



## **Retrospective Evaluation of Phobic or Handicapped Patient's Sedation Techniques for Dental Treatment**

**Berrin Işık<sup>1</sup>, Yeliz Kılınç<sup>2</sup>, Mustafa Arslan<sup>1\*</sup> and Mustafa Sancar Ataç<sup>2</sup>**

<sup>1</sup>*Department of Anesthesiology and Reanimation, School of Medicine, Gazi University, Ankara, Turkey.*

<sup>2</sup>*Department of Oral and Maxillofacial Surgery, School of Dentistry, Gazi University, Ankara, Turkey.*

### **Authors' contributions**

*This work was carried out in collaboration between all authors. Authors MA and BI designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author MSA managed the analyses of the study. Author YK managed the literature searches. All authors read and approved the final manuscript.*

**Original Research Article**

**Received 23<sup>rd</sup> October 2013**  
**Accepted 20<sup>th</sup> January 2014**  
**Published 30<sup>th</sup> January 2014**

### **ABSTRACT**

**Aims:** Phobic or handicapped patients presenting a lack of cooperation need pharmacological sedation techniques for performing dental procedures. The purpose of the study was to retrospectively evaluate the morbidity outcomes of dental patients receiving various levels of sedation in Oral and Maxillofacial Surgery Clinic supervised by an anesthesiologist.

**Place and Duration of Study:** This study was performed in the Department of Oral and Maxillofacial Surgery, Gazi University Faculty of Dentistry, Ankara, Turkey from January 2009 to July 2010.

**Methodology:** This study was approved by the Department of Oral and Maxillofacial Surgery at Gazi University Faculty of Dentistry. All relevant data were obtained from the patients' dental records. The sample consisted of 321 patients. Dental procedures performed included tooth extractions (simple tooth and impacted tooth extractions), orthognathic surgery, maxillofacial trauma procedures, tumor resections, cystenucleations, excisional biopsies, reconstructive surgery, abscess drainage, prosthetic, endodontic,

\*Corresponding author: Email: [mustarslan@gmail.com](mailto:mustarslan@gmail.com);

periodontal, combined treatments or surgery for orthodontic purposes.

**Results:** There were 164 males and 157 females (American Society of Anesthesiologists (ASA) I:181, ASA II:137, ASA III:3). Their ages ranged from 2.5 to 85 years with a median age of 25.8 years. 177 patients had phobic anxiety disorder and 96 patients had mental motor retardation. Sedation level was minimal (50), moderate (94), deep sedation or general anesthesia (177). Of the 321 cases nausea and vomiting (23, 7.1%), postoperative agitation (8, 2.5%), desaturation (5, 1.6%), bradycardia (3, 0.9%), hypotension (3, 0.9%), ventricular extra systoles (1, 0.3%) and tachycardia (1, 0.3%) were determined as a complication.

**Conclusion:** Careful consideration needs to be given to the objectives of the sedation when deciding which pharmacologic agents to be used because they all possess slightly different clinical characteristics and various degrees of risk. Patient and agent selection are the most critical factors when making decisions about sedation because the patient's expectations and general health status are of big importance for keeping the procedure safe. There are safe and effective sedative combinations for reducing patient fear and improving the level of comfort. But unexpected, rare and catastrophic events can occur with sedation.

*Keywords: Pharmacological sedation; dentistry; phobic anxiety; handicapped.*

## 1. INTRODUCTION

Several procedures encountered in general dental practice produce a significant amount of pain and anxiety. Patients that became phobic as a result of unpleasant dental or medical procedures, pediatric patients presenting a lack of cooperation and the growing number of people with special needs involving mental and physical limitations need special care for performing dental procedures.

It has been cited in various reports that the people with disabilities have more dental problems compared to general population [1-8]. In addition dental fear still continues to be a big problem despite significant progress in treatment modalities [9-11]. According to a study conducted in Turkey, the dental anxiety level among adults has been stated as 21.3% [12]. Performing dental procedures in these subsets of patient population has been a challenge for the dental practitioner, therefore providing high quality pain and anxiety control is of great importance to get satisfactory treatment results.

Management of pain and anxiety caused by the procedures performed in general dental practice is achieved by various methods. Management options include behavioral, psychological and pharmacological methods. Among these methods, pharmacologic approaches are usually required owing to their effective control on pain and anxiety. Sedation procedures, in which various levels of depression in consciousness are produced, help to provide a state of cooperation, thereby facilitating a safe and successful dental treatment [13]. Even though sedation can be considered a very safe and successful procedure; it's not free from risks. Hypoventilation, apnea, airway obstruction, laryngospasm, cardiopulmonary impairment, nausea and vomiting are some of the examples of the associated risks reported by many studies [14,15]. Identifying the risks arising from the potential side effects of the medications being used, thereby preventing adverse outcomes and minimizing their effect when they occur are the main goals of sedation care. Taking into consideration that complications can easily occur due to the level of sedation and medication

regimens in these subsets of patient population, it is essential to assess the complication rates and involved risks in providing dental care.

The purpose of the study was to retrospectively evaluate the morbidity outcomes of 321 patients receiving various levels of sedation in Oral and Maxillofacial Surgery Clinic of the Dentistry Faculty supervised by an anesthesiologist.

## **2. MATERIALS AND METHOD**

### **2.1 Method**

This study was performed in the Department of Oral and Maxillofacial Surgery, Gazi University Faculty of Dentistry, Ankara, Turkey from January 2009 to July 2010. Data was collected on all dental patients who received dental treatment under sedation between 31/1/2009 and 31/7/2010 dates. This study was approved by the Department of Oral and Maxillofacial Surgery at Gazi University Faculty of Dentistry. The dental procedures were carried out by several residents training in the dentistry faculty, and only one anesthesiologist performed in applying sedation procedures. Dental and anesthetic pre-operative assessments were carried out one day before the procedure. Details of previous medical and dental histories, medical clinical examination and radiographs were taken. Routine laboratory tests consisting of complete blood count, chest radiography, partial thromboplastin (PT) and activated partial thromboplastin time (aPTT) were ordered for patients if necessary. Patients or their parents were given written and verbal instruction to ensure patient's fasting from eating food and drinking water or beverages for 3-8 hours pre-operatively.

On the morning of surgery, a final pre-operative assessment was carried out and then written consent was obtained. After placement of intravenous (IV) line on the hand and routine heart rate, blood pressure, saturation of oxygen devices (Datascopes trio monitor™) were taken (when this could not be done earlier), nasal mask was positioned (AMS Minor 612™) and sedatives agents were given intravenously.

### **2.2 Statistical Analysis**

Statistical analysis was carried out with the use of the SPSS 12.0 for Windows. Data were presented as mean value  $\pm$  standard deviation (SD), n, (%).

Kolmogorov-Smirnov test was performed for the measurable parameters in order to determine whether the range is normal. Parametric values were evaluated with one-way ANOVA with Bonferroni adjustment. Numerically equality be achieved and non-parametric values were studied with Kruskal-Wallis test and the differences were evaluated with Mann-Whitney U test. Anesthetic agent according to sedation level (Nitrous oxide), Sedation level according to medical diagnosis was compared using Chi-square and Fisher's exact tests. Statistical significance was set at a p value  $<0.05$  for all analysis and  $p < 0.033$  (0.1/3) for Bonferroni adjusted Mann-Whitney U test.

### 3. RESULTS

Demographic variables, operation data and indications for treatment under sedation or general anesthesia are shown in Tables 1 and 2 respectively. Sedation level in patient as minimal-moderate-deep sedation or general anesthesia is shown in Table 3. Pharmacologic agents for sedation in patients and anesthetic agents in patients according to sedation level are shown in Tables 4 and 5. Sedation related complications and medication for treatment of side effects are presented in Tables 6 and 7. Of the 321 cases nausea and vomiting (23, 7.1%), postoperative agitation (8, 2.5%), de-saturation (5, 1.6%), bradycardia (3, 0.9%), hypotension (3, 0.9%), ventricular extra systoles (1, 0.3%) and tachycardia (1, 0.3%) were determined as a complication. In our study, we defined failed sedation for only 3 cases. A summary of the dental procedures performed is shown in Table 8.

IV administration of midazolam and fentanyl in moderate and deep sedation was found to be significantly higher when compared to moderate sedation ( $p < 0,0001$ ,  $p < 0,0001$ ). The administration of ketamine in deep sedation was significantly higher in comparison with moderate sedation ( $p < 0,0001$ ). The nitrous oxide use in deep and moderate sedation was significantly higher than minimal sedation ( $p < 0,0001$ ). The use of oral midazolam was similar in both deep and moderate sedation groups ( $p > 0,05$ ) Table 5.

Patients with mental motor retardation required deeper sedation or general anesthesia (75%) compared with phobic anxiety patients (51.4%) (Table 9).

**Table 1. Demographic properties and operation data (Mean±SD (Min-Max), n)**

<b>Demographic properties</b>	
Number of the patient (n)	321
Gender (Male/Female)	164/157
Age (Year)	25,85±16,92 (2,5-81)
Weight (kg)	55,10±25,43 (12-120)
Height (cm)	156,51±22,82 (27-197)
ASA (I/II/III)	181/137/3
Time of anesthesia (minute)	50,18±28,78 (15-205)
Time of dental procedure (minute)	39,24±27,48 (3-190)

*American Society of Anesthesiologists (ASA)*

**Table 2. Indications for treatment under sedation or general anesthesia (n (%))**

<b>Medical diagnosis for sedation indication</b>	<b>Patient (n, (%))</b>
Phobic anxiety	177 (55,1)
Mental motor retardation	96 (29,9)
Analgesia	20 (6,2)
Autism	9 (2,8)
Allergy	5 (1,6)
Maladaptive stress disorder	2 (0,6)
Monitorization	8 (2,5)
Other	4 (1,2)

**Table 3. Sedation level (n, (%))**

<b>Sedation level</b>	<b>Patient (n, (%))</b>	<b>State</b>
<b>Minimal sedation</b>	50 (15,6)	Patients respond normally to verbal commands, Cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.
<b>Moderate sedation</b>	94 (29,3)	Patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.
<b>Deep sedation or general anesthesia</b>	177 (55,1)	Patients cannot be easily aroused but respond purposefully following repeated or painful stimulation, ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate and positive pressure ventilation may be required because of depressed spontaneous ventilation. Cardiovascular function is usually maintained but may be impaired

**Table 4. Pharmacologic agents for sedation (n, Mean±SD (Min-Max))**

<b>Pharmacologic agents for sedation in patients</b>	<b>n</b>	<b>Mean±SD (Min-Max)</b>
Nitrous oxide (Inhalation)	280	-
Sevoflurane (Inhalation)	87	-
Midazolam (IV, mg)	173	3,02±1,93 (0,5-10,5)
Midazolam (Oral, mg)	30	12,78±2,65 (6-16)
Fentanyl (IV, µg)	203	81,33±42,63 (10-300)
Fentanyl (Oral, µg)	1	25,00±0,0 (25-25)
Ketamine (IV, mg)	85	46,25±42,63 (5-190)
Propofol (IV, mg)	32	177,72±139,91 (40-600)

**Table 5. Anesthetic agents according to sedation level (%), Mean±SD (Min-Max)**

	<b>Minimal sedation</b>	<b>Moderate sedation</b>	<b>Deep sedation or general anesthesia</b>
<b>Nitrous oxide</b>	32 (11,5)	84 (30,1)	163 (58,4)
<b>Sevoflurane</b>	-	-	87 (100)
<b>Midazolam (IV)</b>	1,75±0,65(0,5-3)	2,78±1,54(0,5-7)	3,42±2,18(0,5-10,5)
<b>Midazolam (Oral, mg)</b>	-	12,17±2,81(8-15)	13,05±2,61(6-16)
<b>Fentanyl (IV, µg)</b>	37,50±31,82(15-60)	83,03±43,46(20-300)	81,08±42,20(10-275)
<b>Fentanyl (Oral, µg)</b>	-	-	25,00±0,0(25-25)
<b>Ketamine (IV, mg)</b>	-	20,00±14,75(5-60)	53,30±44,92(5-190)
<b>Propofol (IV, mg)</b>	-	100,00±0,0(100-100)	185,07±144,77(40-600)

*Intravenous (IV)*

**Table 6. Complication and/or side effects (n (%))**

<b>Complication or side effects</b>	<b>(n (%))</b>
Nausea and vomiting	23 (4,1)
Postoperative agitation	8 (2,5)
Desaturation ( $94 \leq \text{SpO}_2 \leq 90$ )	7 (2,2)
Bradycardia (HR < 50 per minute)	5 (1,6)
Undesirable movement	3 (0,9)
Sedation failure	3 (0,9)
Hypotension	3 (0,9)
Convulsion	2 (0,6)
Disposal of swallowing	2 (0,6)
Ventricular extra systole	1 (0,3)
Tachycardia (HR $\geq 120$ per minute)	1 (0,3)
Postoperative pain	1 (0,3)

*Heart Rate (HR); peripheral oxygen saturation (SpO<sub>2</sub>)*

**Table 7. Medication for treatment of side effects (n (%))**

<b>Agents</b>	<b>(n (%))</b>
Metoclopropamide	23 (7,2)
Prednisolone	10 (3)
Anti-histaminic	7 (2,2)
Atropine	6 (1,9)
H <sub>2</sub> Receptor antagonist	4 (1,2)
Methyl-prednisolone	2 (0,6)
$\beta$ -Blocker	1 (0,3)
Tenoxicam	1 (0,3)
Furosemide	1 (0,3)

**Table 8. Dental procedures (n)**

<b>Surgical operation</b>	
Extractions (simple tooth extractions, impacted tooth extractions)	217
Orthognathic procedures (genioplasty, segmental osteotomy, Le Fort 1 osteotomy)	6
Maxillofacial trauma procedures (open reduction, intermaxillary fixation, tooth splinting, removal of plaques)	6
Maxillofacial pathologies (tumour resection, cyst enucleation, excisional biopsy, apical resection)	20
Reconstructive surgery (implant surgery, oroantral fistula repair, cleft palate repair)	7
Abscess drainage	6
Surgery for orthodontic purposes (frenectomy, exposure of unerupted teeth)	3
Endodontic Treatment (root canal therapy) & Dental Filling (amalgam, composite etc.)	23
Periodontal Treatment (detartrage, scaling and root planning)	4
Prosthetic Treatment (tooth preparation)	1
Combined Treatment	14
Other	14

**Table 9. Sedation level according to medical diagnosis (n (%))**

	Minimal	Moderate	Deep sedation/General anesthesia
MMR	6 (6,3)	18 (18,8)	72 (75)
Phobic anxiety	30 (16,9)	57 (32,2)	90 (50,8)
Analgesia	2 (10)	10 (50)	8 (40)
Autism	1 (11,1)	1 (11,1)	7 (77,8)
Allergy	3 (60)	2 (40)	-
Other	-	4 (100)	-
Monitorized patient care	8 (100)	-	-
Maladaptive stress disorder	-	2 (100)	-

*Mental motor retardation (MMR)*

#### 4. DISCUSSION

In this study, we performed a retrospective evaluation of our dental patients treated under sedation. Patients with phobic anxiety disorders or mentally and physically handicapped patients can have a high standard of care under sedation, which might not be possible under local anesthesia as they are often unable to cooperate. Previous studies [8,15-19] reported a lower quality of dental care for this group of patient in a regular clinical setting.

Dental patients with "special needs" can encompass a wide range of disabling conditions including intellectual disability, dementia, physical limitations, movement disorders, behavioral disorders and chronic medical conditions. Many of these individuals can be treated in routine dental settings with minimal special accommodations or with interventions that are well within the scope of most dental professionals and anesthesiology specialist. Although the incidence of mortality and morbidity associated with dental sedation are rare, the focus on sedation safety must remain a top priority. Avoiding drug overdose is one of the most important aspects of sedating handicapped patient [8,19-24]. In our clinics the administration of anesthesia is not performed due to the protocols holding a selection of standard dosage and agent, but planned individually depending on the varying needs of the patients. It is aimed at choosing the level of sedation in which a comfortable working environment maintaining the patient safety is obtained for the dental team.

Various differences exist in the dental sedation or anesthesia techniques provided for handicapped and phobic patients with different demands [8,21-26]. During sedation, the effects of pharmacological agents are superimposed on a patient's emotional state and level of arousal. A patient's endogenous behavioral state is particularly relevant for the practitioners who use sedation to enhance patient comfort. Deeper levels of sedation and even general anesthesia are required for patients exhibiting higher levels of anxiety and fear, whereas nitrous oxide alone is sufficient for the minimally anxious patient [27-28]. In the present study the agent and dosage used in the anesthesia technique were determined considering the individual features of each patient, and the types and amounts of the analgesic agents and dosages used in phobic and mentally disabled patients were different according to their varying degrees of anxiety. On the other hand mental motor retardation (MMR) patient's required deeper sedation or general anesthesia (75%) compared with phobic anxiety patients (51.4%).

Determination of the agents and dosages chosen depending on the varying needs of the patients ensured a low complication rate. Of the 321 cases nausea and vomiting occurred in 23 patients. Seven patients were de-saturated which was improved in a short time by using positive pressure ventilation. Five patients had short term bradycardia. Three patients had hypotension. One patient had ventricular extra systoles resolving spontaneously. One patient had tachycardia. The treatment could not be completed in three patients due to the inadequate level of sedation. In the postoperative period agitation occurred in 8 patients but it resolved in the first 30 minutes period. Two patients developed disposal of swallowing. Generalized convulsions occurred in a young adult patient free of systemic diseases and diagnosed with phobic anxiety disorder in the course of treatment under nitrous oxide sedation. A mentally motor retarded patient under epilepsy treatment developed generalized convulsions in the recovery period. Any life threatening complication wasn't encountered in our case series. The anesthesia team and equipment available for the induction of general anesthesia and for the maintenance of breathing and circulation support against possible life threatening complications provided the effective treatment for the side effects and complications in a short time.

Sedative and analgesic medications are routinely used in phobic or handicapped patients to reduce pain and anxiety, thereby facilitating dental treatments [8,16-19,21-24]. Mostly a combination of an opioid or ketamine, to provide analgesia and a hypnotic, such as a benzodiazepine or propofol to provide anxiolysis is used. A variety of opioids used by intravenous administration in adults are available for use in the anesthesia practice, including morphine, fentanyl, alfentanil, sufentanil and remifentanil [8,14-17,19-24]. In our practice we prefer fentanyl as an opioid and midazolam as a benzodiazepine since they have antagonist agent just like naloxan and flumazenil. But we did not need using of the antagonists.

Levels of sedation are classified by the American Academy of Pediatric Dentistry (AAPD) as minimal, moderate or deep sedation [29]. However it's entirely a theoretical classification and it's a state of continuum where the intended level of sedation could pass to a deeper stage due to the anesthesia administration and patient characteristics. In our patients sedation level was minimal (n=50) moderate (n=94), deep sedation or general anesthesia (n=177).

While dental procedures could not be performed owing to the inadequate levels of sedation in a few cases; conditions including nausea, vomiting, pain, postoperative agitation, desaturation, arrhythmias, hypotension and undesirable movements were encountered in some cases. Airway obstruction and nausea/vomiting are the most frequently encountered complications reported in various studies [13-18,20-22,26]. In a study of Boynes et al. [16] 286 patients that underwent sedation for their dental treatment have been reported a complication rate of 22.4%. All of the complications were considered to be mild (90.6%) or moderate (9.4%); there were no reports of severe complications. The complications encountered most frequently were airway obstruction (18 reports) and occurrence of nausea/vomiting (12 reports). Perrott et al. [30] reported the types and frequencies of some physiologic responses as complications associated with ambulatory anesthesia including laryngospasm, bronchospasm, cardiac arrhythmia, syncope, seizure, neurologic impairment etc on 34191 patients. The overall complication rate per patient was 1.3 per 100 cases (local anesthesia, conscious sedation and deep sedation/general anesthesia) and for conscious sedation 0.9 per 100 cases in their study.



## 5. CONCLUSION

As a conclusion; with well-trained dental clinicians and anesthetic staff, full equipment set up and following best described but not standardized protocol, office-based sedation offers a viable option for such patients whose dental treatment may otherwise be impossible to render.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. U.S. Department of Health and Human Services. Oral health in America: A Report of the Surgeon General-Executive Summary. Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health; 2000.
2. Oral Health America. The disparity cavity: filling America's oral health gap; 2000. Accessed June 20, 2010. Available: <http://www.oralhealthamerica.org/pdf/Disparitycavity.pdf>
3. Haavio ML. Oral health care of the mentally retarded and other persons with disabilities in the Nordic countries: present situation and plans for the future. *Spec Care Dentist*. 1995;15:65-9.
4. Feldman CA, Giniger M, Sanders M, Saporito R, Zohn HK, Perlman SP. Special Olympics, special smiles: assessing the feasibility of epidemiologic data collection. *J Am Dent Assoc*. 1997;128:1687-96.
5. Waldman HB, Perlman SP, Swerdloff M. Use of pediatric dental services in the 1990s: some continuing difficulties. *ASDC J Dent Child*. 2000;67:59-63.
6. Almomani F, Williams K, Catley D, Brown C. Effects of an oral health promotion program in people with mental illness. *J Dent Res*. 2009;88:648-52.
7. Baird WO, McGrother C, Abrams KR, Dugmore C, Jackson RJ. Verifiable CPD paper: factors that influence the dental attendance pattern and maintenance of oral health for people with multiple sclerosis. *Br Dent J*. 2007;13(2020): E4;discussion 40-1.
8. Anders PL, Davis EL. Oral health of patients with intellectual disabilities: a systematic review. *Spec Care Dentist*. 2010;30:110-7.
9. Armfield JM. Towards a better understanding of dental anxiety and fear: cognitions vs. experiences. *Eur J Oral Sci*. 2010;118:259-64.
10. Dionne RA, Gordon SM, McCullagh LM, Phero JC. Assessing the need for anesthesia and sedation in the general population. *J Am Dent Assoc*. 1998;129:167-73.
11. Smith TA, Heaton LJ. Fear of dental care: are we making any progress? *J Am Dent Assoc*. 2003;134:1101-8.
12. Firat D, Tunc EP, Sar V. Dental anxiety among adults in Turkey. *J Contemp Dent Pract*. 2006;7:75-82.
13. Glassman P. A review of guidelines for sedation, anesthesia, and alternative interventions for people with special needs. *Spec Care Dentist*. 2009;29:9-16.
14. Penã BM, Krauss B. Adverse events of procedural sedation and analgesia in a pediatric emergency department. *Ann Emerg Med*. 1999;34:483-91.
15. Côté CJ, Notterman DA, Karl HW, Weinberg JA, McCloskey C. Adverse sedation events in pediatrics: a critical incident analysis of contributing factors. *Pediatrics*. 2000;105:805-14.

16. Boynes SG, Lewis CL, Moore PA, Zovko J, Close J. Complications associated with anesthesia administered for dental treatment. *Gen Dent.* 2010;58:20-5.
17. Boynes SG, Moore PA, Lewis CL, Zovko J, Close JM. Complications associated with anesthesia administration for dental treatment in a special needs clinic. *Spec Care Dentist.* 2010;30(1):3-7.
18. Klein M, Weksler N, Weksler D, Bodner L. Office-based ambulatory sedation--the use of the airway protector system during oral surgery: a prospective audit of the first 100 patients. *J Oral Maxillofac Surg.* 2008;66:858-63.
19. Glassman P, Caputo A, Dougherty N, et al. Special Care Dentistry Association consensus statement on sedation, anesthesia, and alternative techniques for people with special needs. *Spec Care Dentist.* 2009;29:2-8.
20. D'Eramo EM, Bontempi WJ, Howard JB. Anesthesia morbidity and mortality experience among Massachusetts oral and maxillofacial surgeons. *J Oral Maxillofac Surg.* 2008;66:2421-33.
21. Melloni C. Anesthesia and sedation outside the operating room: how to prevent risk and maintain good quality. *Curr Opin Anaesthesiol.* 2007;20:513-9.
22. Flick WG, Katsnelson A, Alstrom H. Illinois dental anesthesia and sedation survey for 2006. *Anesth Prog.* 2007;54:52-8.
23. Caputo AC. Providing deep sedation and general anesthesia for patients with special needs in the dental office-based setting. *Spec Care Dentist.* 2009;29:26-30.
24. Kilbaugh TJ, Friess SH, Raghupathi R, Huh JW. Sedation and analgesia in children with developmental disabilities and neurologic disorders. *Int J Pediatr.* 2010;2010.pii:189142.
25. Dougherty N. The dental patient with special needs: a review of indications for treatment under general anesthesia *Spec Care Dentist.* 2009;29:17-20.
26. Jackson DL, Johnson BS. Conscious sedation for dentistry: risk management and patient selection. *Dent Clin North Am.* 2002;46:767-80.
27. Gras S, Servin F, Bedairia E, et al. The effect of preoperative heart rate and anxiety on the propofol dose required for loss of consciousness. *Anesth Analg.* 2010;110:89-93.
28. Malamed SF. *Sedation: a guide to patient management*, 4th ed. St. Louis, MO: Mosby. 2003;428-31.
29. American Academy of Pediatric Dentistry; American Academy of Pediatric Dentistry Committee on Sedation and Anesthesia. Guideline on the elective use of minimal, moderate, and deep sedation and general anesthesia for pediatric dental patients. *Ped Dent.* 2005-2006;27:110-8.
30. Perrott DH, Yuen JP, Andresen RV, Dodson TB. Office-based ambulatory anesthesia: outcomes of clinical practice of oral and maxillofacial surgeons. *J Oral Maxillofac Surg.* 2003;61:983-96.

© 2014 Işık et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*

*The peer review history for this paper can be accessed here:*  
<http://www.sciencedomain.org/review-history.php?iid=419&id=32&aid=3480>