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Research Article

Complications of IV sedation for dental treatment in individuals with intellectual disability

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KEYWORDS

Complications;
IV sedation;
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Abstract Few studies have looked at the incidence of complications performed with IV sedation for dental treatment. The purposes of this study were to (1) delineate the nature and frequency of postdental treatment complications associated with dental treatment under IV sedation in individuals with intellectual disability, and (2) correlate morbidity reports with patient's gender, age, and duration of dental procedures.

Materials and methods: 28 Patients with intellectual disability, 13 females and 15 males, aged 3–36 years. IV Propofol was given 1 mg/kg IV Propofol bolus Incremental top ups of 0.25 mg/kg Propofol as required. If the patients were dental treated, then postcomplications while recovering in hospital were evaluated. Statistical comparisons of patient complications, gender, age, and duration of dental treatment were made.

Results: There were no reported serious adverse effects. Minor posttreatment complications occurred in 7 (25%), agitation in 28.6%, sleepiness in 28.6%, drowsiness in 14.3%, and pain in 14.3%, followed by dental bleeding in 14.3%. Gender of the patients was found to be significantly related to post-operative complications, while age and duration of dental treatment showed no significant relationship.

Conclusion: IV sedation with Propofol for patients with intellectual disability for dental treatment appears to be with minor complications.

1. Introduction

Persons with intellectual disability have difficulty in cooperating, so they need special support in order to receive dental treatment, as many of them are referred for IV sedation [1]. There are many drugs for IV sedation as Propofol. Propofol alone or in combination with other sedatives/analgesics has become popular for procedural sedation. Most published guidelines do not include considerations for people with special needs. There is a need for increased research and documentation of combined treatment modalities, and these combined approaches need to be incorporated into guidelines for patient care for people with special needs [2].

The important goals of sedation/anesthesia for outpatient surgery are low incidence of postoperative side effects permitting a rapid and safe discharge [3].

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Many complications had been observed after dental treatment. Few studies have looked at the incidence of complications performed with IV sedation for dental treatment. So the design is made to determine these complications and their correlation to gender, age and duration of dental treatment for the individuals with intellectual disability undergoing dental treatment.

The purposes of this study were to (1) delineate the nature and frequency of postdental treatment complications associated with dental treatment under IV sedation in individuals with intellectual disability, and (2) correlate morbidity reports with patient's gender, age, and duration of dental procedures.

2. Materials and methods

28 Patients with intellectual disability, 13 females and 15 males, aged 3–36 years, with a weight of range 10–80 kg, healthy classified as ASA 1 or 11, were mainly referred from the faculty of dentistry in Damascus University, Syria.

The patients were selected for IV sedation because they were highly resistive during the initial examination. So each patient previously exhibited combative behavior sufficient negative to dental treatment using routine behavior management techniques. The research Ethics Committee of Damascus University, Syria, approved the study. Informed consent was obtained for the drug regimen. The parent was instructed to keep the patient NPO for 8 h before the appointment, except for a glass of water 4 h before the appointment. The parent also was instructed to place a diaper on the patient. No premedication was used.

The intellectual disability patients were treated at setting room at maxillo-facial hospital at Faculty of dentistry, Damascus University, Syria. The IV sedation was provided by an anesthetist at the hospital. A certified registered nurse anesthetist administered the drug and monitored the patient.

In this study, Propofol was given according to a previously published guideline 1 mg/kg IV Propofol bolus Incremental top ups of 0.25 mg/kg Propofol as required.

The protocol allowed for each patient to receive an additional intravenous bolus of Propofol. Sedation level was adjusted to achieve scores of 5 on the Ramsay Sedation Scale (Table 1).

All patients were treated by pediatric dentist residents under direct supervision of pediatric dentist consultant. The dental treatment started 5 min after Propofol administration, when the patients were sufficiently sedated. No local anesthesia had been performed. Sedation and treatment were satisfactorily completed in all cases in one visit, and all patients involved in this study were received the expected dental care. The most frequent treatment was, extraction 82%, followed by ART fillings 11%. The least applied dental treatments were sealants 7%, requiring no saline irrigation. The treatment ended between 9:30 AM and 1:00 PM. The duration of the treatment was 5–60 min.

Table 1 Ramsay scale for the assessment of the level of sedation.

Level of activity	Points
Patient anxious agitated or restless	1
Patient cooperative, commentated and tranquil	2
Patient responding only to verbal commands	3
Patient with brisk response to light glabella tap or loud auditory stimulus	4
Patient with sluggish response to light glabella tap or loud auditory stimulus	5
Patient with no response to light glabella tap or loud auditory stimulus	6

Vital signs consisting of blood pressure, respiratory rate, heart rate and hemoglobin oxygen saturation via pulse oximetry were obtained. Resuscitation equipment was available if required and a medical team followed each treatment session. Preparing for discharge started in the recovery area. The medical practitioner did not leave the recovery area until the discharge criteria were met.

All patients involved in this study were observed in the recovery room before the patient was ready to leave hospital and postoperative complaints were recorded.

The presence or absence of posttreatment complications including respiratory depression, cardiopulmonary complications, Bradycardia, emesis was evaluated. Also minor complications including, nausea, vomiting, sleepiness, pain, bleeding, Agitation, and headache, and others such as coughing, were evaluated by one pediatric dentist.

Discharge from recovery room was within 60 min. Patients were discharged from the hospital after complete recovery, which was defined as the presence of vital variables within reference limits, full wakefulness, and the ability to drink or eat. The decision as to whether the patient was ready for discharge was made by the resident in charge of the sedation.

2.1. Statistical analysis

The study included descriptive and analytical data. Complications while recovering in hospital were evaluated. The obtained results were analyzed statistically using SSPS Version 13 statistical software. Statistical comparisons of patient complications, gender, age and duration of dental treatment were made by unpaired Student's t-test. All differences were considered significant at $p < 0.05$.

3. Results

No serious adverse effects occurred. There were no deaths and no reported incidents of aspiration or emesis associated with procedural Propofol sedation. None of the patients had required mechanical ventilation.

Adverse events showed that 7 patients (25%) had less serious posttreatment complications (Table 2).

The most common minor complaints reported were: Agitation in 2 patients (28.6%), sleepiness in 2 patients (28.6%), drowsiness in 1 patient (14.3%), and pain in 1 patient (14.3%), followed by dental bleeding in 1 patient (14.3%) (Table 3).

In this present study, statistical comparisons of patient complications and gender were made by unpaired Student's *t*-test. A positive significant correlation was found between the presence of the complications and gender of the patient (p value $= 3.877$, $p = 0.049 < 0.05$). This increase was greater in males than in females (Table 4).

Table 2 Results of presence of one or more post-operative complication at recovery time.

No. patients			Percentage		
No complication	One complication or more	Total	No complication	One complication or more	Total
21	7	28	75.0	25.0	100

Table 3 Results of post-operative complication at recovery time.

Complication	Number of patient	Percentage (%)
Agitation	2	28.6
Sleepiness	2	28.6
Drowsiness	1	14.3
Pain	1	14.3
Dental bleeding	1	14.3

In this present study, statistical comparisons of patient complications, age and duration of dental treatment were made by unpaired Student's *t*-test. There were no significant differences found between the presence of the complications and age of the patient ($t = 1.306$, $p = 0.052 > 0.05$) (Table 5), and the duration of the treatment ($t = 0.545$, $p = 0.591 > 0.05$) for the patient (Table 5).

4. Discussion

In this study intravenous sedation using Propofol was applied for dental patients with intellectual disability similar to other reports [4–6]. Propofol was given according to published guideline [7,8] 1 mg/kg IV Propofol bolus Incremental top ups of 0.25 mg/kg Propofol as required, as study of Newstead and his colleagues [9]. A safe dosing regimen is therefore not apparent, although started with a dose of 1 mg/kg followed by titration of smaller doses to effect, as study of Symington and Thakore [10].

Currently, there are no established definitions or terminology for sedation-related adverse events (AEs). With clear terminology and definitions, sedation events may be accurately identified and tracked, providing a benchmark for defining the occurrence of AEs, ranging from minimal to severe [11].

However, there was a paucity of data on the incidence of complications performed with IV sedation for dental treatment. This is the first regional study to determine the type and frequency of postoperative complaints expected of IV Sedation for dental treatment in individuals with intellectual disability.

In this study no immediate mortality was reported and no serious adverse effects were seen, similar to some reports [12–14], and similar to reports for intellectual disability patients [1,6,15].

Trials suggest that the use of IV hydroxyethyl starch solutions is associated with increased risk of death and acute kidney injury in critically ill and surgical patients in the study of Gillies and his colleagues [16].

Table 4 Relationship between post-operative complaints and gender of the patient.

		No. male patients	No. female patients	Total	Percentage male patients	Percentage female patients	Student's t-test	*p*	
Gender of patient	No complication	9	12	21	60.0	92.3	3.877	0.049	Significant relationship
	One complication or more	6	1	7	40.0	7.7			
All		15	13	28	100	100			

Table 5 Relationship between post-operative complaints and age of the patient and duration of the treatment.

		No complication	One complication or more			
Age of patient	No. patients	21	7			
	SMA	14.10	9.43			
	Standard deviation	9.19	2.94			
	Minimum	3	6			
	Ceiling	34	14			
	Student's t-test	1.306				
				p	1.306	No significant relationship
Duration of treatment	SMA	22.25	19.17			
	Standard deviation	11.75	13.57			
	Minimum	5	10			
	Ceiling	60	45			
	Student's t-test	0.545				
				p	0.591	No significant relationship

In this study there were no serious cardiopulmonary complications suffered by patients, similar to some reports using IV Propofol sedation [13,17].

In this study no patient experienced respiratory depression or required any intervention, in accordance with the study performed by Phillips and his colleagues [16]. Hahl and his colleagues observed that respiratory depression occurs mainly during deep sedation in 19% of patients receiving Propofol alone, due to deep sedation or over-dose sedation produced by Propofol, but no associated morbidity or major adverse events [18].

McGrane and his colleagues observed 4.65% experienced adverse events related to procedural sedation with Propofol. Hypotension was the most common, occurring in 2.33% of the patients. 1.40% experienced brief hypoxia, 0.93% of patients developed brief apnea that required brief bag valve mask-assisted ventilation. No patient required any advanced airway management [19].

In this study 1 h after treatment, minor complications occurred in 7 (25%) of all performed IV sedation with Propofol have been used, while the percentage was 10.1% in the study of Lynette and his colleagues [20]. Adverse sedation events occurred in 6.0% but there were no incidents with serious squeal in the study of Ransford and his colleagues [21]. The sentinel adverse event rate of 1% identified prompts review: 11 sentinel (5 cases of hypoxia, 6 of hypotension), 34 moderate, 25 minor and 3 minimal risk adverse events in the study of Newstead and his colleagues [9]. In a previous study in adults with disability using intranasal plus intravenous midazolam 6% of adverse events were reported in the study of Manley and his colleagues [22]. Also minor side effects were recorded for 16.6% of sessions in patients with intellectual disability in the study of Callado and his colleagues, using intravenous Midazolam. The disparity between these results is in part due to differences in defining and recording minor adverse events [23].

In this study the most common complaint during early and intermediate recovery reported was: Agitation 28.6%. This phenomenon did not delay discharge from the recovery room. In contrast, Picard and his colleagues reported Postoperative agitation 9%. Also the use of Propofol is associated with a reduction in the incidence of emergence agitation in the study of Key and his colleagues [24]. There were no instances of agitation, nausea, or vomiting in the study of Lynette and his colleagues [20].

Other complaints included sleepiness were reported in this study 28.6%. This would be expected given the time of the day, since most of the treatment ended between 9:30 AM and 1:00 PM, while the most common intraoperative and post-adverse events were hallucination (3.9%) and excessive sleep (41.9%), respectively in the study of Costa and his colleagues using oral medication [25].

Postoperative pain was reported in this study 14.3%. In other studies pain along the intravenous line after Propofol injection was the most frequent adverse effect. It was reported on injection in 48% (excluding patients with central venous catheters), despite simultaneous lidocaine infusion in the study of Barbi and his colleagues [26].

Shabana observed, the incidence of both immediate and delayed types of pain associated with Propofol injection was 24% [27].

Postoperative dental bleeding was reported in this study 14.3%. It must be stated that all parents were given postoperative instructions that included patients eating soft foods, staying well hydrate.

In this study there were no instances of postoperative nausea and vomiting similar to other studies [3,20]. But the incidence of both nausea and vomiting was significantly lower in the study of Moore and his colleagues [28].

Propofol has a bronchodilating effect. Its anti-emetic characteristic gives an added advantage to minimize postsedation nausea. These aforementioned characteristics make propofol especially beneficial for individuals with intellectual disability [29].

In this study there was no cough reflex, but there was cough reflex in the study of Kohjitani and his colleagues, for 21 intellectually disabled patients who were enrolled, coughing episodes correlated neither with intraoral use of water nor with infusion rate of Propofol. These findings suggested that accumulation of water in the oropharynx increased vulnerability to the cough reflex in dental treatments performed under intravenous sedation [30].

The incidence of cough episodes was significantly higher at the maxillary anterior site and lowest at the right mandibular molar areas in the study of Hanamoto and his colleagues [31]. These findings suggest that difficulties in swallowing and in the suction of intraoral fluids have variable effects at different surgical sites. Careful suction of intraoral water and an appropriate sedation level are required, especially in procedures in the maxillary anterior region.

In this present study a positive significant correlation was found between the presence of the complications and gender of the patient. This increase was greater in males than females. This may be due to the slow rate of boy's psychological maturation that makes them unable to tolerate complications than females. This difference found also by Norton and his colleagues who investigate the hypnotic upper airway mechanics during midazolam sedation and reported that men have increased dynamic pressures required to induce upper airway obstruction [32]. Female subjects required more negative pressures to cause upper airway obstruction with midazolam but not with Propofol. Also female sex hormone may play a role in determining upper air way structures and mechanical properties [33].

In this present study there were no significant differences found between the presence of the complications and age, duration of dental treatment performed for the patient.

Age could not be stratified because the subjects recruited were adults in the study of Rahman and Hashim [34], while age and psychological maturity can affect emergence agitation in the study of Picard and his colleagues [3]. Minor complications were recorded in children under 16 years, all patients with intellectual disability in the study of Ransford and his colleagues [21].

There was no significant difference in the complications rate between males and females, among the different ages, or among the different indications for procedural sedation and analgesia in the study of Pena and his colleagues [35].

This is the first regional study to determine the postoperative complications expected with IV sedation for dental treatment in patients with intellectual disability. The strength of this study came from its prospective design, which helped us in determining the postoperative complications immediately and did not allow for poor recall.

Further studies are necessary for offering better dental care to those patients. It should include large sample sizes from varying disability kinds, and varying age will help strength the results and provide greater confidence when applying the finding to clinical practice.

5. Conclusion

The use of IV sedation with Propofol for patients with intellectual disability for providing dental treatment appears to have minor complications, when administered and monitored by a qualified anesthetist.

Conflict of interest

There is no conflict of interest.

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