19.9%, respectively) (Figure 1). Distribution of patients according to gender is given in Table II. 76% of the patients received general anesthesia, 17.1% received deep sedation, and 6.9% received conscious sedation (Table III). The most common patients for dental treatment under sedation/general anesthesia were pediatric patients (49.4%) and patients with mental illnesses (26.9%) due to poor cooperation (Table IV). Mental disability was found to be the most commonly encountered reason among patients with mental illnesses

Table I. Distribution of patients according to age

Groups	n (%)	Age (year) Mean $\pm$ SD (min-max)
Child	287 (52.3)	5.63 $\pm$ 2.53 (2-12)
Adolescent	45 (8.2)	15.17 $\pm$ 1.82 (13-17)
Adult	217 (39.5)	34.9 $\pm$ 12.89 (18-74)

Table II. Distribution of patients according to gender

Gender	n (%)	Age (year) Mean $\pm$ SD
Male	268 (48.8)	15.71 $\pm$ 14.75
Female	281 (51.2)	20.14 $\pm$ 17.25

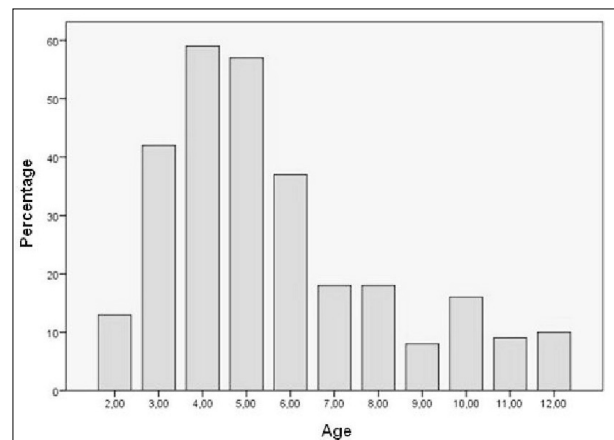


Figure 1. Distribution of age in pediatric patients

**Table III. Distribution of anesthesia method according to the age of patients**

	General Anesthesia n (%)	Deep sedation n (%)	Conscious Sedation n (%)
Total	414 (76)	95 (17.1)	39 (6.9)
Children	198 (69)	89 (31)	-
Adolescent	36 (80)	3 (6.7)	6 (13.3)
Adult	181 (83.4)	3 (1.4)	33 (15.2)

**Table IV. The primary indication requiring treatment under anesthesia**

Indication	n	%
Non-cooperative child patients	271	49.4
Mental disability	148	26.9
Dental anxiety	77	14
Large surgical procedures	45	8.2
Strong emetic reflex	8	1.5

**Table V. Distribution of patient diagnosis**

Diagnosis	n	Rate in mental illnesses (%)	Rate in all patients (%)
MD*	90	60	16.3
MD+epilepsy	22	14	4
Autism	10	6.7	1.8
Down Syndrome	9	6	1.6
Epilepsy	8	5.4	1.4
Schizophrenia	3	2	0.5
Spasticity	2	1.3	0.3
Hearing-impaired	2	1.3	0.3
Hyperactivity	1	0.6	0.1
Drug addiction	1	0.6	0.1
Total	148	100	26.9

\*MD: Mental Disability

(Table V). The most common indication for receiving anesthesia among adolescents and adults who were mentally well was dental anxiety (n=77, 14%). The most common types of dental treatment performed under anesthesia were tooth extraction, filling treatment and

**Table VI. Distribution of treatments according to patient ages**

Procedure	Total n (%)	Child n (%)	Adolescent n (%)	Adult n (%)
Tooth extraction	342 (62.3)	229 (67)	22 (6.4)	91 (26.6)
Filling treatment	204 (37.2)	169 (82.8)	9 (4.4)	26 (12.7)
Compacted tooth extraction	115 (20.9)	4 (3.5)	13 (11.3)	98 (85.2)
Extensive surgical approaches*	53 (9.7)	2 (3.8)	6 (11.3)	45 (84.9)
Periodontal treatment	19 (3.5)	2 (10.5)	4 (21.1)	13 (68.4)
Endodontic treatment	12 (2.2)	7 (58.3)	2 (16.7)	3 (25)

\*odontogenic cyst, odontogenic tumor, alveoloplasty

**Table VII. Distribution of patients according to the clinics that performed the treatment**

Clinic	n	%
Pedodontics	232	42.3
Oral and Maxillofacial Surgery	231	42.1
Integrated Clinic	65	11.8
Endodontics	3	0.5
More than one clinic	18	3.3

**Table VIII. Durations of surgery and anesthesia according to anesthesia method**

Method of Anesthesia	n	Anesthesia duration (minute) (min-max/mean)	Surgical duration (minute) (min-max/mean)
General Anesthesia	415	10-180/54.9	4-171/41.9
Deep sedation	95	5-40/14.8	2-35/6
Conscious sedation	39	9-45/19.9	3-30/10.3
Total	549	5-180/45.6	2-171/33.6

compacted tooth extraction (Table VI). The clinics which performed dental treatment under anesthesia most frequently were the Pediatric Dentistry Clinic and Oral and Maxillofacial Surgery Clinic (Table VII). The total and mean durations of the anesthesia and surgery in relation to the anesthesia methods employed are given in Table VIII. The shortest time for treatment under general anesthesia was 4 minutes and the longest was 171 minutes. When the recovery durations of patients with a mental disability and mentally intact patients were compared, it was seen that those with a mental disability took longer to recover than mentally healthy patients, and the difference was statistically significant ( $p < 0.001$ ) (Table IX). The patients who had received general anesthesia underwent nasotracheal intubation (84.4%) and orotracheal intubation (15.6%). Complications related to anesthesia were desaturation after extubation ( $SpO_2 < 90\%$ , n=26), postoperative nausea-vomiting (n=5), postoperative nasal hemorrhage due to nasal intubation (n=2), postoperative laryngeal edema (n=2) and pneumothorax in the right lung (n=1) (Table X).

**Table IX. Recovery times of patients with mental disabilities and intact patients**

Mental disability	n	Mean time (minute)	P value
Absent	292	5.57±2.33	<0.001*
Present	122	7.4±3.5	

\*p<0.05, statistically significant difference

**Table X. General anesthesia-related complications**

Complication	n
Desaturation after extubation	26
Postoperative nausea and vomiting	5
Nasal hemorrhage	2
Postoperative laryngeal edema	2
Pneumothorax	1

## DISCUSSION

It was observed that general anesthesia for dental treatment was mostly performed on pediatric patients and patients with mental illnesses. In healthy children, a fear of dental treatment and anxiety may interfere with the cooperation required for treatment. Similarly, mental illnesses negatively impacts on cooperation. The approach to these patients is particularly important, but because of its potential risks, general anesthesia should not be considered as an alternative in dental treatment but only as a final step.

The rate of treatments under anesthesia was 0.2% in all patients who received dental treatment in the hospital. Savanheimo et al. (3), reported in his study that 349 of about 160.000 patients who underwent dental treatment in Helsinki received general anesthesia. Similar to our study, about 2 out of 1000 patients who applied to the hospital for dental treatment received treatment under general anesthesia.

When choosing a method of anesthesia, the patient's cooperation, the extent of the treatment being performed and the estimated duration of the treatment should all be taken into consideration. Conscious/deep sedation was generally preferred for only a small number of simple tooth extractions. Since pressurized water is fed into the mouth during filling treatment, general anesthesia was performed together with endotracheal intubation to prevent the tracheal aspiration. Multiple treatments and extensive surgical procedures were also performed under general anesthesia.

The dental treatment under general anesthesia was most frequently performed in children aged 0-12. The majority of the treatments performed in children were multiple extractions and fillings (5,6). The American Academy of Pediatric Dentistry (AAPD) has classified

indications of dental treatment under general anesthesia in children. According to this classification, general anesthesia is typically required due to severe dental fear that interferes with the patient's ability to cooperate (2). The most challenging factors causing fear are injections, filling procedures, the noise of dental drills, the instruments put into the mouth, the touch of a stranger and the dentist himself (4,7-9). Additionally, the attitude of parents can also trigger the dental fear in children (10,11). Coric et al. (10), found in the study they conducted on 114 children and their parents that there was a significant positive correlation between the high score in the maternal Corah Dental Anxiety Questionnaire (CDAQ) and the dental fear and anxiety of the child. Jankauskiene et al. (12), observed that the oral health-related quality of life of the children and thus, the quality of life of the whole family, improved significantly after dental treatment under general anesthesia. In our study, the group defined as mentally disabled patients included the non-cooperative patients who had mental, motor or psychiatric problems that prevented their treatment in the clinic. It was observed that oral hygiene was poor in the majority of these patients, and often, multiple treatments were performed. The incidence of dental disease is higher in patients with mental disabilities than with mentally intact patients (13). They may have different pathologies affecting the oral cavity (14). They can not provide daily oral hygiene properly, easily access basic medical treatment and thus, they generally require multiple treatments (15,16). Since cooperation can not be assured, general anesthesia for dental treatment becomes essential for most patients with mental disabilities. When the relationship between dental problems and other systemic disorders is taken into consideration, the value of the treatments performed increases (17). Dental problems can enhance aggressive behaviors in mentally disabled patients. On the basis of the interviews performed with relatives of the patients, it was reported that after the dental treatment under general anesthesia, improvement was observed in the quality of life and neurocognitive functions of the patients with mental disabilities (18).

The data on dental anxiety in our study does not reflect the anxiety rate of all patients but reflects the rates of the adolescent and adult patients who received treatment under sedation/general anesthesia due to dental anxiety. In the literature, the incidence of dental fear and anxiety in adult patients ranges between 10% and 42.1% depending on the country (19). Dental anxiety delays the necessary dental treatment in most patients. It causes the progression of current oral pathologies and the deterioration of oral health-related quality of life (20,21). Most of these

patients have traumatic dental experiences and injection phobia (22-24). We observed that many patients who applied to our clinic with dental anxiety had suffered a traumatic dental experience. Thus, dental anxiety can be an indicator for dental treatment under sedation/general anesthesia even in mentally intact, healthy adults.

Since most dental treatments under anesthesia involve both lower and upper jaws, nasotracheal intubation has usually been preferred, in order to provide a comfortable working area for the dentist and to stabilize the endotracheal tube more safely. The intubation method may vary depending on the preferences of individual anesthetists. Oral intubation can be also performed, and the position of the endotracheal tube can be changed, depending upon which side is receiving treatment.

It was observed that the duration of recovery from general anesthesia was significantly longer for patients with mental disabilities compared with that of intact patients. In our study, the recovery time was recorded as the period between the cessation of sevofluran and N<sub>2</sub>O, and extubation. Any scale or monitorization was employed for the recovery criteria. Since the study plan was retrospective, we would like to present this datum derived from the study as our personal observation. In a study, mentally disabled and intact patients who received sevofluran were conducted and compared for dental surgery (25). They recorded the values of their regaining consciousness after the cessation of sevofluran and observed that patients with mental disabilities recovered from anesthesia more slowly. They emphasized that clinicians should be on the alert for the likelihood of late recovery in patients with mental disabilities. Since there are not enough studies in the literature, we believe that the effect of mental disabilities on the recovery time is an issue that needs to be studied.

In all our patients, the dentists applied 2% articaine infiltration in addition to sedation/general anesthesia. In a survey conducted on anesthetists working alongside dentists, reported that 90% of the anesthetists prefer to administer a local anesthetic injection as well as general anesthesia (26). The reasons for the local anesthesia application were a) to stabilize the vital signs, b) to decrease the depth of anesthesia, c) to increase the quality of recovery and d) to control bleeding. In our patients, LA injections were preferred primarily for the stabilization of vital signs and for increasing the quality of recovery.

In our study, the most commonly encountered complication related to anesthesia was oxygen desaturation (SpO<sub>2</sub> < 90%) after extubation. The most common cause

for desaturation after extubation is laryngospasm (27, 28). Laryngospasm is the involuntary closure of the upper respiratory tract due to glottic muscle spasms. Manipulation of the airway and blood or secretions in the pharynx are among the most commonly observed causes of laryngospasm (27). Due to the presence of these possible risks, the risk of laryngospasm can be expected to increase after a dental treatment under general anesthesia. The rate of cardiac arrest related to hypoxia induced with laryngospasm is reported to be 0.5% (28). In our study, the patients with laryngospasm were treated successfully and cardiac arrest did not occur. The complication with the highest mortality risk in our study was a right lung pneumothorax that developed after intubation in a mentally disabled 9-year-old patient. Persistent hypoxia development despite the proper intubation was considered as pneumothorax and a lung puncture was performed through the right midaxillary 4<sup>th</sup> - 5<sup>th</sup> intercostal space. Following clinical improvement, urgent pediatric surgery consultation was requested and a chest tube was inserted. The patient was transferred to the university hospital and discharged without any sequelae on the fourth day. The intraoperative pneumothorax observed in our patient is a rare, anesthesia-related complication. It is independent from the dental treatment, and has high mortality if not treated (29).

## CONCLUSION

Dental treatment under general anesthesia is mostly preferred in pediatric and mentally disabled patients with whom cooperation is not always possible. Independent risks related to general anesthesia should be considered during patient selection. However, dental treatment under general anesthesia is inevitable for a considerable number of patients, and its outcome is satisfactory.

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