Original Article

Is Age a Determinant for Nausea and Vomiting in Disabled Patients after Dental Treatment Under Sedation?

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Abstract

Background and Aim: Postoperative nausea and vomiting (PONV) is one of most frequently encountered problems after dental treatment of mentally and/or motor disabled patients under sedation or general anesthesia. In this study, we aimed to investigate whether PONV incidence in disabled patients differs between adults (≥18 years) and children/teenage (<18 years). Also investigating complication rates related with anesthesia protocols were additional objectives of the study. **Materials and Methods:** We retrospectively evaluated anesthesia reports of 664 cases undergone different dental treatment procedures under deep sedation with various anesthetic agents. Two study groups (Group 1 consisted from patients with special needs <18 years, while Group 2 consisted from patients ≥18 years) were created. PONV incidence and other complications recorded. **Results:** There was no statistical difference between groups in terms of used anesthetic agent except midazolam ($P < 0.017$), while higher female/male ratio and longer duration of anesthesia was recorded in Group 2 ($P = 0.043$ and $P = 0.046$, respectively). We found significantly higher PONV rates in disabled patients under 18 years ($P = 0.006$). Hypoxia (peripheral oxygen saturation (SpO^2) <90%) and bradycardia (heart rate <50/minute) were observed in only two patients. **Conclusion:** PONV is more common in disabled patients younger than 18 years and dental treatment procedures under deep sedation can be provided with acceptable complication rates in patients with special needs.

Keywords: *Nonintubated general anesthesia, patients with special needs, postoperative nausea and vomiting, sedation*

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Introduction

Patients with motor dysfunctions such as cerebral palsy, Parkinsonism, hereditary familial tremor, or mental disorders, such as Down syndrome, autism, seizure disorders, mental retardation, or both of mental and motor dysfunctions classified as patients with disabilities or special needs. All over the world approximately 785 million (15.6%) persons 15 years and older live with a disability.[1] In Turkey, percentage of people with mental and/or motor dysfunctions (0–70 years) to overall population was 2.58%.[2]

Higher incidence of dental caries and other dental problems in patients with special needs have been reported because of inadequate plaque removal, malocclusion, uncontrolled high carbohydrate diet also receiving not enough regular dental care for dental conditions because of unawareness of general health care and dental condition.[3,4]

Sedation either conscious or unconscious often facilitates dental procedures in patients with anxiety and fear, cognitive impairment, or motor dysfunction. A safe and successful dental intervention frequently becomes

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possible when performed under sedation in this group of patients.

Postoperative nausea and vomiting (PONV) is one of the most frequently reported complications of sedation protocols and PONV is the main cause of unplanned hospital admission after day care surgery in children.[5] Also in adults 30% of surgical patients are affected by PONV every year.[6] In this study, we aimed to investigate and compare the PONV incidence in patients with disabilities aged under 18 years with patients are equal or greater than 18 years received different dental procedures under deep (unconscious) sedation. Also, we investigated overall complication rates related with anesthesia protocols.

Materials and Methods

After obtaining approval of Ethics Committee of Gazi University Faculty of Medicine, we performed a retrospective analysis of clinical and anesthesia reports of 664 cases of 494 different patients (286 males, 208 females) with special needs who underwent different dental procedures under deep sedation. Reports of patients with Down syndrome, mental retardation, cerebral palsy, seizure disorders, motor function disorders, schizophrenia, Parkinsonism were investigated for purpose of study. Age, sex, duration of procedure, dose of administered anesthetic agent, postoperative complications include nausea vomiting, hypoxia, and hemodynamic disturbances were recorded. Two study groups regarded to age limit of <18 (Group 1 patients <18 years old, Group 2 ≥18 years) were created.

Statistical analysis

The statistical analysis was performed using Statistical Package for Social Sciences 20.0 software and $P < 0.05$ was considered statistically significant. The results were analyzed using independent *t*-test, Wilcoxon, Mann–Whitney, and Pearson's chi-square tests as appropriated. Data were expressed as mean ± standard deviation, (minimum-maximum), n (%).

Results

Data from 664 cases were evaluated; demographical data and total anesthesia time are presented in [Table 1]. Number of female patients in Group 2 was significantly higher than in Group 1 (0.043). Various anesthetic agents include midazolam, ketamine, propofol, fentanyl, sevoflurane, and N_2O were used alone or combined with each other. The most frequently used agent was midazolam, while ketamine had second place [Table 2]. Mean amounts of intravenous agents are presented in [Table 3]. Nausea was observed in 36 (5.4%) patients, while vomiting was in 31 (4.7%) patients. Only two respiratory or cardiac complications (hypoxia (defined as SpO_2<90%) and bradycardia (heart rate <50/minute) were observed [Table 4].

Mean anesthesia time was significantly longer in Group 2 than that in Group 1 (37.72 ± 14.89 vs 40.53 ± 16.51,

Table 1: Demographical data and duration of anesthesia in groups [mean ± SD (minimum-maximum), *n*]

	Group 1 (*n*=182)	Group 2 (*n*=482)	*P*
Age (year)	14.19 ± 3.27 (5-17)	25.87 ± 7.83* (18-64)	<0.0001
Sex (M/F)	110/72	249/233*	0.043
Duration of anesthesia (min)	37.72 ± 14.89 (10-90)	40.53 ± 16.51* (10-150)	0.046

*P<0.05: Compared to Group 1

Table 2: Types of administered drugs in groups [*n*]

	Group 1 (*n* = 182)	Group 2 (*n* = 482)	*P*
Midazolam	150	439	0.052
Ketamine	143	361	0.323
Propofol	36	93	0.802
Fentanyl	24	63	0.963
N_2O	99	258	0.841
Sevoflurane	86	221	0.747

Table 3: Mean amount of administered anesthetic drugs in groups [mean±SD (minimum-maximum)]

	Group 1 (*n* = 182)	Group 2 (*n* = 482)	*P*
Midazolam (mg)	1.59 ± 0.69 (0.5-4)	1.80 ± 0.97* (1-7)	0.017
Ketamine (mg)	34.18 ± 25.97 (5-150)	35.38 ± 25.35 (5-190)	0.637
Propofol (mg)	53.67 ± 25.89 (10-100)	62.37 ± 29.90 (10-200)	0.127
Fentanyl (µg)	101.46 ± 94.56 (20-400)	147.06±122.06 (10-600)	0.103

*P<0.05: Compared to Group 1

Table 4: Complication rates [*n* (%)]

	Group 1 (*n* = 182)	Group 2 (*n* = 482)	*P*
Nausea	17 (9.3)	19 (3.9) *	0.006
Vomiting	14 (7.7)	17 (3.5) *	0.023
Other (hypoxia and bradycardia)	2 (1,1)	0 (1)	0.131

*P<0.05: Compared to Group 1

Table 5: Scale for levels of sedation

Level	Description	Characteristics
1	Minimal	Awake but calm (little evidence of drowsiness)
2	Moderate	Awake but sedated (slowed or slurred speech)
3	Moderate	Asleep but easily aroused (verbally)
4	Deep	Asleep but difficult to arouse (shake/shout)
5	Deep	Asleep and unarousable

P = 0.046). Administered mean midazolam dose was significantly higher in Group 2 than recorded in Group 1 (P = 0.017). Mean doses of other administered agents were found similar between groups [Table 3]. In terms of postoperative complications, only one patient suffered from hypoxia and again only one patient suffered from bradycardia that did not required additional anticholinergic/sympathomimetic drug therapy. We found significantly higher nausea rates in Group 1 than that in Group 2 [9.3% (n = 17) vs 3.9% (n = 19), P = 0.006]. Similarly postoperative vomiting rates were higher in Group 1 than that in Group 2 [7.7% (n = 14) vs 3.5% (n = 17), P = 0.023].

Discussion

Safe, successful, and effective dental treatment (extraction, restorative, endodontic, periodontal treatment) of patients with special needs often requires sedation or general anesthesia due to lack of cooperation, involuntary movements of head, tongue or another parts of body, high levels of anxiety that does not respond regular medical therapy of patients.[7-10] Different levels of sedation can be used during dental procedures; however, we usually prefer deep sedation using intravenous or—with less frequency—inhalation anesthetics in patients with special needs because of higher incidence of uncontrolled movements and resistance to both anesthesiologist and dentist during session. During deep sedation patient is asleep, difficult to arouse, or unarousable [Table 5].[11] Also, we ensure an effective and sufficient local anesthesia because previous reports showed that more satisfied sedation without pain can be possible with an effectively provided local anesthesia.[3]

PONV is one of the most common adverse events seen at early postoperative period that affects 30% surgical patients every year.[6] Although clinically PONV is often self-limiting and resolves spontaneously with/without any medication, Macario *et al*.[12] reported that patients rated PONV as more distressing than postoperative pain. Another two studies also reported significantly improved patient satisfaction rates following successful prevention of postoperative nausea.[13,14] In patients at high risk (female, nonsmoking status, history of PONV or motion sickness, anxiety, general anesthesia using volatile anesthetics or nitrous oxide, the use of opioids, longer surgical as well as anesthesia periods, children 3 years or older) incidence of PONV can be as high as 80%.[6] In our study, overall nausea and vomiting rates are 5.4% and 4.7%, respectively. When we made a comparison between two study groups we clearly noted that PONV incidence in patients younger than 18 years was significantly higher than those at 18 years or older (9.3% vs 3.9% and 7.7% and 3.5%, respectively, P = 0.006 and P = 0.023, respectively). Whenever we investigate used anesthetics in two groups—because opioids, inhalational agents, such as N_2O and sevoflurane are all accepted as risk factors for PONV—we found significant differences in only mean midazolam doses (1.59 ± 0.69 vs 1.80 ± 0.97, P = 0.017) between two groups. Also number of female patients and duration of procedure—both of two are accepted as risk factors for PONV[6]—were significantly higher in Group 2 (P = 0.043 and P = 0.046, respectively). These findings strongly indicate that disabled patients younger than 18 years are at high risk for PONV even without risk factors, such as female gender, longer anesthesia time. Results of this study are compatible with findings of previous studies indicating the average incidence of PONV in childhood of between 33.2% and 82% can be twice as high compared with adults.[15-18] As mentioned previously patients with any disabilities are not accepted as high-risk patients for PONV and several investigations showed similar PONV rates in patients with special needs compared to phobic and anxious patients.[19,20] As a result, we can suggest that the age of patients undergoing dental treatments under deep sedation using various anesthetic drugs even emetogenic agents include opioids and inhalation agents can be accepted as risk factor for PONV but not the special status of disabled patients.

In deep sedation it's essential to secure the airway clear from rinsing water, secretions, and debris. Although any complications (mainly mild or moderate) related with anesthesia administration were reported at approximately 20%,[3] we found only two postoperative complications (hypoxia and bradycardia without any medical treatment) except PONV in our study records. This finding is similar with results of various studies conducted in this patient group. Perrott *et al*.[21] reported no mortality in 34,391 procedures involving deep sedation/general anesthesia (71.9%), conscious sedation (15.5%), and local anesthesia only (12.6%) over a 1-year period and only two complications (an allergic reaction to antibiotic treatment and aspiration) that required hospitalization occurred. In another study, Enever *et al*.[9] retrospectively investigated

postoperative complications in children with or without any disabilities and found no life-threatening complications [nausea/vomiting (20%), unexpected drowsiness (13%) and the need for pain relief at home (13%)].

Conclusion

We suggest that the low incidence of morbidity found in our study and studies cited previously is related to careful patient selection, perioperative management include close monitoring, usage of anesthetic drugs with improved side effect and faster recovery profile, finally and most importantly excellent cooperation between the anesthesiologist and dentist. Finally, according to our results we can conclude that PONV rates encountered during dental treatments under deep sedation of patients with special needs younger than 18 years are higher than those found in older patients. Additionally PONV rates in both of two age groups may not differ from those seen in normal population—data from previous studies that have been cited above.

Limitations

Retrospective and uncontrolled design of this study is the main limitation of study that does not allow further and more accurate evaluation of risk factors related with PONV and other complications in this special population. However, results of this study conducted on a large number of patients with special needs may lead future studies and encourage anesthesiologists and dentists in their practice on disabled patients.

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Conflicts of interest

There are no conflicts of interest.

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